# MANGALAYATAN UNIVERSITY, ALIGARH

## CENTRE FOR DISTANCE AND ONLINE EDUCATION


## PROGRAMME PROJECT REPORT

# BACHELOR OF ARTS

## (JOURNALISM AND MASS COMMUNICATION)

# BA-JMC

## 2023-24

# Introduction

BACHELOR OF ARTS (JOURNALISM AND MASS COMMUNICATION)(BA-JMC) is unique at Mangalayatan University in its commitment to both breadth and depth of knowledge after 12th. Its aim and scope is very focused in its approach to preparing a student for higher education as well as for needs of media industry.

The duration of the Program shall be of three academic years for award of undergraduate degree and 4 years for award of undergraduate degree with research. Each academic year shall be divided into two Semesters, viz., Odd Semester comprising the period between July and December/January and Even Semester comprising the period between January and

May/June. The program follows CBCS (Choice Based Credit System) which encourages inter-disciplinary approach allowing student to choose any subject of their choice offered by various departments. This allows students to get a Major degree in Mass Communications along with a Minor degree in their chosen subject.

## A. Programme's Mission and Objectives

**Mission:**

To excel students in a multicultural environment to be critical thinkers, innovative professionals and writers, and leaders in the field of journalism.

To create new knowledge that contributes to understand community and global issues through media studies

**Objectives:**

- To educate and train individuals to be well prepared for higher education and media industry.
- To be able to engage independent and life-long learning.
- To develop professionally that ensures existence in the competitive world.

## B. Relevance of the Programme with HEI's Missions and Goals

BACHELOR OF ARTS (JOURNALISM AND MASS COMMUNICATION) program is a blend of theory and practical designed to stimulate the creative muscles. The students study and undergo training in various domains like reporting, writing and editing for print media, feature writing, photography and photojournalism, advertising and public relations, event management, web journalism, print design, anchoring and electronic media production, film studies, media law, radio journalism, media management and research. Their perspectives are further broadened by classes on the Indian economy, Indian politics, international relations and culture & communication. They realize the importance of developing critical and lateral thinking, employed intelligently in crafting communication.

The BACHELOR OF ARTS (JOURNALISM AND MASS COMMUNICATION) aims to provide highly professional environment such as community radio station, Newsroom studio

to the broadcast media aspirants. Program also aims to provide highly equipped media lab for editing and designing news for electronic as well as print media.

The goals of ODL (Open Distance Learning) programme is to provide educational facilities to all qualified and willing persons who are unable to join regular courses due to personal or professional reasons. There are many potential learners who cannot afford to join regular courses due to professional responsibilities and personal commitments. The programme's objectives and goals are on the lines of HEIs vision and Mission.

**Vision:**

To be an institution where the most formative years of a young mind are spent in the guided pursuit of excellence while developing a spirit of inquisitive questioning, an ability to excel in the pressure of a fast-changing professional world, and a desire to grow into a personality than a person, in an environment that fosters strong moral and ethical values, teamwork, community service and environment consciousness.

**Mission:**

- To be the enablers of the confluence of academic rigor and professional practicality.
- To bring global best practices to students through widespread use of technology.
- To empower our faculty to constantly develop new skills and excel professionally.
- To provide the best campus environment to students and faculty with all facilities to nurture their interest.

## C. Nature of Prospective Target Group of Learners

The ODL programme of Mangalayatan University (MU) shall target the working professionals as well as those who cannot attend a full-time programme due to constraints. We also welcome those candidates who want to see their career in the field of Basic Sciences. Students may complete their practical work/assignment through virtual lab mode. Desirous candidates of BA - JMC. program shall have to meet the eligibility norms as follows:

1. To obtain admission in BA – JMC programme offered through ODL mode, the learner must have completed 10+2 in any stream.
2. The learner must have scored a minimum of 45% marks aggregately at 10+2 level.

## D. Appropriateness of Programme to be conducted in ODL mode to acquire specific skills and competence

The University has identified the following **Programme Outcomes (PO)** and **Programme Specific Outcomes (PSO)** as acquisition of specific skills and competence in BA – JMC Programme.

**Programme Outcomes (PO)**

PO1: Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO2: Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

PO3: Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings

PO4. Effective Citizenship: Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO5. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

PO6. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

PO7. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

**Programme Specific Outcomes (PSOs)**

PSO 1: Acquiring functional knowledge of the underlying principles and recent emerging trends of communication and media industry.

PSO 2: Develop ability to embrace convergent media by shooting video, making photographs, and writing for and posting to the web.

PSO 3: An understanding of the roles and duties of journalism in society, and recognition of the legal and other implications of their work.

**E. Instructional Design**

The program is divided into eight semesters and minimum credit requirement is 160 to get BA-JMC. Degree in ODL mode from Mangalayatan University. Minimum time period for acquiring BA-JMC degree will be four year and maximum time period to acquire BA-JMC degree eight years.

**Evaluation Scheme**

| **Semester-I** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | **Course Code** | **Course Name** | **Area** | **Credit** | **Continuous Assessment Marks** | **Term End Exam Marks** | **Grand Total** |
| | | | | | **Max. Marks** | **Max. Marks** | |
| 1 | JMO1101 | Basics of Mass Communication | CC - Major | 4 | 30 | 70 | 100 |
| 2 | JMO1102 | History of Mass Media | CC - Major | 4 | 30 | 70 | 100 |
| 3 | JMO1104 | Introduction to radio jockeying | Minor | 4 | 30 | 70 | 100 |
| 4 | JMO1105 | Political science | Minor | 4 | 30 | 70 | 100 |
| 5 | ENO-1100 | English Communication | AECC | 2 | 30 | 70 | 100 |
| 6 | BCA-102 | Computer Fundamental and Office automation | SEC | 2 | 30 | 70 | 100 |
| Total | | | | 20 | 180 | 420 | 600 |

| **Semester-II** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | **Course Code** | **Course Name** | **Area** | **Credit** | **Continuous Assessment Marks** | **Term End Exam Marks** | **Grand Total** |
| | | | | | **Max. Marks** | **Max. Marks** | |
| 1 | JMO1201 | Print Media | CC - Major | 4 | 30 | 70 | 100 |
| 2 | JMO1202 | Advertising and Public Relations | CC - Major | 4 | 30 | 70 | 100 |
| 3 | JMO1203 | Media writing skills | Minor | 4 | 30 | 70 | 100 |
| 4 | JMO1204 | Radio production | Minor | 4 | 30 | 70 | 100 |
| 5 | HNO-1101 | Hindi I | AECC | 2 | 30 | 70 | 100 |
| 6 | BSO-2100 | Introduction to computer applications | SEC | 2 | 30 | 70 | 100 |
| Total | | | | 20 | 180 | 420 | 600 |

| **Semester-III** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | **Course Code** | **Course Name** | **Area** | **Credit** | **Continuous Assessment Marks** | **Term End Exam Marks** | **Grand Total** |
| | | | | | **Max. Marks** | **Max. Marks** | |
| 1 | JMO2101 | Specialized Reporting | CC - Major | 4 | 30 | 70 | 100 |
| 2 | JMO2102 | Media Law & Ethics | CC - Major | 4 | 30 | 70 | 100 |
| 3 | JMO2103 | Corporate Communication | Minor | 4 | 30 | 70 | 100 |
| 4 | ENO-1101 | Professional Communication | AECC | 2 | 30 | 70 | 100 |
| 5 | JMO – 1103 | Basics of still photography | SEC | 3 | 30 | 70 | 100 |
| 6 | AGL-1100 | Environmental Studies | Value added | 3 | 30 | 70 | 100 |
| Total | | | | 20 | 180 | 420 | 600 |

| **Semester-IV** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | **Course Code** | **Course Name** | **Area** | **Credit** | **Continuous Assessment Marks** | **Term End Exam Marks** | **Grand Total** |
| | | | | | **Max. Marks** | **Max. Marks** | |
| 1 | JMO2201 | Community Radio | CC - Major | 4 | 30 | 70 | 100 |
| 2 | JMO2202 | New media | CC - Major | 4 | 30 | 70 | 100 |
| 3 | JMO2203 | Media and Society | Minor | 4 | 30 | 70 | 100 |
| 4 | HNO–2101 | Hindi II | AECC | 2 | 30 | 70 | 100 |
| 5 | BSO-2101 | E- Marketing | SEC | 3 | 30 | 70 | 100 |
| 6 | ECO-0001 | Renewal sources of Energy | Value added | 3 | 30 | 70 | 100 |
| Total | | | | 20 | 180 | 420 | 600 |

| **Semester-V** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | **Course Code** | **Course Name** | **Area** | **Credit** | **Continuous Assessment Marks** | **Term End Exam Marks** | **Grand Total** |
| | | | | | **Max. Marks** | **Max. Marks** | |
| 1 | JMO3101 | Introduction to Electronic Media | CC - Major | 4 | 30 | 70 | 100 |
| 2 | JMO3102 | Radio and Television production | CC - Major | 5 | 30 | 70 | 100 |
| 3 | JMO3103 | Development Communication | CC - Major | 5 | 30 | 70 | 100 |
| 4 | **H000201T** | Health and Hygiene | Interdisciplinary | 3 | 30 | 70 | 100 |
| 5 | MAV–0005 | Basic statistics | Interdisciplinary | 3 | 30 | 70 | 100 |
| Total | | | | 20 | 150 | 350 | 500 |

| **Semester-VI** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | **Course Code** | **Course Name** | **Area** | **Credit** | **Continuous Assessment Marks** | **Term End Exam Marks** | **Grand Total** |
| | | | | | **Max. Marks** | **Max. Marks** | |
| 1 | JMR3201 | Dissertation | CC - Major | 6 | 30 | 70 | 100 |
| 2 | JMI3201 | Viva voce | CC - Major | 4 | 30 | 70 | 100 |
| 3 | JMO3201 | Media and International Scenario | CC - Major | 4 | 30 | 70 | 100 |
| 4 | JMT3201 | Internship | SEC | 3 | 30 | 70 | 100 |
| 5 | B070404T | Web Designing | Interdisciplinary | 3 | 30 | 70 | 100 |
| Total | | | | 20 | 150 | 350 | 500 |

| Semester-VII | | | | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | **Course Code** | **Course Name** | **Area** | **Credit** | **Continuous Assessment Marks** | **Term End Exam Marks** | **Grand Total** |
| | | | | | **Max. Marks** | **Max. Marks** | |
| 1 | JMO4101 | Communication Research | CC - Major | 4 | 30 | 70 | 100 |
| 2 | JMO4102 | Broadcasting & Film Production | CC - Major | 4 | 30 | 70 | 100 |
| 3 | JMO4103 | Media Management | CC - Major | 4 | 30 | 70 | 100 |
| 4 | JMO4104 | Film Studies | CC - Major | 4 | 30 | 70 | 100 |
| 5 | JMO4105 | Television News Presentation | Minor | 4 | 30 | 70 | 100 |
| Total | | | | 20 | 150 | 350 | 500 |

| Semester-VIII | | | | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | **Course Code** | **Course Name** | **Area** | **Credit** | **Continuous Assessment Marks** | **Term End Exam Marks** | **Grand Total** |
| | | | | | **Max. Marks** | **Max. Marks** | |
| 1 | JMT4201 | Internship and presentation | CC - Major | 4 | 30 | 70 | 100 |
| 2 | JMI4201 | Viva Voce | CC - Major | 4 | 30 | 70 | 100 |
| 3 | JMR4201 | Dissertation | CC - Major | 4 | 30 | 70 | 100 |
| 4 | JMO4201 | Film and Documentary making | CC - Major | 4 | 30 | 70 | 100 |
| 5 | JMO4202 | Basics of camera, lights and sound | Minor | 4 | 30 | 70 | 100 |
| Total | | | | 20 | 150 | 350 | 600 |

**MOOCs**

The University shall give flexibility in opting for MOOCs (Massive Online Open Courses)/SWAYAM by the students pertaining to the prescribed curriculum and also the Credits earned in the MOOCs may be dealt as part of the evaluation scheme as per UGC (Open and Distance Learning Programmes and Online Programmes) Regulations, 2020.

**Syllabi and Course Materials**

Syllabi, PPR and self-learning materials are developed mostly by experienced faculty members of Mangalayatan University in consultation with contents experts and the same will be forwarded to CIQA and BoS/Academic Council/ Executive Council for further suggestions and approval.

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## Semester I

## Course Name: Basics of Mass Communication

**Course Code: JMO – 1101** **Credits: 4**

**Course Objectives:**
The objective of the course is to teach basic concept of communication. The course also focuses to define various types of communication. It also focuses to explain mass communication and its feature and barriers.

**Course outcomes:** At the end of the course, student would be able to:

| COs No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | Elaborate concept of communication and its process. | Remember |
| 2. | Define mass communication and its features | Understand |
| 3. | Understand theories and models of communication in current scenario | Apply |
| 4. | Explain the impact of Mass Communication in the society and audience. | Understand |
| 5. | Describe the types of audience and limitations of Mass Communication. | Understand |

**BLOCK I: Introduction to Mass Communication**

**UNIT 1:** Communication: concept, definitions and types of mass communication

**UNIT 2:** Functions of communication, Elements of mass communication

**UNIT 3:** Intra-personal, inter-personal, Verbal and non verbal communication, Tools of Mass communication

**UNIT 4:** Development of Mass Communication in India

**BLOCK II: Models of communication**

**UNIT 5:** Model: Concept, Meaning and definition of model.

**UNIT 6:** Harold Laswell's model of communication, Shanon and Weaver model
**UNIT 7:** Charls Osgood Model, Shanon and Weaver,

**UNIT 8:** Wilbur Schramm Model, George Gerbner's Model, Westley and Maclean's Model.

**BLOCK III: Theories of communication**

**UNIT 9:** Theories: Concept, Meaning and definition of theory, Four theories of press,

**UNIT 10:** Bullet Theory, Individual difference theory, personal influence theory, Selective Exposure Theory,

**UNIT 11:** Cognitive dissonance theory, Uses and Gratification theory, social responsibility theory

**UNIT12:** Development Communication theory, Democratic Participant Media theory

**BLOCK IV: Effects of Mass Media**

**UNIT 13:** Effects of Mass Communication

**UNIT 14:** Mass communication as an agent of Social change

**UNIT 15**: Demassification, Demystification, Decentralization and convergence

**UNIT 16:** Characteristics of Audiences, Type of audiences, Elite audience, General audience, specialized audience Limitations of Mass Communication.

**Text and References:**

1. Mass-Communication in India: Kevel J. Kumar: Jairo Mumbai
2. Mass-Communication theory-An Introduction: Denis McQuail: Sage Delhi
3. Bharat Men Sanchar aur Jansanchar: J.V.Vilanilam: M.P. Hindi Granth Academy Bhopal
4. Mass-Communication: Concepts and issues: D.V.R Murthy: Olive green: Kochi

5. Mass-, Culture, Language and arts in India: Mahadev L. Apte: Popular Prakashan Mumbai
6. Towards sociology of Mass-Communication: Denis McQuail: Collier –Macmillan

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## Course name: History of Mass Media Course Code: JMO – 1102
## Credits: 4

**Course Objectives:**
The objective of the course is to teach student invention of paper and printing press. The course also focuses to discuss development of mass media around the world. It also focuses to explain historical perspectives of print media, radio, television and cinema.

At the end of the course, student would be able to:

| Cos No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | Understand origin of paper and printing press | Remember |
| 2. | Describe birth of Journalism in India | Understand |
| 3. | **Demonstrate**- Role of Indian Newspapers: Pre independence & Post independence. | Apply |
| 4. | **Explain** Role of Indian Press in Indian freedom movement | Understand |
| 5. | **Describe** Development of Hindi Journalism after Independence. | Understand |

**BLOCK I: Development of print media**

**UNIT 1:** Invention of paper, Invention of printing press, **D**evelopment of printing – early efforts to publish newspapers in India. Early communication systems in India

**UNIT 2:** Independence and the press – issues of freedom, both political and press freedom, Birth of the Indian language press – contribution of Raja Ram Mohan Roy;

**UNIT 3:** Birth of the Indian news agencies and Western News agencies, The Indian press and freedom movement – Mahatma Gandhi and his journalism;

**UNIT 4:** social, political and economic issues before Independence and the Indian press; the press in India after Independence;

**UNIT 5: S**ocial, political and economic issues and the role of the Indian press

**BLOCK II: Development of radio**

**UNIT6:** Development of radio as a medium of mass communication

**UNIT 7:** History of radio in India, Radio as an instrument of propaganda during the World War II.

**UNIT 8:** Emergence of AIR – commercial broadcasting.

**BLOCK III: Development of television**

**UNIT 9:** Development of television as a medium of mass communication

**UNIT 10:** Historical perspective of television in India **UNIT**

**11: S**atellite and cable television in India.

**BLOCK IV: Development of cinema**

**UNIT 12:** Early efforts – film as a mass medium;

**UNIT 13:** Historical development of Indian films – silent era, talkies

**UNIT 14:** Indian cinema after Independence

**UNIT 15:** parallel cinema

**UNIT 16:** Commercial cinema

**UNIT 17:** Regulatory bodies of Indian Cinema

**Text and references**


1. Mehta Nalin; India on Television, Harper Colins Publisher India, New Delhi, 2008 Page
2. David & Crawley William; Satellites Over South Asia, Sage Publication New Delhi, 2001
3. Robin Jeffrey, India's Newspaper Revolution: capitalism, politics and the Indian Language PRESS, Oxford University Press, 2003
4. Black Jay & Bryant Jennings; Introduction to Mass Communication. Third Edition, WCB WM.C. Brown Publishers, 1992
5. Singhal Arvind & Rogers M. Evert; India's Communication Revolution, Sage Publication, New delhi, 2001

6. Kumar Keval J.; Mass Communication in India, Jaico Publishing House, Delhi, 2005 India Year Book; Chapter on Mass Media, Publication Division, Government of India, New Delhi.
7. Mathur, C. K. (2013). Mass media and democracy in India: a political study of their relationship in post emergency period.
8. INFLIBNET. Retrieved from http://shodhganga.inflibnet.ac.in:8080/jspui/handle/10603/27658

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## Course Name: Introduction to Radio Jockeying Course Code: 1104 Credits: 4

**Course Objectives:**

The course focuses to describe development of radio in the world. The course also focuses to discuss radio and its characteristics. It also aims to discuss various terminologies and techniques used in radio industry**.** In addition, course also explain various radio program formats.

At the end of the course, student will be able to:

| COs No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | **Define** the history of radio. | Remember |
| 2. | **Differentiate** the nature and types of Radio Programs | Understand |
| 3. | **Classify** the Pronunciation / Diction Clarity/Voice Modulation / Vocal Exercise etc | Apply |
| 4. | **Demonstrate** skills of Specific Audience Programs | Apply |
| 5. | **Explain** the Anchoring /Video Conference/ Connect to PCR etc | Understand |
| 6. | **Describe** the Organizational Structure for TV and Radio, | Understand |

**BLOCK 1: Development of Radio**

**UNIT 1**: Development of Radio in the World, Radio: Brief History of Radio in India,

Akashvani, AIR Code.

**UNIT 2:** Radio and its Characteristics, Radio terminology, AM and FM

**UNIT 3:** Radio presenter, Radio Jockey, News reader, Radio Announcer, Stock Artist

**UNIT 4:** Anchoring and news reading skills: general awareness, presence of mind, clarity, diction, pronunciation etc.

**BLOCK 2: RADIO PROGRAM FORMATS**

**UNIT 5:** Meaning of radio program formats

**UNIT 6:** Musical radio program format, Classical, Light, Folk, and Western Music programs

**UNIT 7:** Spoken word Radio program formats

**UNIT 8:** Information based-radio program format**,** Radio talk, Radio interview, Talk show/Chat show, Discussion, Lecture and Literary discourse

**BLOCK 3: RADIO FEATURES**

**UNIT 9**: Content based Radio program formats, Radio features and

Poetry recital, Short story reading,

**UNIT 10:** Documentary, Radio serial, Radio drama,

**UNIT 11:** Book and Film reviews

**UNIT 12**: Interactive radio program formats, Listner's letter, OB based programs, Forum Programs, Phone-ins programs, Voice and email based programs, Audio conferencing and radio bridge, Quiz programs

**BLOCK 3: NEWS PROGRAMS**

**UNIT 13:** Radio News, Characteristics of news, format of news, Types of news News bulletins

**UNIT 14**: News Magazine, types of news magazines and Newsreels

**UNIT 15:** Strength and weakness of the medium, Skills of a radio news reporter: developing sources, gathering news

**Text and references:**

- Zettl Herbert, Television Production Handbook
- White, TED &Barnas Frank, Broadcast News, Writing Reporting & Producing, Focal Press
- Radio & TV Journalism – K M Srivastava, Sterling Publishers Pvt. Ltd., New Delhi.
- Broadcasting Management in India – Angela Wadia.
- Electronic Media in Modern World – S P Phadke.

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## Course name: Political Science Course Code: JMO – 1105
## Credits: 4

**Course Objectives:**
The primary objective of political science is to study and analyze the theory and practice of politics and government to better understand political systems, behaviors, and their impact on society.

At the end of the Political Science course, student will be able to:

| COs No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | **Define** the basic concepts of state, Sovereignty, Liberty and Equality. | **Remember** |
| 2. | **Differentiate** traditional idea with modern political system. | **Understand** |
| 3. | **Classify** the applications and practices of political ideas and values. | **Apply** |
| 4. | **Demonstrate** a general understanding of Political Science. | **Apply** |
| 5. | **Explain** theories of origin, nature, function and state. | **Understand** |
| 6. | **Describe** rights and duties and relationship between them. | **Understand** |

**BLOCK 1: INTRODUCTION OF POLITICAL SCIENCE**

**Unit1:** Political Science: Meaning, origin, nature and scope of the discipline

**Unit2:** Relationship of Political Science with allied disciples

**Unit3:** Law: Meaning, original, sources and classification **Unit4:**

Relevance of Political Science to the study of Law

**BLOCK 2: STATE GOVERNANCE**

**Unit5:** State: Meaning, essential elements

**Unit6:** distinction between state, society, government and other associations.

**Unit7:** Theories of the origin, nature and functions of the state.

**Unit8:** Concepts of Totalitarian and Welfare State.

**BLOCK 3: POLITICAL IDEOLOGIES**

**Unit9:** Political Ideologies: Liberalism, Neo-liberalism, Marxism,

**Unit10:** Socialism, Fascism, Utilitarianism ganderism and Sarvodaya **Unit11:** Sovereignty: Meaning, Features, Kinds and Theories of sovereignty-Austin and

Pluralist

**BLOCK 4: RIGHTS AND DUTIES**

**Unit12: Fundamental** Rights and Duties: Meaning, classification

**Unit13:** theories of Rights; Relationship between Rights and Duties.

**Unit14:** Liberty: Meaning, kinds, safeguards and relationship between liberty and law

**Unit15:** Equality: Meaning, kinds and relationship with liberty, Freedom & Autonomy in

Media

**Text and references:**


- Joad, C.E.M.: Political Theory
- Appadorai, A : Substance of Politics
- Asirvatham, A: Political Theory
- Ray & Bhattacharya, M. : Political Theories Ideas and Institutions
- Verma, S.P. : Modern Political Theory
- Singh, G.N. : Fundamental of Political Science and Organisation
- Ghosal: A History of Indian Political Ideas

- Sabine, G.H. : A History of Indian Political Ideas
- Rathore, L.S.: Political Theory and Organisation (Eastern Book Haggi, S.A.H. Company, Lucknow)
- Ghose, Shankar: Socialism and Communism in India (Bombay A.Pub.)
- Sriniwas, M.N. : Social Change in Modern India
- Ommen, T.K.: Sociology


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## Course Name: English Communication Course Code: ENO-1100 Credits: 2

**Course Objectives**:
Understanding the fundamental communication skills being integral to personal, social and professional interactions. To develop the ability to share thoughts, emotions and ideas through various means of communication: both verbal and nonverbal.

**Course Outcomes**
After completion the course, students will be able to develop correct pronunciation. They will be able to communicate effectively.

**Block I: Self-Introduction**

**Unit 1:** Introducing self

**Unit 2:** Speaking about achievements

**Unit 3:** Voicing future aspects

**Block II: Non-Verbal Communication**

**Unit 4:** Types of non- verbal communication

**Unit 5:** Body Language

**Unit 6:** Paralanguage skills

**Block III: Manners and Etiquettes**

**Unit 7:** Personal grooming

**Unit 8:** Dress code

**Unit 9:** Telephone etiquettes

**Unit 10:** Intellectual grooming

**Block IV: Conversation in Real Life Situations**

**Unit 11:** Meeting people

**Unit 12:** Travelling

**Unit 13:** Visiting Places

**Unit 14.** Shopping

**Block V: Public Speaking Skills**

**Unit 15:** Extempore

**Unit 16:** Role Play

**Unit 17:** Group Discussion

**Text and references:**


- Fluency in English part-1, Macmillan, Delhi,2005, Units 1-18
- Martin Hewing, Advanced English Grammar, CUP, New Delhi, 2010, Unit 1-60.
- Language through Literature (forth coming). Dr. Gauri Mishra, Dr. Ranjana Kaul,
- Dr. Brat Biswas, Primus Books, Delhi 2005 Chapter 1-17


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## Course Name: Computer Fundamental & Office Automation Course Code: BCA-102 Credits: 2

**Course Objective:**

Office tools course would enable the students in crafting professional word documents, excel spread sheets, power point presentations using the Microsoft suite of office tools. To familiarize the students in preparation of documents and presentations with office automation tools.

**Course Outcome:**

At the end of the course student would be able to:

| S. No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|

| | | |
|---|---|---|
| 1. | **Describe** the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming | Knowledge |
| 2. | **Explain** the concept of operating system and its function | Understand |
| 3. | **Illustrate** the concept of call by vaue and call by reference | Apply |
| 4. | **Contrast** on compile and debug programs | Analyze |
| 5. | **Design** programs connecting documents | Create |

**Block I: Introduction to Computers**

**Unit 1:** Introduction, Characteristics of Computers, Block diagram of computer.

**Unit 2**: Types of computers and features, Mini Computers, Micro Computers, Mainframe Computers, Super Computers.

**Unit 3**: Types of Programming Languages (Machine Languages, Assembly Languages, High Level Languages). Data Organization, Drives, Files, Directories.

**Unit 4**: Types of Memory (Primary And Secondary) RAM, ROM, PROM, EPROM. Secondary Storage Devices (FD, CD, HD, Pen drive)
**Unit 5**: I/O Devices (Scanners, Plotters, LCD, Plasma Display) Number Systems
Introduction to Binary, Octal, Hexadecimal system Conversion, Simple Addition, Subtraction, Multiplication

**Block II: Algorithm and Flowcharts**

**Unit 6**: Algorithm: Definition, Characteristics, Advantages and disadvantages,

**Unit 7:** Definition, Define symbols of flowchart,

**Unit 8:** Examples Flowchart

**Unit 9:** Advantages and disadvantages, Examples.

**Block III: Operating System and Services in O.S.**

**Unit 10**: Dos – History, Files and Directories,

**Unit 11:** Internal and External Commands,

**Unit 12:** Batch Files,

**Unit 13:** Types of O.S.

**Block IV: Windows Operating Environment**

**Unit 14:** Features of MS – Windows,

**Unit 15:** Control Panel,

**Unit 16:** Taskbar, Desktop, Windows Application, Icons, **Unit-17:**

Windows Accessories, Notepad, Paintbrush.

**Block V: Editors and Word rocessors Unit**

**18:** Basic Concepts, Examples: MSWord **Unit**

**19:** Introduction to desktop publishing.

**Unit 20:** Purpose, usage, command, MS-Excel, Creation of files in MS-Access, Switching between application, MS-PowerPoint.

**Text and references:**


1. Norton Peter, "Introduction to computers", 4th Ed., TMH, 2001.
2. Alex Leon & Mathews Leon, "Fundamentals of Information Technology", Leon Techworld, 1999.
3. Vikas Gupta, "Comdex Computer Kit", Wiley Dreamtech, Delhi, 2004 4. P. K. Sinha & Priti Sinha, "Computer Fundamentals", BPB Publications, 1992.
5. V. Raja Raman, "Introduction to Computers", PHI, 1998.
6. Alex Leon & Mathews Leon, "Introduction to Computers", Vikas Publishing House, 1999.
7. Computer Architecture and Organization, Nicholas carter, Scaum Series TMH Adaptation, 2010


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## Semester II

## Course name: Print media Course Code: JMO – 1201
## Credits: 4

**Course Objectives:**

The objective of the course is to teach students the basic concept of news and various types of news beats. The course also focuses to inculcate an understanding of news features and interviews among students. It also focuses to explain editing concepts and processes in the context of print media.

**Course outcomes:**
At the end of the course, student would be able to:

| COsNo | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | Define News: Definition & Type, Sources of news | Understand |
| 3. | Demonstrate Interview skills: Methods, Importance and types, Book review, Film Review | Apply |
| 4. | Demonstrate to write headline: Meaning, Significance Writing and types | Apply |
| 5. | Explain – Editing, Importance & Significance of the Editorial Page | Understand |
| 6. | Describe -Dummy page, make up, layout, pagination. | Understand |

**BLOCK I: NEWS AND ITS BEATS**

**UNIT 1:** News: Definition & Type, News beats, Sources of news, Elements of news,

**UNIT 2:** New writing style/Structure of News Story:

**UNIT 3: H**eadline, lead, Intro, Body (Inverted Pyramids) etc., Lead and types Lead,News Value judgment,

**UNIT 4:** Qualities & Responsibilities of Reporter

**BLOCK II: NEWS FEATURES AND INTERVIEWS**

**UNIT 5:** News Writing Process, Problems in News Writing,

**UNIT 6:** Media Interview: Methods, Importance and types,

**UNIT 7:** Book review, Film Review,

**UNIT 8 :** Feature: Definitions, Importance and Types of Features

**BLOCK III: EDITING: CONCEPT**

**UNIT 9:** Editing: Meaning, Definition & Need, Role of sub editor, Qualities & Duties of Sub editor

**UNIT 10:** Headline: Meaning, Significance Writing and types,

**UNIT 11:** Structure of editorial Department, Proof reading symbols, Importance& Significance of the Editorial Page

**UNIT 12:** Use of style sheet. Dummy page, make up, layout, and pagination, Editing of Press releases, news and features

**BLOCK IV: STRUCTURE OF PRINT ORGANISATION**

**UNIT 13: Structure of** Editorial department,

**UNIT 14: Structure of** Advertisement,

**UNIT 15:** Structure of H.R, Circulation,

**Text and references:**


1. M.V. Kamath, The Journalists Handbook, Vikas Publishing House, New Delhi, 1995.
2. George, T.J.S. Editing: A Handbook for the Journalist, IIMC, New Delhi, 1989.
3. Srivastava, K.M. News Reporting and Editing, Sterling Publishers, New Delhi, 1995.
4. M.V. Kamath, The Journalists Handbook, Vikas Publishing House, New Delhi, 1995.
5. Bhanavat Sanjeev, SamacharLekhanKeSiddhant,
6. Mencher, M. (2013). News Reporting and Writing. McGraw-Hill.


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## Course name: Advertising and Public Relations Course Code: JMO – 1202 Credits: 4

**Course Objectives:**

The objective of the course is to teach students the concept of advertising and implication of advertising. The course also focuses to inculcate an understanding of media plan and message development. It also focuses to explain public relation processes and its objectives.

**Course outcomes:**
At the end of the course, student would be able to:

| COs No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | **Define** the processes of Advertising and Public Relations. | Remember |
| 2. | Design media strategy and apply the tools of Public Relations. | Apply |
| 3. | **Demonstrate** the knowledge of self-employment and advertising agencies. | Apply |
| 4. | **Explain** the functions of Public Relations in different sectors. | Understand |
| 5. | **Describe** the Role and responsibilities of PR officer. | Understand |

**BLOCK I: Advertising: Concept, Meaning and Definition**

**UNIT 1:** Concept and definition of advertisement

**UNIT 2:** Social, Economic and Legal Implications of Advertisements

**UNIT 3: S**etting advertisement objectives

**UNIT 4:** Advertising Agencies, selection and remuneration, advertisement campaign.

**BLOCK II: Media Plan**

**UNIT 5:** Media plan – type and choice criteria

**UNIT 6: R**each and frequency of advertisements

**UNIT 7: C**ost of advertisements related to sales

**UNIT8:** Media strategy and scheduling.

**BLOCK III: Message Development**

**UNIT 9:** Message development, Different types of advertisements

**UNIT 10:** Layout – design appeal –copy structure, Advertisement production: print, Radio, TV, and web advertisements

**UNIT 11:** Media Research: testing validity and reliability of ads

**UNIT 12:** Measuring impact of advertisements.

**BLOCK IV: Public Relations: an Introduction**

**UNIT 13:** Public relation: Concept and origin, Definitions, Objective and Functions,

**UNIT 14:** PR tools, Target audience for PR

**UNIT 15:** Role and responsibilities of PR officer, PR in Government sector; PR in Public, Private and NGO Sectors;

**UNIT 16:** PR Codes and Professional bodies

**Text and References:**


1. Kenneth Clow. Donald Baack, "Integrated Advertisements, Promotion and Marketing communication", Prentice Hall of India, New Delhi, 2003.
2. S. H. H. Kazmi, Satish K Batra, "Advertising & Sales Promotion", Excel Books, New Delhi, 2001.
3. George E Belch, Michel A Belch, "Advertising & Promotion", McGraw Hill, Singapore, 1998.
4. Belch M A and Belch G E- Advertising and Promotion – An Integrated Marketing Communication Perspective (Tata McGraw-Hill) 2003. 6th ed
5. Asker, David and Myers John G., Advertising Management, Prentice Hall of India, New Delhi
6. Solomon, M. R. (2019). Consumer behavior: Buying, having, and being. Pearson.
7. McAllister-Spooner, S. M., & Ware, L. M. (2021). A longitudinal analysis of public relations undergraduate curriculum content: A 12-year review. Public Relations Journal, 15(2), 1-19.
8. Liu, F., & Kim, D. (2018, June). The impact of native advertising format and disclosure on consumers' attention and persuasion. Paper presented at the International Communication Association Conference, Prague, Czech Republic.

## Course Name: Media writing skills Course Code: JMO – 1203
## Credits: 4

**Course Objectives:**
The objective of the course is to teach students the basics concept of writing. The course also focuses to inculcate an understanding of media writing. It also focuses to explain writing for various media such as print media, electronic media and cinema.

**Course outcomes:**
At the end of the course, student would be able to:

| S. No. | Course Outcomes | Cognitive Level |
|---|---|---|
| 1 | Explain basics of Media writing | Remember |
| 2 | Understand the style and types of print, TV &Radio | Understand |
| 3 | **Demonstrate** Conscious attention to surroundings/Listening carefully, reading, observing, writing | Apply |

**BLOCK 1: WRITING FOR THE SCREEN AND PRINT**

**UNIT 1:** Media writing: concepts, The Nature and Characteristics of Media Writing, Literary text v/s text written for screen.

**UNIT 2:** News: Basic news structures, Headlines**:** Writing Headlines, Lead: Characteristics, Writing Leads, body, conclusion/end

**UNIT 3:** Feature Writing: Concept, type, elements& structures, Article writing, Film/Book review writing,
**UNIT 4:** Overview of the television industry and its various formats, Role and responsibilities of a television writer

**BLOCK 2: WRITING FOR RADIO**

**UNIT 5:** Writing opinion pieces, Writing script for radio talk show, Writing for radio news bulletins

**UNIT6:** writing for radio promos-jingle-general announcement

**UNIT 7:** Radio interview writing**,** Writing agriculture feature

**UNIT 8:** Radio feature, drama and documentary

**BLOCK 3: WRITING FOR TELEVISION**

**UNIT 9:** Writing for television news

**UNIT 10:** Writing for TV programmers, Writing for TV news, Writing television talk,

**UNIT 11:** Writing advertisement,

**UNIT 12:** Writing for TV interview and discussion/ debate

**BLOCK 4: WRITING FOR WEB**

**UNIT 13:** News writing for web,

**UNIT 14:** Writing blog, Vblog, Podcast, writing Photo caption,

**UNIT 15:** Writing for Web interview and discussion/ debate

**UNIT 16:** Writing for web/AMP stories

**Text and references:**


1. Copy writing for electronic media: A practical guide, Milan D. Meeske, Wadsworth Publishing Co. 2006
2. Broadcast Journalism: Techniques of Radio and Television Journalism by Andrew Boyd, Focal Press 2009
3. Broadcasting News: Writing, reporting and producing by Ted White 2008
4. The craft of copywriting by June A. Valadares, Response Books 5. Writing for Media by Usha Rani, Oxford University Press, 2010


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## Course Name: Radio Production Course Code: JMO1204
## Credits: 4

**Course Objectives:**
The course focuses to describe basics of writing for radio programs. The course also focuses to discuss challenges and elements of radio writing. It also aims to discuss various In addition; it aims to explain writing for various radio program formats.

**Course outcomes:**
At the end of the TV Anchoring and Radio Jockeying course, student will be able to:

| COs No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | **Define** – Basics of writing, anchoring radio programs | Remember |
| 2. | **Differentiate** writing style of various Radio Programs formats | Understand |
| 3. | **Classify** the Pronunciation / Diction Clarity/Voice Modulation / Vocal Exercise etc | Apply |
| 4. | **Demonstrate** Writing skills of Specific Audience Programs | Apply |
| 5. | **Explain** – anchoring of various programs | Understand |
| 6. | **Describe** – Sound editing and mixing software | Understand |

**BLOCK 1: WRITING FOR RADIO**

**UNIT 1:** Radio, Meaning, Definition, Characteristics of radio

**UNIT 2:** Writing, Meaning of writing, Radio writing Challenge of Audio medium, Basic Elements of Radio

**UNIT 3:** Writing for deferent radio formats

**UNIT 4:** Radio script writing tips, Scope of Radio programs

**BLOCK 2: RADIO STORIES & NARRATIONS**

**UNIT 4:** Writing Short stories, its basic elements, Characteristics of short stories

**UNIT 5**: Radio Drama writing and Recording, Feature of Radio Drama

**UNIT 6:** Writing for Radio interview, discuss, and talk show

**UNIT 8:** Writing feature stories, Radio live program

**BLOCK 3: RADIO COMMERCIAL PROGRAMS**

**UNIT 9:** Writing Radio Jingle, and commercial

**UNIT 10:** Documentary writing

**UNIT 11:** Writing musical program script, producing musical program

**UNIT 12:** Writing for Phone ins program, Quizs, children programs

**BLOCK 4: WEEKLY RADIO PROGRAMS (MAGAZINE)**

**UNIT 13:** How to write radio news and read radio news

**UNIT 14:** Radio magazine – Writing and Producing

**UNIT 15:** Agriculture programs (Writing and Producing)

**UNIT 16:** Writing for special audience

**Text and References:**

- Zettl Herbert, Television Production Handbook
- White, TED &Barnas Frank, Broadcast News, Writing Reporting & Producing, Focal Press
- Radio & TV Journalism – K M Srivastava, Sterling Publishers Pvt. Ltd., New Delhi.
- Broadcasting Management in India – Angela Wadia.
- Electronic Media in Modern World – S P Phadke.

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## Course Name: Hindi-I Course Code: HNO–1101
## Credits: 2

**Course Objective:**

1- छात्रों में पठन कला को ननपणता ु का विकास करना।

2- छात्रों को क्षेत्रीय लोकोक्ततयों एि महाि रों ु का संपणणू ज्ञान कराना।

3- छात्रों को ननबंध, सं ि ाद, सारांश, पत्र इत्याददद ललखने की कला कुशलता उत्पन्न करने का प्रयास करना।

4- छात्रों को व्याकरण संबंधी ननयमों का पणणू ज्ञान कराना।

**Course Outcomes:**

सीओ 1: दहदं ी भाषा और उसके सादहत्य की उत्पवि को समझना। सीओ 2: सादहत्य के इनतहास की अिधारणा को समझना। सीओ 3: दहन्दी सादहत्य के ि र्गीकरण का

आधार समझना। सीओ 4: दहदं ी नाटक, लघकथा ु और उपन्यास के विकास के इनतहास को समझना। **Block 1:** t;kdj izlkn ^vtkr "k=q*

इकाई .1 उद्देय; प्रस्ताि ना; दहन्दी सादहत्य एि भाषा का इनतहास; आधननकु काल मंे दहन्दी र्गद्य के उदय तथा विकास। इकाई 2- उदण ू सादहत्य] अजानात्रुः ु कथासार] अजानात्रुः ु नाट्यकला] अजानात्रुः ु संि ाद योजना] अजानात्रुः ु दोकाल और ि ाताि रण] अजानात्रुः ु अलभनेयता; अजानात्रुः ु प्रनतपाद्य@उद्देय] अजानात्र।ु इकाई 3- भाषा**शैली**] अजानशत्रुः ु रस-योजना, अजानशत्रुः ु र्गीनित-योजना] अजानशत्रुः ु पात्र-योजना] प्रमखु नारी पात्र।

**Block 2:**

**इकाई** 4 उद्देश्य; निाब हमीदल्लाहुः ु एक पररचय] परम्परा] प्रर्गनत और स्ि रूप। **इकाई** 5 हमीदल्लाहु के नाटकों में नारी] 'दलारी ु बाई और ख्याल भारमली में लोकनाट्य शैली, ख्याल भारमली मंर्गलाचरण की विलशष्टता, सत्रधारू - अलभनेत्री का प्रयोर्ग] भोपा-भोपी का प्रयोर्ग, र्गायन मण्डली का प्रयोर्ग

**इकाई** 6 भारमली की लोककथा] लोकसंि ाद और लोकभाषा, शब्द और भाषा का प्रयोर्ग, लोकर्गीत, लोकनत्यृ , लोकिाद्य, पिदणू ीक्तत शैली, हास्य और व्यंग्य, ननष्कष।ण

**Block 3:**

**इकाई** 7 उद्देश्य प्रस्ताि ना, जन्म एि बाल्यकाल, लशक्षा-दीक्षा, राजेत्र यादिुः व्यक्ततत्ि तथा कृनतत्ि।

**इकाई** 8 राजेत्र यादिुः कृनतत्ि] लेखन का प्रारम्भ तथा प्रेरणा, बहुे ुमखी ु प्रनतभा] सादहत्य की समीक्षा, सम्पादक ि अनिादक।ु

**इकाई** 9 राजेत्र यादि की रचना-दृक्ष्ट तथा चचन्तन पर यर्गु का प्रभाि, राजेत्र यादि के उपन्यास] राजेत्र यादि की प्रकालशत रचनाएँ] उपसंहार।

**Block 4:**

**इकाई** 10 & उद्देश्य, प्रस्ताि ना, निजार्गरण का प्रभाि, वप्रक्न्टंर्ग प्रेस की स्थापना, पत्रपत्रत्रकाओं का प्रकाशन, अनिादु की भलमका ू , निजार्गरण का सामान्य पररचय, भारतेन्द ु यर्गीनु ननबन्धों में निजार्गरण का स्ि रूप।

**इकाई** 11 & समाज सधारु , धमण सधारु की आिश्यकता पर बल, नारी चेतना, देशभक्तत और राष्रीय चेतना, आचायण शतलु का ननबन्ध सादहत्य, ननबन्ध सादहत्य की पररक्स्थनतयाँ, ननबन्ध की विशेषताएँ; ननबन्धकार शतलजीु का ि ैलशष्ट्य।

**इकाई** 12 & आचायण हजारी प्रसाद द्विेदी के ननबन्धों में लाललत्य तत्ि, आचायण हजारी प्रसाद द्विेदी के ननबन्धों में सांस्कृनतक तत्ि, आचायण हजारी प्रसाद द्विेदी के ननबन्धों में जीिटता, लललत ननबन्ध की विकास यात्रा।

**इकाई** 13 & विद्याननिास लमश्र का व्यक्ततत्ि एि उनका सादहत्य संसार, पं. विद्याननिास लमश्र के ननबन्धों का प्रनतपाद्य, भक्ततकाल का काल विभाजन और नामकरण, भारतेन्द ु यर्गु का काल विभाजन और नामकरण, आददकालीन जैन सादहत्य, लसद्ध-नाथ सादहत्य, रासो सादहत्य।

**इकाई** 14 & कबीरदास, ननर्गणुण एि सर्गणु भक्तत, आददकालीन जैन सादहत्य, रामभक्तत काव्य के सामन्तिाद विरोधी मल्यू , भक्तत आन्दोलन।

इकाई 15 & सफीू प्रेमाख्यानक काव्य, ननर्गणुण काव्यधारा की ज्ञानमार्गी शाखा, सफीू प्रेमाख्यान, कृष्णभक्तत काव्य की कथ्यर्गत विशेषता।

**Block 5:**

**इकाई** 16 & रीनतकालीन काव्यभाषा, पनरुत्थानिादु की अिधारणा, छायाि◌ाद, भारतेन्द ु यर्गीनु नाटक , तलनात्मकु भाषाविज्ञान; राष्रभाषा और राजभाषा। **इकाई** 17& दहन्दी शब्द की उत्पवि एि विकास, वपक्जन और क्रियोल में अन्तर, विज्ञापन की भाषा, भाषा और सामाक्जक सन्दभण, साि◌भण ौलमक व्याकरण; दहन्दी की स्ि◌ाननम व्यिस्था, अथग्रण हण की प्रक्रिया, मौखखक तथा ललखखत ि◌ाताणलाप, ऐनतहालसक ध्ि◌ानन प्रक्रिया पररितनण, संसक्तत।

**इकाई** 18 & भाषा लशक्षण के क्षेत्र, व्यनतरेकी विश्लेषण, बदहरंर्ग आलोचना और अंतरंर्ग आलोचना, भाषा लशक्षण की विचध, नतकडु नाटक 'औरत में स्त्री की समस्याएँ, 'धोखा ननबन्ध की शैलीर्गत विशेषताएँ, सप्रसंर्ग व्याख्या। **इकाई** 19 & शतलु जी के ननबन्धों के भाि◌ और मनोविकार, आचायण रामचत्र शतलु की भाषा-शैली, े◌ंसंस्कृनत और जातीयता, रेखाचचत्र और े◌ंसंस्मरण, ठकुरी बाबा की तत्ि◌ों◌ं के आधार, प्रेमचंद द्ि◌ारा रचचत 'कलम का लसपाही'।

**इकाई** 20 & आत्मकथा तया भलू ँ◌ू तया याद करूँ, 'क्रकन्नर देश की ओर की शैली और भाषार्गत विशेषता, अदम्य जीि◌न की लशल्पर्गत विशेषता, आतटेवियो पॉज नामक साक्षात्कार, व्यंग्य ननबन्धकार की दृक्ष्ट से हररशंकर परसाई, जीि◌नी और आत्मकथा की तलना।ु

## Course Name: Introduction to Computer Applications Course Code: BSO-2100 Credits: 2

**Course Objective:**

This is a basic paper for Business Administration students to familiarize with basic principles of computer system including computer arithmetic, hardware, operating system, software applications, internet and world-wide web and their applications in the relevant fields.

**Course Outcomes:**

After completing the course, the student shall be able to:

| **Course Outcome** | **Cognitive level** |
|---|---|
| **CO1**-Define the concept of Computer Fundamentals. | Remember |
| **CO2-** Describe the conversion of one base to another base Number System. | Understand |
| **CO3**- Explain the needs of hardware and software required for a computation task. | Understand |
| **CO4** - Demonstrate the use of Operating system. | Understand |
| **CO5** -Demonstrate how a document to be prepared and formatted. | Understand |

**Block I: Computer Basics**

**Unit 1:** Introduction, Characteristics of a Computer, Evolution of Computer, Generations of Computer. **Unit 2:** Classification of Computers, Applications of Computer, Computer Applications in various fields of Science and management, **Unit 3:** Block Diagram of Digital Computers.

**Block II: Number Systems & Software**

**Unit 4: Number System:** Introduction, Classification of Number System, Types of Number System,
**Unit 5:** Conversions from One Base to Another, Conversion using Shortcut Method.
**Unit 6: Software:** Introduction, Definition & types of Software, Uses of smart-phone, Uses of ICT.

**Block III: Hardware and Memory**

**Unit 7: Hardware:** Introduction, Computer Peripherals Devices, Input and Output Devices with examples.
**Unit 8: Memory:** Introduction, Classification, Hierarchical Chart (Primary memory, Secondary memory,
**Unit 9:** RAM, ROM, PROM, EPROM, EEPROM).

**Block IV: Operating System and DBMS**

**Unit 10: Operating System:** Introduction, Functions of an Operating System, Classification of Operating System (Multi-user, Multiprocessing, Multitasking, Real time). **Unit 11: DBMS:** Introduction of database, Database Management System (DBMS), **Unit 12: A**pplication of DBMS.

**Block V: MS Office**

**Unit 13: MS Word:** Introduction, Basic Formatting in MS Word, Advanced Formatting, Printing Documents, Print Preview.
**Unit 14: MS Excel**: Introduction, Workbook, Worksheet, Formatting in excel, Working with formulas, Printing worksheets.
**Unit 15: MS PowerPoint**: Introduction, Creating a Presentation, Basic Formatting in PowerPoint, Inserting charts, Inserting tables, Printing presentations.

**Text and Readings:**

1. Rajaraman, "Fundamentals of Computers", Prentice Hall of India, 3rd Edition. 2. Alexis Leon and Mathews Leon," Introduction to computers", Leon Techworld.
3. Yashwant Kanetkar "Unix Shell Programming" BPB.

## Semester III - Syllabus Course Code: Specialized Reporting Course Code: JMO2101 Credits: 4

**Course objectives:**

The course focuses to teach specialized reporting. It also focuses various types of beats and their sources. The course also aims to teach various types of specialized reporting and techniques of specialized reporting.

**Course Outcomes:**

At the end of the Writing for Print Media course, student will be able to:

| Cos No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | **Define** Specialized reporting**,** types of beats, writing style. | Remember |
| 2. | **Identify** techniques of News gathering. | Understand |
| 3. | Apply developing multiple sources for getting information. | Apply |
| 4 | Observing various reports and their importance and impact on the society. | Analyse |

**BLOCK 1: INTRODUCTION TO SPECIALIZED REPORTING**

**UNIT 1:** What is specialized Reporting? Who is a Specialized Reporter? How to Identify Specialized Reports**,** Difference between Print and Television Reporting, Importance of Research for Reporters,

**UNIT 2:** Press conference & Speech Reporting, Press Officers; Spin Doctors and Experts,

**UNIT 3:** Beats: Meaning and Definition, Principles of Reporters on a Beat Types of Beats: General Reporting, Political Reporting,

**UNIT 4:** Education and Research Reporting, Environment Reporting, Religious Reporting,

**BLOCK 2: REPORTING BEATS**

**UNIT 5:** Feature and Follow-Ups in Journalism.**,** Cultural Reporting, Sports Reporting,

**UNIT 6:** Parliament Reporting, Court/ Crime Reporting, War Reporting,

**UNIT 7:** Disaster reporting, Health reporting, Defence reporting

**UNIT 8:** Reporting Communal riots,

**BLOCK 3: KINDS OF REPORTING**

**UNIT 9:** Objective reporting  Investigative reporting, Interpretative reporting, in-depth reporting.

**UNIT 10**: Crime reporting, Interviewing: principles and techniques;  types: news interview;

**UNIT 11:** Eminent peoples' profile writing

**BLOCK 4: ONLINE REPORTING**

**UNIT 12**: Online reporter, Qualities and responsibilities of Online Reporters,

**UNIT 13**: Online Websites Related to News Reporting and Journalism, Impact on readers, Impact on publishers,

**UNIT 14:** Citizen Journalism, Web Journalism and Tools for Today's New Media Journalist

**UNIT 15:** Implications on traditional Journalism, Work outside traditional press,Blogs, and its writing

**Text and References:**


1. Selected Themes in Specialised Reporting Paperback- Hajara Umar Sanda and Aondover Eric Msughter
2. Specialist Journalism by Sharon Wheeler (Editor); Barry Turner (Editor); Richard Orange (Editor)
3. News Writing and Reporting – Mames M Neal and Suzanne S Brown
4. Investigative Reporting and Editing – P. N. Williams
5. Reporting for the Print Media – F. Fedler
6. Reporting – Mitchell V Charnley
7. Depth Reporting – Neal Copple
8. Interpretive Reporting – D. D. Mach Dougal


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## Course Name: Media law and Ethics Course Code: JMO2102
## Credits: 4

**Course Objectives:**

The objective of the course is to teach students privilege for media available in Indian constitution. The course also focuses to inculcate an understanding of fundamental duties and rights. It also focuses to explain media laws and ethics and their importance in the Journalism.

**Course outcomes:**
At the end of the course, student would be able to:

| S. No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | **Discuss** the evolutionary history of Media laws in India. | Remember |
| 2. | **Differentiate** constitutional limitations of media freedom in India. | Analyze |
| 3 | **Demonstrate** the knowledge of constitution and media laws. and apply journalistic ethics while reporting news. | Apply |
| 4 | **Explain** the various Indian laws with respect to media practices. | Understand |

**BLOCK I: PREVILEGE FOR MEDIA IN INDIAN CONSTITUTION**

**UNIT 1:** Constitution of India: preamble and basic features, fundamental rights and duties, **D**irective principles of state policy

**UNIT 2:** freedom of speech and expression and their limits, provisions of declaring emergency and their effects on media

**UNIT 3:** provisions for amending the constitution; **P**rovisions for legislature reporting;

**UNIT4:** parliamentary privileges and media; theory of basic structure; union and states; and election commission and its machinery.

**BLOCK II: SPECIFIEDPRESS LAWS**

**UNIT 5:** History of press laws in India, ContemptofCourtsAct197, civil and criminal law of defamation

**UNIT 6: R**elevant provisions of Indian Penal Code with reference of sedition, crime against women and children;

**UNIT 7:** laws dealing with obscenity; Official SecretsAct,1923,

**UNIT 8: R**ight to information, Press and Registration of BooksAct,1867.

**BLOCK 3: MEDIA LAWS**

**UNIT 9:** Working Journalists and Other Newspaper Employees(Conditions of Service & Miscellaneous Provisions )Act,1955;

**UNIT 10:** Cinema to graph Act,1953;

**UNIT 11:** Prasar Bharati Act;

**UNIT 12:** WTO agreement and intellectual property right legislations, including Copy right Act,

**BLOCK 4: ETHICS**

**UNIT 13:** Media's ethical problems including privacy, right to reply, communal writing and sensational and yellow journalism;

**UNIT 14:** freebies, bias, coloured reports;

**UNIT 15:** Ethical issues related with owner ship of media–

**UNIT 16:** Press Council of India and it s broad guidelines for the press

**Text and references**


- Media Law and ethics by Moore, Roy L, and Murray, Michael D.
- Press Law Sanjeev Bhanavat • Press Kanun, Nand Kishore Trikha.
- भारत का संविधान -डीडी बस।ु
- भारत का संविधान-सभाषु कश्यप।
- भारत का संविधान- डॉ जय नारायण पाण्डेय] सेन्त्रल लॉ ऐजेंसी। • पत्रकाररता एिं प्रेसविचध -डॉ बसंतीलाल बाबेल] सविधाु लॉहाउस


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## Course name: Corporate communication Course Code: JMO2103 Credits: 4

**Course Objectives:**

The objective of the course is to teach students the basics of corporate communication. The course also focuses to inculcate an understanding of corporate culture among students. The course also focuses on application of corporate communication in the media industry

**Course outcomes:** At the end of the course, student would be able to:

| S. No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | Discuss – Introduction to corporate communication | Remember |
| 2. | Understanding Corporate Environment | Understand |
| 3. | Explain - Application of Corporate Communication. | Apply |
| 4 | Describe Structure and forms of Corporate Communication: Management, Marketing, Organizational | Analyse |

**BLOCK I: INTRODUCTION TO CORPORATE COMMUNICATION**

**UNIT 1:** Corporate Communication: Meaning, Definition, Concept And Scope, Characteristics
**UNIT 2:** Structure and forms of Corporate Communication: Management, Marketing, Organizational

**UNIT 3:** Corporate Communication as Branding strategy: Monolithic, Endorsed, Branded

**UNIT 4:** Public relation, Meaning, definition, characteristics and function, Shift from PR to Corporate Communication

**BLOCK II: UNDERSTANDING CORPORATE ENVIRONMENT**

**UNIT 5:** Contemporary Corporate Environment: an overview, Forms of Corporate Constituencies
**UNIT 6:** Corporate Philanthropy and Social Responsibility

**UNIT 7:** Definition, Concept and evolution of Brand Management- Brand AnalysisComponents of Brand; Strategies and Structure-building brand equity

**UNIT 8:** Brand Identity, Brand Image and Brand Reputation

**BLOCK III: CORPORATE COMMUNICATION IN PRACTICE**

**UNIT 9:** Developing a Communication Strategy

**UNIT 10:** Perspectives on Organizing Communication: Vertical, Horizontal and Lateral **UNIT 11:** Corporate Identity Audit: Concept And Steps, Corporate Advertising: Concept and Functions

**UNIT 12**: Maintaining brand loyalty-strategies and tactics, brand ability, brand idea, brand value and corporate brands.

**BLCOK IV: APPLICATION OF CORPORATE COMMUNICATION**

**UNIT 13:** Media Relations: Tools and Techniques, Media Monitoring and Research,Gate keeping research and output analysis

**UNIT 14:** Internal & External Communication: Concept and Tools

**UNIT 15:** Guidelines and Ethics for Corporate Communication, Crisis Management: Concept and Case Studies (Infosys Crisis and Nestle Maggie)

**Text and References:**


1. Argentic, P. A. (2009). Strategic Corporate Communication: A Global Approach for doing Business in the New India. New York: McGraw-Hill.
2. Cornelissen, J. (2008). Corporate Communication: A guide to Theory and Practice. Los Angeles: SagePublications.
3. Jethwaney, J. (2010). Corporate Communication: Principles and Practice. Oxford: Oxford University Press.
4. Oliver, S. (2004). A Handbook of Corporate Communication and Public Relations: Pure and Applied. London: Routledge.


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## Course Name: Professional Communication Course Code: ENO-1101 Credit: 2

**Course Objectives:**

Cultivate and develop reading and writing habit to enhance their vocabulary. Understanding necessary communication skills for effective presentation and management.

**Course Outcomes**

By the end of the course, students will be able to build a professional tone. It will develop goodwill among customers and enhance business writing skills also would help them compete.

**Block I. Paragraph Writing**

**Unit- 1** Requisites of good paragraph writing

**Unit- 2** Scientific writing skills
**Unit- 3** Importance of listening and hearing

**Unit- 4** Effective listening skills

**Block II. Personal Skills**

**Unit- 5** Tips for before interview

**Unit- 6** Tips for during and after interview

**Unit- 7** Debates

**Unit- 8** Role play

**Unit- 9** Office etiquettes

**Unit-10** Corporative behaviour

**Unit-11** Group Discussion- Tips

**Block III. Letter Writing: Types and Format**

**Unit-12** Formal letters
**Unit-13** Informal letters
**Unit-14** Business letters
**Unit-15** Official letters
**Unit-16** Job applications

**Block IV. Communication Skills**

**Unit-17** Definition of Communication
**Unit-18** Types of Communication
**Unit-19** Level of Communication
**Unit-20** Flow of Communication
**Unit-21** Barriers to effective Communication

**Block V. Scientific writing skills**

**Unit-22** Techniques of scientific writing
**Unit-23** Plagiarism
**Unit-24** Types of reports
**Unit-25** Lay out of formal report**.**

**Text and Reference:**

- Fluency in English part-1, Macmillan, Delhi,2005, Units 1-18
- Business English, Pearson, Delhi,2008, Units 1-3
- Language through Literature (forth coming). Dr. Gauri Mishra, Dr. Ranjana Kaul, Dr. Brat Biswas, Primus Books, Delhi 2005 Chapter 1-17
- Martin Hewing, Advanced English Grammar, CUP, New Delhi, 2010, Unit 1-60.

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## Course Name: Basics of Still Photography Course Code: JMO – 1103
## Credits: 3

**Course Objectives:**
The objective of the course is to teach students the development of photography and various types of camera. The course also focuses to inculcate an understanding of camera handling and visual composition. It also focuses to explain various techniques of lighting used in photography.

**Course outcomes:**
At the end of the course, student would be able to:

| S. No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | **Demonstrate** still camera and its accessories. | Apply |
| 2. | **Differentiate** genres of photography. | Analyze |
| 3. | **Classify** the various lights and lighting techniques. | Understand |
| 4. | **Demonstrate** the working style and technology new media. | Apply |
| 5. | **Explain** the principles of visual composition. | Understand |
| 6. | **Describe** prominent Indian photographers. | Understand |

**BLOCK I: DEVELOPMENT OF PHOTOGRAPHY**

**UNIT 1:** History and development of photography, Using Still Camera: holding the camera properly

**UNIT 2:** Steadying the camera, snapping shutter, Principles of camera obscura,

**UNIT 3:** Components of Camera: viewfinder, lenses, iris diaphragm, shutter, film chamber, light metre

**UNIT4:** Composition – different types of shots, camera angles and camera movements

**BLOCK II: CAMERAS AND ACCESSORIES**

**UNIT 5:** Types of Cameras: Simple; compact, view camera, range finder and reflex camera, underwater camera, digital camera, Digital Camera

**UNIT 6:** Camera for self-developing material (Polaroid),
**UNIT 7:** Camera accessories: Tripod, Tripod head, Remote Release Lens hood, Flash unit, filters, close up attachment etc.

**UNIT 8:** Types of photography: Adventure, black and white, Brand, Architectural, candid, Fashion, commercial product, event, food, golden hour, nature, landscape, sports, travel photography

**BLOCK III - LENSES AND THEIR USES**

**UNIT 9:** Types of Lenses: Single, Single Focal length and Zoom

**UNIT 10:** Controlling image; angle of view, Aperture and f-no. C.

**UNIT 11:** Depth of field, how depth of field works d. Depth of focus.

**UNIT 12:** Standard Lenses, Telephoto, Wide Angle, Portrait, Macro, Fisheye

**BLOCK IV: LIGHTS AND LIGHTING TECHNIQUES**

**UNIT 9:** Natural Light and Color Temperatures, Types of Studio Lights: Tungsten, Halogen, Mercury, LED, Mono lights

**UNIT 10**: Lighting Design: Key Light, Fill Light, Cutter Lights, Back Light, Spot Lights,

**UNIT 11:** Three point system, four point system

**UNIT 12:** Positioning of Light: High, Eye Level, Low, Natural Light and Color Temperatures

**BLOCK IV: PHOTO-JOURNALISM**

**UNIT 13:** Photojournalism, Importance of Photojournalism,

**UNIT 14:** Photo-Journalist and Tips for photojournalist,

**UNIT 15:** Photo editor, Qualities of photo editor

**UNIT 16:** Eminent Photographer: Raja Deen Dayal, Sunil Janah, Homai Vyarawalla, Henri Cartier Bresson, Raghu Rai, Prashant Panjiar, John Isaac,

**Text and References**


1. The Magic of Digital Landscape Photography (Lark Photography) by Rob Sheppard, 2010, Sterling
2. Creative Still Life Photography by Bruce Pendleton, 1982, Littlehampton Book Services Ltd
3. Rick Sammon's Creative Visualization for Photographers: Composition, exposure, lighting, learning, experimenting by Rick Sammon 2015, Focal Press
4. Sunlight and Shadows: An Indian Wildlife Photographer's DiarybyM. Y. GhorpadePenguinIndia 2004
5. The History of Photography: 1839 to the Present Day by Beaumont Newhall, 1982, Museum of Modern Art.


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## Course Name: Environmental Studies Course code: AGL-1100 Credits: 3

**Course Outcomes:**

Upon successful completion of this course, the student will be able to:

| S. No. | Paper Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | **Recognize** key concepts ecology, environment and eco-sytem | Knowledge |
| 2. | **Describe** the applications of alternative energy sources | Understand |
| 3. | **Solve** the different types of environmental pollution problems | Apply |
| 4. | **Categorize** current environmental issues | Analyze |
| 5. | **Reframe** critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world. | Evaluate |

**Unit I: Multidisciplinary Nature of Environment & Ecosystem**

Environmental Education: Definition, Scope & Importance, Need for Public Awareness, Ecology & Environment, Type and components of Environment, Basics of Environmental Impact Assessment, Sustainable Development.

Eco system: Component of ecosystem, Type of ecosystem, food chain, food web, energy flow Ecological pyramids, Aquatic ecosystem (pond).

**Unit II: Alternative Energy Resources**

Biofuels: Alcohol, Hydrogen production technology, Biofuels from Jatropa.
Green Energy: Sources, efficiency and sustainability, Energy from Biomass and solid waste. Renewable Energy Resources: solar, wind, hydro, geothermal, fuel cells.

**Unit III: Environmental Pollution**
Water Pollution: Types of pollutants, sources, effect of water pollution on human health. Air Pollution: Air Pollutants, Sources, Effect of air pollutants on environment and human health, Dispersion of air pollutants.
Noise Pollution: Sources and effects.
Solid Waste Management: Sources and classification of solid wastes, Causes and effects of solid waste, Management of solid waste.

**Unit IV: Current Environmental Issue**
Population growth, Climate Change and Global warming: causes & effects, Acid Rain, Ozone Layer depletion, Photochemical smog, Case Study.

**Unit V: Social Issues and Environment**
Environmental legislations (Air, Water, Environmental protection, Forest and Wild life protection Act), Nongovernmental organizations and their role in environment improvement and education.

**Text and Reading:**


1. "Environmental Studies", Smriti Srivastava, S.K. Kataria & Sons, Delhi.
2. "Environmental Science", H. Kaur, Pragati Prakashan, Meerut.
3. "Environmental Studies", Benny Joseph, Tata McGraw Hills-2005.
4. "Environmental Chemistry", V.P. Kudesia, Pragati Prakashan, Meerut.
5. "Environmental Chemistry & Pollution Control", S.S. Dara, S. Chand & Co.


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## Semester IV Course Name: Community Radio Course Code: JMO2201 Credit: 4

**Course Objectives:**
The objective of the course is to teach concept, meaning and evaluation of community radio. The course also focuses to describe community radio personnel and their responsibilities. It also aims to describe various community radio program formats and their production.

At the end of the course, student will be able to:

| COs No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | **Define –** Concept and meaning of community radio | Remember |
| 2. | **Differentiate** - .CRS and Commercial Radio | Understand |
| 3. | **Classify** – CRS Human resources | Apply |
| 4. | **Demonstrate** – Role and responsibilities of CRS reporter, announcers. | Apply |
| 5. | **Explain**- CRS program format and production | Understand |
| 6. | **Describe –** Guidelines setting up and running a CRS | Understand |

**BLOCK 1: CRS: CONCEPT AND EVOLUTION**

**UNIT 1:** Concept and Meaning of CRS,

**UNIT 2: Community radio, Its** Features, Functions, Difference between CRS and Commercial radio

**UNIT 3:** Community Radio: Evolution

**UNIT 4:** CR Initiatives in India

**BLOCK2: CRS HUMAN RESOURCES**

**UNIT** 5: Community Radio Announcer: Qualities, role and responsibilities

**UNIT 6:** Community radio reporter: Qualities, role and responsibilities

**UNIT 7:** Community Radio Program producer: Qualities, role and responsibilities **UNIT 8:** Community radio set up (Structure);

**BLOCK 3: CRS PROGRAM FORMAT AND PRODUCTION**

**UNIT 9:** Fixed Point Chart and various program formats

**UNIT 10:** Devotional program, Agricultural program, Career counselling, Interviews **UNIT 11:** Health programs, Health Mantra –Desi Nuskhe, Developmental Program and reporting,

**UNIT 12:** Women Emporment program, Employment based program

**BLOCK 4: EDITING AND LICENCING**

**UNIT 13**: Technology used in editing broadcasting

**UNIT 14:** CRS Promotion, Audience retaintion, CRS - RAM rating

**UNIT 15:** Community radio license – GOPA, WOL, CRS program Guidelines

**Text and References**


1. Community Radio Handbook, (2001) Colin Fraser and Sonia Rest repo Estrada, Unesco,https://www.infoamerica.org/teoria_textos/radio_comunitaria_en.pdf
2. Community Radio, (2018), Josiah, Jocelyne, Malik, Kanchan S., Sharma, Sanjana,R. Sreedherhttp://egyankosh.ac.in/handle/123456789/48587
3. Community Radio in India (2019) R. Sreedher, Pooja O. Murada, Aakar Books Aakar

The Radio Career Book: From Programming to Performance (2019), Sayed Mohammad Amir


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## Course Name: New Media Course Code: JMO2202 Credit: 4

**Course Objectives:**

The objective of the course is to teach concept new media and online journalism. The course also focuses to describe OTT platforms in India. In addition, the course also aims to discuss origin and growth of social media.

**Course outcomes:**

At the end of the course, student would be able to:

| COsNo. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | The concept of New media and online Journalism | Understand |

| | | |
|---|---|---|
| 2. | Utilize social media platforms to engage with audiences, promote content, and gather news. | Remember |
| 3. | Utilise social media platforms to engage with audiences, promote content, and gather news | Apply |
| 4. | Evaluate the credibility and reliability of | Evaluate |
| | online sources and ethical practice reporting in the digital age. | |

**BLOCK I: INTRODUCTION TO NEW MEDIA**

**UNIT 1:** New media, Features of New Media, Difference between Old and New Media, **UNIT 2:** Evaluation, Tools, Advantages and disadvantages of online media, Various Online media Platforms

**UNIT 3**: OTT platforms: meaning and definition, OTT Platforms in India,Advantages and disadvantages of OTT platform,

**UNIT 4:** Online Journalism, trends, and challenges in online jouralism, Online reporter and its qualities,

**BLOCK II: Social Media**

**UNIT 5:** Social Media; Origin and growth

**UNIT 6:** Social Media and its impact on Journlaism, Credibility of Digital Media

**UNIT 7:** Social Media Activism, Social Media Trial, Net Neutrility

**UNIT 8:** Content management systems (CMS) for news production, Search engine optimization (SEO) and digital marketing strategies

**BLOCK III: Social media movements and Ethical Concerns in Digital Age**

**UNIT 9:** Arab Spring, India against Corruption, Me Too Campaign,

**UNIT 10:** Inter-Mediary guidelines and Digital Media Ethic code,

**UNIT 11:** Journalism ethics and principles in the digital era, Copyright, fair use, and intellectual property rights

**UNIT 12:** Information Technology Act 2000

**BLOCK 4: Online journalism**

**UNIT 13:** Blogs, V-Blogs, Podcasts

**UNIT 14:** Internet, News and virtual news room

**UNIT 15:** Citizen Journalism, User Generated Content Producers

UNIT 16: Fake news & Misinformation, Fact checking

**Text and References:**


- "New Media and New Technologies" by Lister Dovey, Giddings, Grant & Kelly. (2003).
- Rosen, J. "The People Formerly Known as the Audience" What video games have to teach us about language and literacy. New York, NY: Palgrave Macmillan.
- Jenkins, Henry. (2006). Convergence Culture: Where Old and New Media Collide. New York, NY:
- May, Keenan & Peter Newcomb. (2008, July) How the Web was won. Vanity Fair, retrieved from http://www.vanityfair.com/culture/features/2008/07/internet200807 • "Privacy vs. the Internet: Americans Should Not Be Forced to Choose" (ACLU report, 2008)


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## Course name: Media and Society Course Code: JMO – 2203 Credits: 4

**Course Objectives:**

The objective of the "Media and Society" course is to examine the reciprocal relationship between media and society, exploring how media influences and reflects societal values, norms, and communication dynamics. Students gain insights into the role of media in shaping public opinion, culture, and social change.

At the end of the Media and Society course, student will be able to:

| COs No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | **Define** mass: popular, folk, media, culture. | **Understand** |
| 2. | **Differentiate** practical theories. | **Analyse** |
| 3. | **Classify** media and technologies. | **Apply** |
| 4. | **Demonstrate** the awareness of different types of culture. | **Apply** |
| 5. | **Explain** uses and gratification approach. | **Understand** |
| 6. | **Describe** new media and cultural forms. | **Understand** |

**BLOCK 1: MEDIA AND SOCIETY**

**Unit1:** Importance of media, Media impact on society, role of media,

**Unit2:** Social responsibility of media, Social groups, Family, Community, Institution, Society,

**Unit3:** Media and Social Change, Concept, Process, Types of Social change and Social change agents, Technology for Social Change, Media Dependency theory

**BLOCK 2: Media and democracy:**

**Unit4:** Public sphere, Media and Freedom of speech and expression,

**Unit5:** Media and Right to information,

**Unit6:** Media and Right to privacy, media as a watchdog.

**BLOCK 3: Mass media and public interest**:

**Unit7:** A critical study of media, Analysis of media contents, its role in serving public, marginalized groups.

**Unit8:** Role of media in social movements:

**Unit9:** political – cultural movements, national integration, communal harmony.

**BLOCK 4: Ownership of media,**

**Unit10:** content – control, Internal and external threats,

**Unit11:** pressures on media – media regulations,

**Unit12:** issues of social class, poverty, development and public health.

**BLOCK 5: Media credibility, Understanding Culture**

**Unit13:** factors affecting media credibility, contemporary issues,

**Unit14:** media performance and its role, critical analysis of media credibility: Paid news

**Unit15:** Understanding Culture, Mass Culture, Popular Culture, Folk Culture Media and Culture

**Text and References:**


1. Media and culture an introduction to mass communication - Richard Campbell
2. Mass media issues analysis and debate – JeorgeOddman
3. Media and Democracy in Asia - An AMIC compilation, 2000
4. Dynamics of mass communication: Media in Transition - Joseph Dominick
5. Conflict sensitive journalism - Ross Howard
6. Media power in politics - Graber, Doris. 1980
7. Media and Society - Arthur Asa Berger
8. Media and Society: challenges and opportunities - Edited by VirBalaAggarwal
9. New Media and Society - Ed: Nicholas Jankowski - Pub: Sage Publications
10. Communication and Persuasion by CI, Hovland/I.L Janies/H H Kelly, Yale University, Newyork, 1953


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## Course Name: Hindi-II Course Code: HNO–2101
## Credits: 2

**Course Objective:**

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**Course Outcomes:**

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2- Nk=ks a eas fparu dh ço`fRr dk fodkl djukA
3- Nk=ks a dks Hkk"kk ds O;ogkfjd fo'y"sk.k eas fuiq.k cukukA
4- Nk=ks a dks O;ogkfjdrk dk Kku djkuk rFkk vU; fo"k;ks a dk lkfgfR;d v/;;u djkukA

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**Block - 2** bdkbZ- 7 izsekJe vkSj d`f'k leL;k %& mn~n"s ; ( izLrkouk ( izsekJe ds jpukdky eas [ksfrgj lekt dh fLFkfr vkSj xfr] vo/k dk fdlku&vkUnksyu vkSj izsekJe ( leL;k dk voyksdu&fcanq ( leL;k ds fofHkUu igyvq kas dh f"kuk[r] tehnkjh izFkk dk vifjgk;Z ifj.kke % mRikndrk dk gzkl vkSj yxku es a c<k+sRrjh] yxku ds lanHkZ eas fczfV"k lkekzT;okn vkSj tehankj oxZ ds laca/k ij dFkkdkj dk n`f'Vdks.k] fdlkuka s ds "kks'k.k ds vU; :i] tehankj oxZ ds cnyr s gq, pfj= dk j[s kkadu

( leL;k dk lek/kkuA bdkbZ -8 izsekJe;qxhu Hkkjrh; lekt vkSj izsepan dk vkn"kZokn mn~n"s ; ( izLrkouk ( izsepUn dh miU;kl&n`f'V % vkn"kksZUeq[k ;FkkFkZokn ( izsekJe eas rRdkyhu lekt dh rLohj] tehankj] fdlku] e/;e oxZ ( dFkkdkj dk vkn"kZoknA

bdkbZ - 9 izsekJe dk vkSiU;kfld f"kYi bdkbZ dh :ij{s kk mn~ns"; ( izLrkouk ( izsekJe dh dFkkoLrq ,oa dFkk la;kstu ( izsekJe eas lkekftd&lkaLd`frd fp=.k ( izsekJe dh ik=&;kstuk] izeq[k iq#"k ik=] izeq[k ukjh ik= ( Hkkf'kd&;kstukA

bdkbZ 10 Kku"kadj dk pfj= mn~ns"; ( izLrkouk ( Kku"kadj ds pfj=&fo/kku es a izsepan dh nf`'V ( izeq[k ikfjokfjd lnL;ks a ds lkFk Kku"kadj dk laca/k] Kku"kadj vkSj izse"kadj] Kku"kadj vkSj izHkk"kadj] Kku"kadj vkSj jk;lkgc deykuna ] Kku"kadj vkSj xk;=h rFkk fo|k ( Kku"kadj % ,d tehankj ds :i eas ( Kku "kadj dh pkfjf=d fo"ks'krk,¡ (Kku "kadj dh thou&n`f'V A

**Block - 3** bdkbZ -11 ifjf"k'V % izsekJ; bdkbZ -12 jaxHkwfe vkSj vkS|kxdhdj.k dh leL;k mn~ns"; ( izLrkouk ( vkS|ksfxdhdj.k rFkk Hkkjr eas mldk egRo ( miU;kl dh e[q ; fo'k; oLrq] lwjnkl dk fojks/k] fe- tkWulsod ds rdZ] izsepan dk n`f'Vdks.k] fe- tkWulsod ,oa lwjnkl dk la?k'kZ ( vaxzsth jkt dh HkwfedkA

bdkbZ 13 jaxHkwfe ij Lok/khurk vkanksyu vkSj xka/khokn dk izHkko mn~ns"; ( izLrkouk ( Lok/khurk vkanksyu dk Lo:i ,oa i`'BHkwfe] xka/khth vkSj vlg;ksx vkanksyu ( jxa Hkwfe eas vaxzst ( vaxzstks a ds leFkZdks a dh fLFkfr ( jxa Hkwfe esa Lok/khurk vkanksyu] MkW-xkaxqyh vkSj dkSafly] ohjiky flag vkSj l"kL= la?k'kZ] jkuh tkg~uoh vkSj /kkfedZ n`f'Vdks.k] fou; vkSj lsok lfefr ( lwjnkl vkSj vlg;ksxA bdkbZ 14 jxa Hkwfe dk vkSipkfjd f"kYi mn~ns"; ( izLrkouk ( jxa Hkwfe eas vkn"kksZUeq[k ;FkkFkZokn ( izsepan dh o.kZu dyk ( jaxHkwfe dk <k¡pk ( jaxHkwfe ds ikBd ( Hkkf'kd lajpukA

**Block - 4** bdkbZ 15 xcu vkSj jk'Vªh; vkanksyu mn~ns"; ( izLrkouk ( izsepan dh jpuk dk mn~n"s ; vkSj ^xcu* ( xcu es a jk'Vªh; vkanksyu ds fp=.k dk ,sfrgkfld lanHkZ ( xcu vkSj jk'Vªh; vkanksyu eas e/;oxZ dh Hkwfedk ( xcu vkSj jk'Vªh; vkanksyu eas fuEuoxZ dh n`f'V ( xcu eas

fpf=r jk'Vªh; vkanksyu vkSj efgyk,¡ ( jk'Vªh; vkanksyu es a iqfyl rFkk ukSdj"kkgh dh Hkwfedk dk fp=.kA

bdkbZ 16 xcu vkSj e/;oxhZ; lekt mn~n"s ; ( izLrkouk ( xcu dk jpukRed mn~ns"; ( e/;oxhZ; ifjokj dh dFkk ( xcu ds ik=] n;kukFk] jekukFk] tkyik] vU; L=h ik=] vU; oxksZa ds ik=A

bdkbZ 17^xcu* dk vkSiU;kfld f"kYi mn~n"s ; ( izLrkouk ( miU;kl dk <k¡pk % dFkkud ( xcu dk dFkkud % ?kVuk iz/kku] pfj= iz/kku ;k ukVdh; ( f"kYi dh izfof/k;k¡] miU;kl ds o.kZu dh "kSyh] ikBd dh vofLFkfr] ys[kd dk ikBd ds lkFk lEcU/k] n`"; dk ukVdh; :i es a izLrqrhdj.k ( vkn"kksZUeq[k ;FkkFkZokn ( xcu dh Hkk'kk A

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## Course Name: E-Marketing Course Code: BSO-2101
## Credits: 3

**Course objectives:**

To provide insight thorough understanding of the principles and practices associated with using the internet to market goods and services.

**Course Learning Outcomes**

After completing the course, the student shall be able to:

| Course Outcome | Cognitive level |
|---|---|
| CO1: Describe the concept of marketing. | Understand |
| CO2: Describe the concept of E-Marketing. | Understand |
| CO3: Comprehend the importance of e-marketing management . | Understand |
| CO4: Understand the concept of internet marketing. | Understand |
| CO5: Know the basic concepts of direct marketing. | Understand |

**Block: I: Introduction**

**Unit - 1:** Concept, Nature and Importance of Marketing,

**Unit - 2:** Basics of Market Segmentation and Targeting.

**Unit - 3:** An overview of Marketing Decision.

**Block: III: E-Marketing**

**Unit - 4:** Concept and nature of e-marketing, E-marketing Vs Traditional marketing:

**Unit - 5:** Issues, Challenges and opportunities for e-marketing, Reason for growth of emarketing,

**Unit - 6:** Tools and techniques of e-marketing, advantages and disadvantages, e-marketing situations.

**Block: III: E-Marketing Management**

**Unit - 7:** Segmentation, Targeting and positioning,

**Unit - 8:** E-marketing and customer relationship management- concept and scope, Ecustomers and their buying process,

**Unit - 9:** E-marketing and customer loyalty and satisfaction, Communities and social networks.

**Block: IV: Internet Marketing**

**Unit - 10:** Concept and role of Internet Marketing, Website design and Domain name branding, Search engine optimization- Function,

**Unit - 11:** Type of traffic, Keywords and steps in search engine optimization,

**Unit – I2:** Internet advertising- Types and Tracking ROI, Online PR, News and reputation Management.

**Block: V: Direct Marketing**

**Unit – I3:** Direct Marketing- Concept, Scope and growth, E-mail marketing,

**Unit – I4:** Social media marketing, concept and tools, Blogging- Benefits, Types,

**Unit – I5:** Video- Marketing for Business Purpose- Tools and Techniques, Pay per Click marketing: Issues and Challenges.

**Text and References:**

1. Strauss, Judy, and Raymond Frost- E-Marketing, Prentice Hall.
2. Hanson Ward A, Principle of Internet Marketing, South Western College Publication Division of Thomson Learning.
3. Chaffey D F Chadwick Ellis, Mayer R and K Johnson, Internet Marketing, Strategy Implementation and Practice, Prentice Hall.
4. Hanson W A and K Kalyanam, Internet Marketing & e-Commerce, South-Western College Publication.

## Course Name: Renewal Sources of Energy Course Code: ECO-0001 Credits: 3

**Block -1 Energy Sources**

**Unit-1** Introduction to energy, Different forms of energy, Energy sources and their availability.

**Unit-2** Conventional and non-conventional sources energy, Conventional energy sources-Fossil fuel energy.

**Unit-3** Hydraulic energy, Non-Conventional Energy Sources-Wind energy, Tidal energy, Solar energy, Nuclear energy

**Block -2 Solar Energy**

**Unit-4** Introduction, Solar Constant, Solar Radiation at the Earth's Surface, Instruments for measuring solar radiation and sun shine, Pyranometer, Sun Shine Recorder, Solar Energy Utilization – Basic ideas about the pre-historic way of using solar energy.

**Unit-5** Solar Energy applications, Solar Collectors, Flat plate collectors (non-concentrating), Concentrating (focusing) type solar collector, Solar Cooker & its types

**Unit-6** Solar Water heater, Solar distillation, Solar Pumping, Electricity from Solar Energy, Solar Photo Voltaics, Applications of Solar Photo-Voltaic System in Rural Areas,

**Block -3 Bio Energy**

**Unit-7** Introduction, Advantages of Bio Gas technology, Bio Gas and its Compositions, History of Bio-gas, Process of Bio gas, generation – Wet Process, dry Process, Raw Materials available for Bio gas Fermentation.

**Unit-8** Selection of site for Installation of a Bio gas plant, Materials required for the Construction of bio gas plant, Constructional Details of Biogas Plant, Utilization and benefits of Biogas Technology

**Unit-9** Common Operational Problems, Economical, social environmental and health benefits of bio gas Utilization, KVIC Bio gas Plant, Pragathi Design Bio gas Plant, Janata Bio gas Plant, Deenbandhu Bio Gas Plant.

**Block -4 Tidal Power Plants**

**Unit-10** Introduction to Tidal Power Plants, Factors affecting the suitability of the site for tidal power plant.

**Unit-11** Classification of tidal Power Plants, Working of Different Tidal Power Plants, Advantages and disadvantages of Tidal Power Plants.

**Unit-12** Components of Tidal Power plants-Power house; Dam or Barrage; Gates and locks.

**Block -4 Wind Energy**

**Unit-13** Wind energy, Classification of wind mills, Advantages and disadvantages of Wind energy,

**Unit-14 Fuel Cells**

Introduction, Working of Fuel Cell, Advantages of Fuel Cells, Processor, Electrolyte, Inverter, Advantages of Fuel Cells.

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**Text and References:**

1. Renewable Energy Sources and Emerging Technologies by D.P. Kothari, K. C. Singhal.
2. Non Conventional Energy Source by G. D. Rai.

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## Semester V

## Course Name: Introduction to Electronic Media

## Course Code: JMO-3101 Credits: 4

**Course objectives:**

At the end of the Introduction to Electronic Media course, student will be able to:

| COs No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | **Define** Introduction to electronic media | Understand |
| 2. | **DifferentiateVarious** types of electronic media. | Remember |
| 3. | **Classify** Public and Private broadcast | Apply |
| 4. | **Describe** Growth of electronic media in India | Understand |

| | | |
|---|---|---|
| 5 | **Describe** Convergence of Technologies. | Analyse |

**Unit I: Electronic Media: Concept and Definition**

1. Meaning and types of media
2. Electronic Media : Meaning and Definition
3. Uses of Electronic Media**,** Advantage & Disadvantage of Electronic Media
4. Early forms of electronic media: Telegraph and telephone
5. Influence of electronic media on society and culture
6. Introduction to broadcasting technologies: radio and television
7. Digital media technologies: internet, mobile devices, streaming services
8. Social media platforms and their impact on communication

**Unit II: Historical Background of radio**

9. History of Radio – Evolution and Development of Radio in India
10. Types of radio, Characteristics of Radio, AM & FM
11. Radio as a mass medium, Growth of private radio channels in India
12. Introduction to major radio networks – FM Gold, FM Rainbow, Radio City, Radio Mirchi, My FM, Big FM, Red FM, Suryan FM, Radio Mantra, RadioDhamal.

**Unit III: Historical Background of Television**

13. History of Television,
14. Television in India: Development and Growth of Doordarshan and other Important Private television channels, Characteristics of TV
15. Introduction to major Indian networks and present scenario: Prasar Bharti, Zee group, Sun group, Enadu group, TV Today network, STAR India, Sahara group, NDTV group, CNN-IBN group

**Unit IV: Internet Radio**

16. Emergence of the internet and its impact on media
17. Introduction to digital media formats
18. Transition from traditional media to digital platforms
19. Interactive TV, Digital TV, Direct To Home (DTH),Video on demand, Set Top Box (STB),
20. Convergence of Technologies, Internet as a mass medium,
21. New media : meaning and characteristics, Media Convergence and future of media, Social media

**Text and References:**

1. Keval J. Kumar -Mass Communication in India Jaico, Mumbai.
2. Denis McQuonil -Mass Communication Theory : An Introduction, Sage
3. H.R. Luthara, Indian Broadcasting 4. P.C. Chatterjee, Broadcasting in India.
5. Radio and guide to broadcasting techniques – Evans 6.
Broadcasting and the people _ MehraMasani
7. Writing for TV and radio - Robert Hellard.
8. Techniques to TV Production – Rudy Bretz (McGraw Hill)
9. Video Production Handbook – Miller (Focal Press)
10. Herbert Zettl, Television Production Handbook, (Delhi : Akash Press, 2007 ) 190-208

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## Course Name: Radio and Television Production Course code: JMO3102 Credits: 5

**Course objectives:**

The objective of the course is to teach students the concept and formats of program production for television and radio. The course also focuses to inculcate an understanding on program production process.

At the end of the Radio and Television Production course, student will be able to:

| COs No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | **Discuss**theorganisational structure and hierarchy of a TV Channel. | **Understand** |
| 2. | **Diffrentiate** basic differences in production. | **Analyse** |
| 3. | **Classify** nature, types & stages of radio and TV. | **Apply** |
| 4. | **Demonstrate** skills of writing for Radio and TV. | **Apply** |
| 5. | **Explain** the basic differences in broadcast formats. | **Understand** |
| 6. | **Describe**various stages of Radio and TV Production. | **Understand** |

**BLOCK 1: TELEVISION NEWS & PROGRAM PRODUCTION**

**UNIT 1:** Sources of TV News- News Agencies,

**UNIT 2**: ENG, Production of ENG, TV News Bulletins, Programs,

**UNIT 3:** Discussions Programs, Chat Shows, Special Audience based programs,

**UNIT 4:** Interview, One to One Interviews, Miscellaneous Programs.

**BLOCK 2: NATURE AND TYPES OF RADIO PROGRAMS**

**UNIT** 5: Composition of Radio Programs: Spoken words program,

**UNIT** 6: Music based radio programs, Specific Audience Programs,

**UNIT 7:** Radio Feature, Drama, Talk,

**UNIT 8:** Magazine Programs, Documentary, and Interactive Programs.

**UNIt 9:** Radio News: Reporting, Sources- Agency News, Broadcast Style, News Pooling in AIR, Announcing and presentation, TV News Bulletin Vs Radio News Bulletin, Newsreels, Voice Dispatch, Spots, Writing for Radio.

**BLOCK 3: STAGES OF PROGRAMME PRODUCTION**

**UNIT 10**: Radio: Pre-Production (Idea, Research, Radio Script, Story boarding, Proposal writing, Budgeting, floor plans, pilot);

**UNIT 11**: Production: Creative use sound (Listening, Recording, Using Archived Sound; Post Production: Sound Editing, Creative use of Sound Effects.

**UNIT 12:** Television: Pre-Production (Idea, Research, TV Script, Story boarding, Proposal writing, budgeting, floor plans, pilot, reccee); Production: Single Camera, Multi-Camera, lights, talent,

**UNIT 13:** Post Production: Audio-Visual Editing, Online/Non-Linear Editing , Linear Editing

**BLOCK 4: ORGANIZATIONAL STRUCTURE OF A TELEVISION CHANNEL**

**UNIT14:** Introduction to News Room-Input & Output, Television Studio, Guest Coordination, PCR, MCR, Graphics, Library,

**UNIT 15:** Production & Store, Programming Team, Special Desk,

**UNIT16:** Research Team, HR & Admin, IT Services, Marketing & Distribution.

**Text and References:**

- Zettl Herbert, Television Production Handbook
- White, TED &Barnas Frank, Broadcast News, Writing Reporting & Producing, Focal Press
- Radio & TV Journalism – K M Srivastava, Sterling Publishers Pvt. Ltd., New Delhi.
- Broadcasting Management in India – Angela Wadia.
- Electronic Media in Modern World – S P Phadke.

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## Course Name: Development Communication Course

## Code: JMO3103 Credit: 5

**Course Objectives:**

The objective of the course is to teach students the concept of development communication. The course also focuses to inculcate an understanding of initial theories of development communication. It also focuses to explain various types of information communication technology used for development.

**Course outcomes:** At the end of the course, student would be able to:

| S. No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1 | Remembering the concept of development communication. | Remember |
| 2 | Understanding the role of mass media in development. | Understand |
| 3 | Applying theories and paradigms of development communication | Apply |
| 4 | Analysing the role of mass media organization like newspapers, radio and TV in development | Analyse |
| 5 | Evaluating development support communication: Case study | Evaluate |

**BLOCK I: THE MEANING OF DEVELOPMENT COMMUNICATION**

**UNIT 1:** Concepts of development & Definition, Role of communication in development

**UNIT 2:** The meaning of development communication in India

**UNIT 3:** WW Rostov model for development; indicators of development

**UNIT 4:** Developed, Developing and Undeveloped nations

**BLOCK II: THEORIES OF DEVELOPMENT COMMUNICATION**

**UNIT 5:** The dominant paradigm of development

**UNIT 6:** Modernization theory, Dependency theory,
**UNIT 7:** Diffusion of innovations theory, Globalization theory, Alternative development,

Participatory communication;

**UNIT 8:** Social marketing theory; Media advocacy

**BLOCK III: INDIAN MODELS OF DEVELOPMENT AND PLANNING**

**UNIT 9:** Gandhi an model of development

**UNIT 10:** National development model: Five Year Plans & Policy commission **UNIT**

**11:** Social development model:

**UNIT 12:** Governance and decentralized development model, e- governance

**BLOCK V: IEC technology FOR DEVELOPMENT:**

**UNIT 13:** The Indian Experience from SITE

**UNIT 14:** Kheda communication project;

**UNIT 15:** Jhabua development communication project;

**UNIT 16:** PURA model

**Text and References:**


1. Development Communication, Uma Narula, 1999, HarAnand Publication Pvt. Ltd., Delhi
2. Development Communication in India, Raghvan.
3. A manual of development Journalism (Press Institute of India): Alam Chalkels.
4. Communication & social development in India (Sterling): B. Kupu Swami.
5. Perspective on Development communication: K. Sadanandan, Sage Publication, New Delhi.
6. Everybody Loves a good drought, P.Sainath

Media, Communication and Development – LinjeMyanjo

## Course Name: Health and Hygiene Course Code: H000201T
## Credits: 3

**Block I:**

**Unit 1**. Basic First Aid

- Aims of first aid & First aid and the law.
- Dealing with an emergency, Resuscitation (basic CPR).
- Recovery position, Initial top to toe assessment.
- Hand washing and Hygiene
- Types and Content of a First aid Kit

**Unit 2** First AID Technique

- Dressings and Bandages.
- Fast evacuation techniques (single rescuer).
- Transport techniques.

**Unit 3**. First aid related with respiratory system

- Basics of Respiration.
- No breathing or difficult breathing, Drowning, Choking, Strangulation and hanging,
- Swelling within the throat, Suffocation by smoke or gases and Asthma.

**Unit 4** First aid related with Heart, Blood and Circulation

- Basics of The heart and the blood circulation.
- Chest discomfort, bleeding.

**Unit 5**. First aid related with Wounds and Injuries

- Type of wounds, Small cuts and abrasions
- Head, Chest, Abdominal injuries
- Amputation, Crush injuries, Shock

**Unit 6** First aid related with Bones, Joints Muscle related injuries

- Basics of The skeleton, Joints and Muscles.
- Fractures (injuries to bones).

**Block II:**

**Unit 7**. First aid related with Nervous system and Unconsciousness

- Basics of the nervous system.
- Unconsciousness, Stroke, Fits – convulsions – seizures, Epilepsy.

**Unit 8** First aid related with Gastrointestinal Tract

- Basics of The gastrointestinal system.
- Diarrhea, Food poisoning.

**Unit 9** First aid related with Skin, Burns

- Basics of The skin.
- Burn wounds, Dry burns and scalds (burns from fire, heat and steam).
- Electrical and Chemical burns, Sun burns, heat exhaustion and heatstroke.
- Frost bites (cold burns), Prevention of burns, Fever and Hypothermia.

**Unit 10**. First aid related with Poisoning

- Poisoning by swallowing, Gases, Injection, Skin

First aid related with Bites and Stings

- Animal bites, Snake bites, Insect stings and bites

**Unit 11** First aid related with Sense organs

- Basic of Sense organ.
- Foreign objects in the eye, ear, nose or skin.
- Swallowed foreign objects.

**Unit 12** Specific emergency satiation and disaster management •

Emergencies at educational institutes and work

- Road and traffic accidents.
- Emergencies in rural areas.
- Disasters and multiple casualty accidents.
- Triage.

Emergency Child birth

**Block III:**

**Unit 13** Basic Sex Education

- Overview, ground rules, and a pre-test
- Basics of Urinary system and Reproductive system.
- Male puberty — physical and emotional changes
- Female puberty — physical and emotional changes
- Male-female similarities and differences
- Sexual intercourse, pregnancy, and childbirth
- Facts, attitudes, and myths about LGBTQ+ issues and identities
- Birth control and abortion
- Sex without love — harassment, sexual abuse, and rape
- Prevention of sexually transmitted diseases.

**Block IV:**

**Unit 14:** Mental Health and Psychological First Aid

- What is Mental Health First Aid?
- Mental Health Problems in the India
- The Mental Health First Aid Action Plan
- Understanding Depression and Anxiety Disorders
- Crisis First Aid for Suicidal Behavior & Depressive symptoms
- What is Non-Suicidal Self-Injury?
- Non-crisis First Aid for Depression and Anxiety
- Crisis First Aid for Panic Attacks, Traumatic events
- Understanding Disorders in Which Psychosis may Occur
- Crisis First Aid for Acute Psychosis

- Understanding Substance Use Disorder
- Crisis First Aid for Overdose, Withdrawal
- Using Mental Health First Aid

**Text and References:**


1. Indian First Aid Mannual- https://www.indianredcross.org/publications/FAmanual.pdf
2. Red Cross First Aid/CPR/AED Instructor Manual.
3. https://mhfa.com.au/courses/public/types/youthedition4.
4. Finkelhor, D. (2009). The prevention of childhood sexual abuse. Durham, NH: Crimes Against Children Research Center. www.unh.edu/ccrc/pdf/CV192. pdf
5. Kantor L. & Levitz N. (2017). Parents' views on sex education in schools: How much do Democrats and Republicans agree? PLoS ONE, 12 (7): e0180250.
6. Orenstein, P. (2016). Girls and sex: Navigating the complicated new landscape. New York, NY: Harper.
7. Schwiegershausen, E. (2015, May 28). The Cut. www.thecut.com/2015/05/mostwomen-are-catcalled-before-they-turn-17.html
8. Wiggins, G. & McTighe, J. (2008). Understanding by design. Alexandra, VA: ASCD. 9. https://marshallmemo.com/marshall-publications.php#8


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## Course: Basic Statistics Course Code: MAV-005

| COs No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | **Recall** measures of central tendency. | Remember |
| 2. | **Define** various measures of dispersion. | Remember |
| 3. | **Explain** the concept of probability, normal distribution and its properties. | Understand |
| 4. | **Summarize** the concept of correlation and regression. | Understand |

**Block 1**
Unit- 1 Introduction, definition of Statistics and its use
Unit-2 limitations of Frequency distribution
Unit-3 Measures of Central Tendency, Arithmetic mean, Median, Mode.

**Block 2**
Unit- 4 Measures of Dispersion
Unit- 5 Standard Deviation,
Unit- 6 Variance

Unit- 7 Coefficient of Variation, Quartile deviation and its coefficient.

.

**Block 3**

Unit- 8 Probability definition and concept of probability
Unit- 9 Normal Distribution
Unit-10 Properties of Normal Distribution

**Block 4**

Unit- 11 Correlation: Computation of Correlation Coefficient and its testing, Unit-12 Linear regression and regression coefficients.

**Text and References:**


1. Gupta S. C. and Kapoor V. K.; Fundamentals of Mathematical Statistics, S. Chand and Sons.
2. Gupta S. C. and Kapoor V. K.; Applied Statistics, S. Chand and Sons.
3. Hogg R. V., Mckean J. and Craig A. T.; Introduction to Mathematical Statistics, Pearson.
4. Das N. G.; Statistical Methods, Tata McGraw Hill.
5. Vittal P. R.; Mathematical Statistics and Probability, Margham Publishers.


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## Semester VI

## Course Name: Dissertation Course code: JMR3201
## Credits: 6

**Course Objectives:**

At the end of the Dissertation course, student will be able to:

| COs No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | Identify and Define appropriate social problems | Remember |
| 2. | Explain appropriate research approaches for addressing social problems | Understand |
| 3. | Apply various tools and techniques to complete research | Apply |
| 4. | Analyse research report and make roboust conclusion | Analyse |

Every student shall, in the Sixth (final) Semester, submit a Dissertation reporting the results of original research on a topic assigned at the beginning of the semester by the concerned research guide (faculty member) in consultation with the student, in his/her area(s) of special interest. The research guide shall be chosen by the student according to his/her interest and the faculty member's area of expertise. No faculty member shall guide more than five students.

The topic of the Dissertation shall be approved by the Head of the Department. For this purpose the candidate shall submit to the Head an application stating the topic for the dissertation along with a synopsis within three weeks of the commencement of classes of the Fourth Semester. Once approved, the topic of dissertation shall not be altered without a fresh proposal from the student accompanied by a written request stating the reason for change. No such request shall be entertained after five weeks of the commencement of classes of the Semester in question.

**Reference Books:**

- **lekftdvuqla/kku& Mk- Mh-,l- c/ksyA**
- **ehfM;k 'kks/k] _rqxks"Bh] y{; ifCyds”kuA**

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## Course Name: Comprehensive Viva-voce Course Code: JMI-3201 Credits: 4

**Course Objectives**

The objective of a Comprehensive Viva-Voce course is to assess a student's knowledge, communication skills, and critical thinking through an oral examination, typically covering a wide range of topics within a specific subject or field of study.

After completion of this course students will be able to

| **S.No.** | Course Outcomes (COs) | **Cognitive level** |
|---|---|---|
| **1** | Identify: Knowledge of student about Journalism and Mass Communication | **Remember** |
| **2** | Demonstrate how the journalistic approach to problem solving and storytelling can produce locally engaged, globally competent citizens. | **Apply** |
| **3** | **Understand** the skills of a journalist. | **Understand** |

| | | |
|---|---|---|
| **4** | **Explain** critical understanding of the contextual factors that shape the media message in a diverse, globalized media landscape. | **Apply** |

The Comprehensive Viva Voce based on the courses of the entire programme and future projections of Media and Entertainment industry. It will be conducted by a Board of Examiners comprising of the Director/Principal or his/her nominee and two External Experts, out of which one should preferably be from the Corporate World i.e. Media Organization operating in the country. The quorum shall be deemed to have met if 2 out of 3 members arepresent.

The comprehensive viva-voce carries100 marks/ 4 credits, which will be evaluated by External and Internal Examiners separately for 50 marks each. The External Examiner will be appointed by the Competent Authority.

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## Course name: Media and International scenario Course Code: JMO3201 Credits: 4

**Course Objectives:**

The objective of the course is to teach students the concept of international communication. The course also focuses to inculcate an understanding on importance of local, national and global in the context of development and culture. It also focuses to explain impact of global media in shaping human life, culture and politics.

**Course outcomes:**

At the end of the course, student would be able to:

| S. No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | Elaborate international communication. | Remember |
| 2. | Impact of global media on local culture and policy making | Analyze |
| 3 | Importance of localize approach | Apply |
| 4 | Understand media and global system | Understand |

**BLOCK I: INTERNATIONAL COMMUNICATION**

**UNIT 1:** meaning and definition of international communication

**UNIT 2:** dimensions of international communication: Political, economic and cultural, Concept of Local, National and International

**UNIT 3:** Globalization and Media, Media Convergence

**UNIT 4:** Changing trend of Public Sphere in globalization era

**BLOCK II: MEDIA AND MASS CULTURE**

**UNIT 5:** Impact of Media on Culture, Culture of Global Communication

**UNIT 6:** Role of media in promoting a global culture, Mass Media and Socialisation

**UNIT 7:** Function of Mass media, Media & Human rights,

**UNIT 8:** Cultural Imperialism -- A Debate, Intercultural Communication

**BLOCK III: GLOBAL MEDIA SYSTEMS**

**UNIT 9:** News & Information flow, NIEO & NWICO

**UNIT 10:** Major International News agencies, Media Imperialism (Oliver Boyd-Barrett 1977)

**UNIT 11:** Dependency theory (Both Media and Dev-com)

**UNIT 12:** Structural Imperialism, Global Media Industry and Ownership Patterns

**BLOCK IV: MASS MEDIA AND GLOBAL ORDER**

**UNIT 13:** Communication and Power

**UNIT 14:** Public diplomacy and soft power, Propaganda

**UNIT 16:** Media and International Relations (Political relations, Economic and trade, Cultural relations) Media, Market and Politics

**Text and references:**


1. DayaKishanThussu. International Communication: Continuity and Change, OUP, 2003.
2. Lee Artz and Yahya R. Kamalipor. The Globalization of Corporate Media Hegemony, New York Press, 2003.

3. Zahida Hussain and Vanita Ray. Media and Communication in the Third World Countries,Gyan Publications,2007.
4. Patnaik, B.N &ImtiazHasnain(ed). Globalisation: Language, Culture and Media, Indian
5. Institute of Advanced Studies, Shimla, 2006. 6. Monroe, Price. Media Globalisation' Media and Sovereignty, MIT press, Cambridge, 2002.

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## Course Name: Internship Course Code: JMT3201
## Credits: 3

**Course Objectives:**
At the end of the Summer Internship course, student will be able to:

| COs No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | **Define** the working styles of different media houses. | Understand |
| 2. | Objectives and importance of internship | Remember |
| 3. | Learn and work with industry professional to understand environment and culture of media | Apply |

**Unit-I**

Basics of writing an Internship Report.The aims & objectives behind developing a report. The importance & necessity of internship report.

**Unit-II**

The Ethics and technicalities of a Report such as the fonts used the size of characters, Headings, Division of Chapters etc.

**Unit-III**

Exposure to any media house for about 4 weeks.On the basis of the Internship done at the respective media house will have to be developed in the form of a Report.

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## Course Name: Web Designing Course Code: B070404T

| S. No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | Explain the history of the internet and related internet concepts that are vital in understanding web development. | Understand |

| | | |
|---|---|---|
| 2. | Discuss the insights of internet programming and implement complete application over the web. | Understand |
| 3. | Utilize the concepts of JavaScript and Java | Apply |
| 4. | Demonstrate the important HTML tags for designing static pages and separate design from content using Cascading Style sheet. | Apply |
| 5. | Reframe web application development software | Evaluate |

**BLOCK-1: INTRODUCTION**

**Unit-1** What is Markup Language Basic Structure of HTML

**Unit-2** Difference Between HTML and XHTML

**Unit-3** Head Section and Elements of Head Section Meta Tags CSS Tags Script Tag Table Tag Div Tag Header Tags Paragraph, pan, Pre Tags

**BLOCK-2: DESIGNING PAGES WITH HTML**

**Unit-4** Anchor Links and Named Anchors Image Tag Object Tag frame Tag Forms Form Tag attributes of Form POST

**Unit-5** GET Method Field set and Legend Text input,

**Unit-6** Text area Checkbox and Radio Button Dropdown.

**Block-3 CSS**
**Unit-7** Dynamic HTML, Document Object Model,

**Unit-8** Features of DHTML, CSSP (Cascading Style Sheet Positioning) and JSSS (JavaScript assisted Style Sheet

**BLOCK 4 JAVA SCRIPT**

**Unit-9** Objects, Methods, Events and Functions, Tags, Operators, Data Types.

**Unit-10** Literals and Type Casting in JavaScript, Programming Construct Array and Dialog Boxes.

**BLOCK 5: FRONT PAGE**

**Unit-11** Front Page Basics, Web Terminologies, Phases of Planning and Building Unit-12 Web Sites, the FTP, HTTP and WPP.

**Text and references:**

1. Steven Holzner: Dreamtech Press

2. Evan Bayross: HTML, Java Script, DHTML, PERL, CGI.
3. Ivon Bayros: Introduction to HTML, DHTML, Java Script.

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## Semester: VII Course name: Communication Research Course Code: JMO4101 Credits: 4

**Course Objectives:**

The objective of the course is to teach students the concept of research and its importance in media studies. The course also focuses to inculcate an understanding on importance of research methodology in the process completing research.3

**Course outcomes:**
At the end of the course, student would be able to:

| S.No. | Course Outcomes (COs) | Cognitive level |
|---|---|---|
| 1. | **Write** the definition and basic concept of Research. | Remember |
| 3. | **Identify -** significance of media research and various types of research. the knowledge about the need, role, importance, functions and ethics of research. | Apply |
| 4. | **Describe -** concept and various issues involved in media research. | Understand |
| 6. | Analysis role of researcher in social problem solving | Analyse |

**BLOCK I: RESEARCH: TYPES AND PROCESS**

**UNIT 1:** Meaning and objectives of research, Types of research, Research, Approaches– quantitative and qualitative, Research Process–the steps involved, Defining the research problem,

**UNIT 2:** Areas of Mass Communication Research: Source Analysis, Audience Analysis and
feedback analysis,

**UNIT 3:** Applications of research in media industry,

**UNIT 4:** Communication Research, Meaning & Definition, Communication research Process-essential steps

**BLOCK II: DATA COLLECTION TOOLS AND TECHNIQUES**

**UNIT 5:** Primary, secondary data and Tertiary Data, Defining the research design and its type

**UNIT 6:** Sampling–Steps in sampling design, sampling procedure, Types of sampling–Probability and Non-Probability

**UNIT 7:** Hypothesis–its characteristics, testing of hypothesis, Survey, Observation, Interview, Content Analysis

**UNIT 8:** Questionnaire and Scheduled Interview, Variables

**BLOCK III: DATA ANALYSIS**

**UNIT** 9: Processing of data–editing, coding, classification, tabulation

**UNIT 10:** Graphic presentation-Histogram, Frequency curve,

UNIT 11: Measures of central tendency–Mean, median and mode

**UNIT 12:** Report Writing - steps involved, layout of the research project

**BLCOK IV: ISSUES IN COMMUNICATION RESEARCH**

**UNIT 13:** Issues in Communication Research,

**UNIT 14:** Role of researcher,

**UNIT**15: Methodological limitations in Communication Research,

**UNIT** 16: Ethical issues in Communication Research.

**Text books and references**

1. Hansen Andero, Cottle Simon, Mass Communication Research methods Negrine Ralph, Newbold Chris McMillan Press Ltd., London 2004
2. Jensen Hlaus Brush ed.A Handbook of Media and Communication Research, Routledge, London 2002
3. Kothari, C R Research Methodology: Methods &Techniques,Wishwa Prakashan,

New Delhi, 2004
4. Judith Bell Doing Your Research Project, Viva Books Private Limited, 1999
5. Wimmer Roger D, Dominick Mass Media Research, Thompson, Joseph R New York, 2004
6. Uma Joshi Media Research-Cross Sectional Analysis, Authors Press, 2002
7. G K Parthasarthy Electronic Media and Communication Research Methods, Authors Press, New Delhi, 2006
8. Allen T Harrell New Methods in Social Science Researches, Praeger Publishers, New York
9. Ghosh, B N Scientific Methods and Social research, Sterling Publishers, New Delhi

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## Course name: Broadcasting & Film Production Course Code: JMO4102 Credits: 4

**Course Objectives:**

The objective of the course is to teach students the concept and formats of program production for television and radio. The course also focuses to inculcate an understanding on broadcasting & film production process.

**Course outcomes:**

At the end of the course, student would be able to:

| S. No. | Course Outcomes | Cognitive Level |
|---|---|---|
| 1 | **Define** Resources Management-Procurement, storage, &Logistics | Remember |
| 2 | **Differentiate** Television Rating Point (TRP) Agencies of Rating, Process &Method of Rating. | Understand |
| 3 | **Demonstrate** the knowledge of film production. | Apply |

**BLOCK 1: BASICS OF FILM PRODUCTION**

**UNIT** 1: Fundamentals of film Production

**UNIT** 2: Key equipment's, personnel involved in production

**UNIT** 3: Developing programme brief: Objective, content, target audience, duration,

Generation of idea, preparing outline, and conducting research

**UNIT** 4: Writing the proposal, preparing floor plan and location sketch Production

**BLOCK 2: STAGES OF FILM PRODUCTION**

**UNIT** 5: PRE-PRODUCTION: Film Production Management details the steps involved in bringing a screenplay to the screen: organizing, staffing, budgeting, scheduling, securing locations, shooting and postproduction

**UNIT 6:** Single camera and multi camera techniques

**UNIT 7:** POST PRODUCTION: Editing, dubbing, voiceover, music and sound mixing

**BLOCK 3: PRODUCTION MANAGEMENT**

**UNIT 8**: Production Planning, Scheduling, & Managing Deadline.

**UNIT 9:** Resources Management- Procurement, storage, &Logistics, Management of Records – Print & Video Library.

**UNIT 10:** Promotion of total Quality Management, Sources of Financial Assistance.

**UNIT 11**: Pre –Script& Post – Script Budgeting.

**BLOCK 4: ELECTRONIC MEDIA MARKETING**

**UNIT 12:** Co-Ordination, Team Building, Leader ship Skill & Motivation.

**UNIT 13:** Market Survey: Media, Product &Audience Profile.

**UNIT 14:** Television Rating Point (TRP) Agencies of Rating, Process &Method Of Rating. Major media Houses Of India, Major Heads of Income In Media: Dominant & Alternative Source.

**UNIT15:** Indian Scenario of Satellite Television Industry Process of Distribution. In House Programmed Commissioned & Sponsored Programme.

**Text book and References:**

1. Introduction to Media Production by Gorham Kindem,
2. Film Production Management: The Ultimate Guide for Film and Television Production Management and Coordination by Deborah S Patz

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## Course name: Media Management Course Code: JMO4103
## Credits: 4

**Course Objectives:**
The objective of the course is to teach students the principles of management. The course also focuses to inculcate and develop skills of planning, execution and management of program. It also focuses to explain organizational structure of media organisation.

**Course outcomes:**
At the end of the course, student would be able to:

| S. No. | Course Outcomes | Cognitive Level |
|---|---|---|
| 1 | Define principle of management | Remember |
| 2 | Elaborate the policies of companies and organisations. | Understand |
| 3 | Demonstrate skills of Planning and execution of program. | Apply |
| 4 | List of editorial, management, marketing strategy and different platforms of media. | Remember |

**BLOCK I: Concept of Management**

**UNIT 1:** Principles of media management and their significance, media as an industry and profession.

**UNIT 2:** Ownership patterns of mass-media in India, sole proprietorship, partnership,

**UNIT 3:** private limited companies, public limited companies, trusts, co-operatives,

**UNIT 4:** religious institutions (societies, franchisees (chains).

**BLOCK II: Structure of media organisation**

**UNIT 5:** Hierarchy, functions and structure of different departments

**UNIT 6:** finance, circulation (sales promotion – including pricing and price – war aspect);

**UNIT 7:** apex bodies: DAVP, INS and ABC.

**UNIT 8:** Changing roles of editorial staff and other media persons.

**BLOCK III: Management aspects of Print and Electronic media**

**UNIT 9:** Economics of print and electronic media

**UNIT 10:** Management, business, legal and financial aspects of media management.

**UNIT 11:** advertising and sales strategy,

**UNIT 12:** labour laws and PR for building and sustaining business and audience.

**BLOCK IV: Management planning and Execution**

**UNIT 13:** Planning and execution of programme production

**UNIT 14:** production terms, control practices and procedures.

**UNIT 15:** Administration and programme management in media

**UNIT 16:** scheduling, transmitting, record keeping, quality control and cost effective techniques, Employee / employer and customer relations services;

**Text books and references**


1. Communication & Management- Nataraja Kumar, Gyan Publishing House
2. The Indian Media Business- KholiVanita, Response Books, New Delhi
3. Barker, M. S., Barker, D., Bormann, N. F., &Neher, K. (2013). Social Media Marketing: A Strategic Approach.
4. Mason, OH: South-Western Cengage Learning.
5. Charlesworth, A. (2014). An introduction to social media marketing. London: Routledge.

6. Parkin, G. (2009). Digital Marketing: Strategies for Online Success. London: New Holland.

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## Course name: Film Studies Course Code: JMO4104
## Credits: 4

**Course Objectives:**
The objective of the course is to teach students the historical background of film making. The course also focuses to inculcate an understanding of various genres of film making. The course also focuses on film production process in detail

**Course outcomes:**
At the end of the course, student would be able to:

| S. No. | Course Outcomes | Cognitive Level |
|---|---|---|
| 1 | Discuss history of world cinema | Remember |
| 2 | Explain various types of world cinema movement | Understand |
| 3 | **Explain Indian cinema** | Understand |
| 4 | **Use** film production and editing process | Apply |

**BLOCK I: WORLD CINEMA (PRE WORLD WAR II)**

**UNIT 1:** History of World Cinema,

**UNIT 2:** German Expressionism: Robert Weine & Fritz Lang,

**UNIT 3:** Soviet Montage: Lev Kuleshov, Vsevolod Pudovkin,

**UNIT 4:** Sergei Eisenstein: Battleship Potemkin, Silent Comedy: Chaplin, Alfred Hitchcock: Suspense

**BLOCK II: WORLD CINEMA (POST WORLD WAR II)**

**UNIT 5: Italian Neo-realism**: Roberto Rossellini & Vittorio De Sica,

**UNIT 6:** Iranian Realism,

**UNIT 7: French New Wave**: Francois Truffaut & Jean Luc Godard,

**UNIT 8: Japanese Cinema**: Ozu, Akira Kurosawa & Mizoguchi

**BLOCK III: INDIAN CINEMA**

**UNIT 9:** Cinema: Characteristics (Film is a medium of Mass, Film is a medium for entertainment, Film is an art medium)

**UNIT 10:** Types Early cinema: Hiralal Sen, D. G. Phalke,

**UNIT 11:** Studio system: New Theatres, Bombay Talkies,

**UNIT 12:** New wave and commercial cinema, Satyajit Rai, Ritwik Ghatak, Vimal Rai, Guru Dutt, Mani Kaul, Shyam Benegal, Gulzaar, Andoor Gopalkrishnan, Govind Nihlani

**BLOCK IV: FILM PRODUCTION & EDITING**

**UNIT 13:** Pre-production, Production, Post Production,

**UNIT 14:** Different types of editing in Cinema

**UNIT 15:** Montage, standard cut, Jump Cut, dissolve, Fade in/ Fade out, cut away

**Text and references**


1. Video Production – Belavadi Vasuki
2. Television Production Handbook, - Herbert Zettl, (Delhi : Akash Press, 2007 ) 190-208
3. Video Production: Handbook – Gerald Millerson and Jim Owens
4. The Videomaker guide to video production – Video maker
5. Robert Coles, Doing Documentary Work,
6. Selection (pp. 7-16 & 319-348) from James Agee and Walker Evans Let Us Now Praise Famous Men (1941).
7. The Documentary Handbook – Peter Lee-Wright, Routledge, Taylor & Francis Groups
8. Writing, Directing & Producing Documentary films and Videos – Allan Rosenthal, Southern Illinois University Press
9. Michael Moore: Roger and Me Nanook of the North by Robert J Flaherty
10. Night mail by Basil Wright Bombay Our City by AnandPatwardhan

## Course Name: Television News Presentation Course Code: JMO-4105 Credits: 4

**Course Objective:**

The objective of a Television News Presentation course is to train students in the art of delivering clear, engaging, and informative news broadcasts, emphasizing effective oncamera performance and journalistic skills.

**Course Outcomes:**

At the end of the Television News Presentation course, student will be able to:

| COs No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | **Define** – Basics of TV News | Understand |
| 2. | **Tailoring –** Anchoring, presenting and News reading skills | Apply |
| 3. | **Understand** Duties and responsibilities of a news anchor, reporter | Remember |
| 4. | **Review** style of news channel program and Language in television news writing | Analyse |

**BLOCK I: Basics of Television News**

**Unit 1:** Television News Concept, Television News Values and elements, Types of Media organization

**Unit 2:** Structure of television news channel, News personnel and their qualities, News room structure and setup, Role and responsibilities of news personnel towards society,

**Unit 3:** Duties and responsibilities of News Anchor, Responsibilities of a News Anchor towards society and nation,

**Unit 4:** Reporting beats and their source, Attribution and Identification of source, News monitoring services, Planning gathering writing and reporting on development issues, Media industry, News Channels broadcasters Association

**BLOCK 2: Language in Television News Writings**

**Unit 5:** Language in Television News Writings**,** Characteristics of TV language,

**Unit 6:** News Writing Concepts, News writing elements, Writing Intro, Writing headline,

**Unit 7:** Writing for visuals - Simple news stories, News writing difference between television and print media

**Unit 8:** Importance of Language in news writings and presentation

**BLOCK 3: Television News Reporters/Reporting**

**Unit 9:** Television News Reporters and their qualities, Work and Responsibilities of television reporters,

**Unit 10:** Objective reporting, Investigative reporting, essentials of live reporting,

**Unit 11:** Piece to camera- techniques of PTC, Guideline for reporting television news, Challenges for the television reporter

**Unit 12:** working on Different beats

**BLOCK 4: Television News Anchors**

**Unit 13:** News Anchors and their qualities, Duties and Responsibilities of a news anchor

**Unit 14:** Ethics for a news anchor, Personality and presentation of a news anchor,

**Unit 15:** Anchoring news, Anchoring a non-news program- a chat show, Anchoring a debate show, Anchoring with the teleprompter, Anchoring without teleprompter, Outdoor anchoring

**Unit 16:** Types of News Anchors, What is the workplace of a News Anchor like?

**Text and references:**


1. Owens, J. (2017). Video production handbook. Routledge.
2. Compesi, R. (2015). Video field production and editing. Routledge.
3. Silcock, B. W., Heider, D., &Rogus, M. T. (2009). Managing television news: A handbook for ethical and effective producing. Routledge.
4. Tuggle, C. A., Carr, F., Huffman, S., Stephens, M., Metzler, K., & Smith, D. (2010). Broadcast news handbook. McGraw-Hill Publishing.
5. Vasuki Belavadi (2013): Video production, Oxford University press
6. Keller, T., & Hawkins, S. A. (2009). Television News: A Handbook for Reporting, Writing, Shooting, Editing & Producing. Holcomb Hathaway.
7. Rabiger, M. (2014). Directing the documentary. Routledge.
8. Frierson, M. (2018). Film and Video Editing Theory: How Editing Creates Meaning.

Taylor & Francis.
9. Thompson, R. (2010). Writing for broadcast journalists. Routledge.
10. Thompson, R., & Malone, C. (2003). The broadcast journalism handbook: a television news survival guide. Rowman & Littlefield Publishers.
11. Millerson, G., & Owens, J. (2012). Television production. CRC Press.
12. Kolodzy, J. (2006). Convergence journalism: Writing and reporting across the news media. Rowman & Littlefield.
13. White, T. (2005). Broadcast news: Writing, reporting, and producing. Taylor & Francis.
14. Mehta, N. (Ed.). (2008). Television in India: Satellites, politics and cultural change (Vol. 10). Routledge. Iggers, J. (2018).
15. Good news, bad news: Journalism ethics and the public interest. Routledge.
16. Cury, I. (2012). Directing and producing for television: a format approach. Focal Press.

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## Semester: VIII

## Course Name: Internship and Presentation Course Code: JMT4201
## Credits: 4

At the end of the Summer Internship course, student will be able to:

| COs No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | **Define** the working styles of different media houses. | Understand |
| 2. | Objectives and importance of internship | Remember |
| 3. | Learn and work with industry professional to understand environment and culture of media | Apply |

**Unit-I**

Basics of writing an Internship Report.The aims & objectives behind developing a report. The importance & necessity of internship report.

**Unit-II**

The Ethics and technicalities of a Report such as the fonts used the size of characters, Headings, Division of Chapters etc.

**Unit-III**

Exposure to any media house for about 4 weeks.On the basis of the Internship done at the respective media house will have to be developed in the form of a Report.

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## Course Name: Comprehensive Viva-voce Course Code: JMI-4201 Credits: 4

**Course Objectives**

The objective of a Comprehensive Viva-Voce course is to assess a student's knowledge, communication skills, and critical thinking through an oral examination, typically covering a wide range of topics within a specific subject or field of study.

After completion of this course students will be able to

| S.No. | Course Outcomes (COs) | Cognitive level |
|---|---|---|
| 1 | Identify: Knowledge of student about Journalism and Mass Communication | **Remember** |
| 2 | Demonstrate how the journalistic approach to problem solving and storytelling can produce locally engaged, globally competent citizens. | **Apply** |
| 3 | **Understand** the skills of a journalist. | **Understand** |
| 4 | **Explain** critical understanding of the contextual factors that shape the media message in a diverse, globalized media landscape. | **Apply** |

The Comprehensive Viva Voce based on the courses of the entire programme and future projections of Media and Entertainment industry. It will be conducted by a Board of Examiners comprising of the Director/Principal or his/her nominee and two External Experts, out of which one should preferably be from the Corporate World i.e. Media Organization operating in the country. The quorum shall be deemed to have met if 2 out of 3 members are present.

The comprehensive viva-voce carries100 marks/ 4 credits, which will be evaluated by External and Internal Examiners separately for 50 marks each. The External Examiner will be appointed by the Competent Authority.

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## Course Name: Dissertation Course code: JMR4201 Credits: 4

At the end of the Dissertation course, student will be able to:

| COs No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|

| | | |
|---|---|---|
| | | |
| 1. | Identify and Define appropriate social problems | Remember |
| 2. | Explain appropriate research approaches for addressing social problems | Understand |
| 3. | Apply various tools and techniques to complete research | Apply |
| 4. | Analyse research report and make roboust conclusion | Analyse |

Every student shall, in the Sixth (final) Semester, submit a Dissertation reporting the results of original research on a topic assigned at the beginning of the semester by the concerned research guide (faculty member) in consultation with the student, in his/her area(s) of special interest. The research guide shall be chosen by the student according to his/her interest and the faculty member's area of expertise. No faculty member shall guide more than five students.

The topic of the Dissertation shall be approved by the Head of the Department. For this purpose the candidate shall submit to the Head an application stating the topic for the dissertation along with a synopsis within three weeks of the commencement of classes of the Fourth Semester. Once approved, the topic of dissertation shall not be altered without a fresh proposal from the student accompanied by a written request stating the reason for change. No such request shall be entertained after five weeks of the commencement of classes of the Semester in question.

**Reference Books:**

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## Course name: Film and Documentary Making Course Code: JMO4201 Credits:4

**Course Objectives:**

The course focuses to teach students basics of documentary making, types of documentary. It also focuses to explain historical background and importance of documentary making. The course also aims to teach students basics of film making and various process of film making in detail.

At the end of the Film and Documentary Making course, student will be able to:

| COs.No. | Course Outcomes | Cognitive Level |
|---|---|---|

| | | |
|---|---|---|
| 1 | **Define** the documentary's relevance in our society. | Remember |
| 2 | **Identify** the roles: Director, Producer, Camera operator, Sound Recordist, editor, writer etc. | Understand |
| 3 | **Demonstrate** team work and communication skills, plan and practice. | Apply |
| 4 | **Use** how to translate a topical idea into visual storytelling and execute production work. | Apply |

**BLOCK 1: UNDERSTANDING DOCUMENTARY**

**UNIT 1:** Documentary: Meaning, Definition & Importance of documentary, History of documentary, elements and characteristics

**UNIT 2:** Types of documentary

**UNIT 3:** Difference between film and documentary, Key steps of documentary, Ethics and Ideology in Documentary making

**UNIT 4:** Documentary Reportage, Documentary Writing

**BLOCK 2: DOCUMENTARY MAKING**

**Unit 5-** Organizing your shoot and understanding your tools, Outline, Organize and Schedule your film shoot,

**UNIT 6:** Parts of camera, Camera movements, camera angles, Importance of camera movement and angles in documentary making

**UNIT 7:** Sound, Connecting Microphones, Lapel Mics.

**UNIT 8:** Lighting techniques

**BLOCK 3: UNDERSTANDING FILM MAKING**

**UNIT 9:** The basics of film making, Elements of film making, Production: Pre- Production, Production and Post Production.

**UNIT 10:** Planning a documentary/Film, Research, Writing the proposal,

**UNIT 11:** Shaping the film, Beginning the first draft, Storyboard, Budget and Contract, Preproduction Survey, Finalizing locations, Shots, Time of shooting,

**UNIT 12:** Production: Shooting locations, visual, society, performances, Shooting interviews

**BLOCK 4: EDITING PROCESS**

**UNIT 13:** Editing: Movie editing basics,

**UNIT 14:** Creating a new project, downloading & organizing footage, editing cuts, editing session, fine cut, Final Project.

**UNIT 15:** Prominent Indian Film makers and their films

**Text book and References:**


1. Video Production – Belavadi Vasuki
2. Television Production Handbook, - Herbert Zettl, (Delhi : Akash Press, 2007 ) 190-208
3. Video Production: Handbook – Gerald Millerson and Jim Owens
4. The Videomaker guide to video production – Video maker
5. Robert Coles, Doing Documentary Work,
6. Selection (pp. 7-16 & 319-348) from James Agee and Walker Evans Let Us Now Praise Famous Men (1941).
7. The Documentary Handbook – Peter Lee-Wright, Routledge, Taylor & Francis Groups
8. Writing, Directing & Producing Documentary films and Videos – Allan Rosenthal, Southern Illinois University Press
9. Michael Moore: Roger and Me Nanook of the North by Robert J Flaherty
10. Night mail by Basil Wright Bombay Our City by AnandPatwardhan


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## Course Name: Basics of Camera, lights, and sound Course code: JMO4202 Credits: 4

**Course objectives:**

The course focuses to teach students fundamental of camera and various types of cameras. It also focuses to describe various types of camera accessories and its uses. Furthermore, course focuses to teach various types of lights and its uses in photo and cinematography.

At the end of the Basics of Camera, Lights and Sound course, student will be able to:

| COs. No. | Course Outcomes | Cognitive Level |
|---|---|---|
| 1 | Introduction to Camera, lights, sound and its accessories | Understand |
| 2 | Identify various techniques of Camera, lights, sound and its accessories used in cinematography | Remember |

| | | |
|---|---|---|
| 3 | Uses Camera, lights, sound and its accessories in cinematography | Apply |
| 4 | Illustrate Importance of Camera, lights, and sound in the process of video production | Analyse |

**BLOCK 1: INTRODUCTION TO CAMERA AND ACCESSORIES**

**UNIT 1:** Understanding the role of cinematography in visual storytelling

**UNIT** 2: Types of cameras and their features, Camera accessories and their functions, Basic camera operations and controls

**UNIT 3:** Introduction to video camera, Parts of video camera and their functions, Principles of composition and framing, Rule of thirds and other framing techniques, Shot sizes and their significance

**UNIT 4:** Lenses – functions and types, Camera controls: exposure, focus, white balance, etc. Shutter speed, aperture, and ISO

**BLOCK 2: INTRODUCTION TO LIGHTING**

**UNIT 5:** Lights, The importance of lighting in visual storytelling, Types of lighting equipment (natural, artificial, continuous, and strobe)

**UNIT 6:** Lighting techniques: key light, fill light, backlight, etc., Three-point lighting setup Lighting for different environments (indoor, outdoor, daylight, night)

**UNIT 7:** Understanding lighting ratios, Color temperature and its impact on lighting Lighting for mood and atmosphere

**UNIT 8:** Light control – diffusers, reflectors, cutters & gels, Accessories used in lighting

**BLOCK 3: SOUND FUNDAMENTALS**

**UNIT 9**: Audio fundamentals, Importance of sound in media production

**UNIT 10:** Microphone types and their applications

**UNIT 11**: Sound recording equipment, Capturing high-quality audio on set

Understanding sound levels and dynamics,

UNIT 12: Location sound recording, Boom operation and microphone placement

Wireless and lavalier microphone techniques

**BLOCK 4: SOUND EDITING AND MIXING**

**UNIT 13:** Recording sound effects and ambient audio, Practical sound recording exercises

Various audio elements used in video programmers - lip synchronized sound, voice, music, ambience, sound effects

**UNIT 14:** Audio Mixer, Use of audio mixers for recording & editing of sound

**UNIT 15:** Different audio equipment for studio and location recording

**UNIT 16**: Audio post production – mix and un-mix tracks.

**Suggested Readings**:
Cinematography: Theory and Practice: Image Making for Cinematographers and Directors, by Blain Brown
Reflections: Twenty-One Cinematographers At Work, by Benjamin Bargery Painting With Light, by John Alton

**Faculty and Support Staff**

The University has identified the requisite faculty and support staff as mandated by UGC and formally they shall be allocated the required positions from amongst the existing faculty exclusively for ODL mode or fresh appointments as required so, shall be initiated for which Letter of Intent have been issued to the prospective faculty and staff. The course material prepared by this university will be on par with any Open University/Distance Education Centre in the country.

List of Faculty associated with BA-JMC program is as follows:-

| S. No. | Name of Faculty | Designation | Nature of Appointment | Qualification | Subject |
|---|---|---|---|---|---|
| 1 | Dr Santosh Kumar Gautam | Associate Professor | Full Time | Ph.D | Journalism & Mass Communication |

| | | | | | |
|---|---|---|---|---|---|
| 2 | Dr Asad Faisal Farooqui: | Assistant Professor | Full Time | Ph.D | Journalism & Mass Communication |

**Delivery Mechanism**

The ODL of MU follows a modern ICT (Information & Communication Technology) enabled approach for instruction. The methodology of instruction in ODL of MU is different from that of the conventional/regular programs. Our ODL system is more learner-oriented and the learner is an active participant in the teaching-learning process. ODL of MU academic delivery system comprises:

**A. Print Material**

The printed material of the programme supplied to the students will be unit wise for every course.

**B. Counselling Sessions**

Normally, counselling sessions are held as per a schedule drawn beforehand by the Subject Coordinator. There will be 6 counselling/ contact classes for 4 credit course will be held on the campus on Saturday and on Sunday of 2 hour duration for each course in face to face mode (In case of 2 credit course contact hours are required 6 hours and in case of 6 credit course contact hours required 18 hours ). Contact classes will be held in the campus on Saturdays and on Sundays.

**C. Medium of Instruction**

Medium of Course Instruction: English
Medium of Examination: English

**Student Support Systems**

Universities Study Centres or Learner Support Centre shall be headed by a coordinator, not below the rank of Assistant professor and shall be augmented with academic and nonacademic staff depending on the learner.
The university has made appropriate arrangements for various support services including counselling schedule and resource-oriented services evaluation methods and dates both online and offline modes for easy and smooth services to the students of distance mode.

At present the university have only one study centre on the campus. The institution is not promoting any study centres outside the campus. All student support services will be provided to the student through a single window method/mode onsite and online.

## F. Procedure for Admissions, Curriculum, Transaction and Evaluation

**Admission Process**

Admission to the BA – JMC Programme will be done on the basis of screening of candidate's eligibility on first come first serve basis. The University will follow the reservation policy as per norms of the Government. Admission shall not be a right to the students and MU, CDOE shall retain the right to cancel any admission at any point of time if any irregularity is found in the admission process, eligibility etc.

**Maximum Duration**

A. The duration of the Program shall be of three academic years for award of undergraduate degree and 4 years for award of undergraduate degree with research. Each academic year shall be divided into two Semesters
B. The student can complete his programme within a period of 6 years failing which he/she shall seek fresh admission to complete the programme.

**Eligibility**

10+2 in any recognized board.

**Fee Structure**

| **Name of the Program** | **Degree** | **Duration** | **Year** | **Tuition Fee/Year** | **Exam Fee/Year** | **Total (in Rs.)** |
|---|---|---|---|---|---|---|
| Bachelor of Arts – Journalism and Mass Communication (BA-JMC) | UG | 4 to 8 Years | 1 | 13500 | 2000 | 15500 |
| | | | 2 | 12000 | 2000 | 14000 |
| | | | 3 | 12000 | 2000 | 14000 |
| | | | 4 | 12000 | 2000 | 14000 |
| Total | | | | | | 57500 |

**Activity Schedule**

| **S.NO.** | **Name of the Activity** | **Tentative months schedule (specify months) during year** | | | |
|---|---|---|---|---|---|
| | | **From (Month)** | **To (Month)** | **From (Month)** | **To (Month)** |
| 1 | Admission | Jul | Sep | Jan | Mar |

| | | | | | |
|---|---|---|---|---|---|
| 2 | Assignment submission (if any) | Sep | Oct | Mar | Apr |
| 3 | Evaluation of assignment | Oct | Nov | Apr | May |
| 4 | Examination | Dec | Dec | Jun | Jun |
| 5 | Declaration of result | Jan | Jan | Jul | Jul |
| 6 | Re-registration | Jul | Jul | Jan | Jan |
| 7 | Distribution of SLM | Jul | Sep | Jan | Mar |
| 8 | Contact programmes (counselling, practicals, etc.) | Sep | Nov | Mar | May |

**Credit System**

MU, CDOE proposes to follow the 'Credit System' for most of its programs. Each credit amounts to 30 hours of study comprising all learning activities. Thus, a 8 credit course requires 240 hours, 6 credit course requires 180 hours , 4 credit course requires 120 hours and 2 credit course requires 60 hours of study. This helps the student to understand the academic effort to complete a course. Completion of an academic programme requires successful clearing of both, the assignments and the term-end examination of each course in a programme.

| **Duration of the Programme** | **Credits** | **Name the of Programme** | **Level of the Programme** |
|---|---|---|---|
| 3 to 6 Yrs | 150 | BA – JMC | Bachelor's Degree |
| 3 – 6 Yrs | 202 | BA – JMC | Bachelor's Degree with research |

**Assignments**

Distance Education learners have to depend much on self study. In order to ascertain the writing skill and level of comprehension of the learner, assignment work is compulsory for all learners. Each assignment shall consist of a number of questions, case studies and practical related tasks. The assignment question papers will be uploaded to the website within a scheduled time and the learners shall be required to respond them within a specified period of time. The response of the learner is examined by a faculty member.

**Evaluation**

The evaluation system of the programme is based on two components:

A. **Continuous evaluation in the form of assignments (weightage 30%):** This Component carries a weightage of 30%. There will be at least one graded assignment and test per

course. These assignments are to be submitted to the Co-ordinator of the CDOE/Study Centre to which the student is assigned or attached with.

**B. Term-end examination (weightage 70%):** This will be held twice every year in the months of June and December. The students are at liberty to appear in any of the examinations conducted by the University during the year. A student will be allowed to appear in the Term-End Examination only after she/he has registered for that course and submitted the assignment. For appearing in the Examination, every student has to submit an Examination form through online (www.mangalayatan.in)/ or offlinebefore the due dates as given in the schedule of operations. If a student misses any term-end examination of a course for any reason, s/he may appear for any of them or all the courses subject to the maximum of 8 courses in the subsequent term-end examinations. This facility will be available until a student secures the minimum pass grade in the courses but up to a maximum period of four semesters, since the date of registration of the course is valid for four semesters. Beyond this period s/he may continue for another four semesters by getting Re-registration by paying fee again. In that case, the score of qualified assignments and/or term-end examination will be retained and the student will be required to complete the left out requirements of such re-registered courses. Minimum requirement for passing a course will be 40% marks.

## G. Laboratory Support and Library Resources

The library of Mangalayatan University aims to empower the teaching mission and intellectual culture of the community through availability through an organized collection of information as well as instruction in its access, relevance and evaluation. The University Library enriches advance learning and discovery by providing access to a broad array of resources for education, research and creative work to ensure the rich interchange of ideas in the pursuit of knowledge.

The Centre for Distance and Online Education of Mangalayatan University has initiated the process of setting up a dedicated Library for ODL program and acquiring printed books and e-books for this purpose. The required International and National subject journals are also provided. We have a full functioning community radio service onboard (90.4 FM). We already have annual journal subscriptions and the capacity can be enlarged at later stages as the University lines up with more online journals.

The collection of the Library is rich and diverse especially in terms of the breadth and depth of coverage. Collection encompasses subjects in Management, Commerce, Information Technology, Computer Applications, and other allied areas. This collection further includes Books, Research Journals, Project Reports/Dissertations and online Journals.

The University has well equipped Computer Laboratories, Lecture Capturing Systems, Audio Video facilities, ICT enabled class rooms, Wi-Fi facilities etc.

## H. Cost Estimate of the programme and the provisions

Initial expenses have been done by the University in terms of provision of infrastructure, manpower, printing of Self Study Material etc. The University intends to allocate expenses out of the total fee collection as per following details:

a) SLM Development and Distribution : 20%
b) Postal and ICT Expenses : 10%
c) Salary and other Administrative expenses : 60%
d) Future Research development reserve : 10%

Once programmes are operational, the programme budget from fee receipts will be planned as per the guidelines of University Grants Commission.

## I. Quality Assurance

The University has established the Centre for Internal Quality Assurance (CIQA) in the University campus. The CIQA will monitor and maintain the quality of the ODL programmes. It has the following objectives in making the compliances of quality implementations.

### Objectives

The objective of Centre for Internal Quality Assurance is to develop and put in place a comprehensive and dynamic internal quality assurance system to ensure that programmes of higher education in the Open and Distance Learning mode and Online mode being implemented by the Higher Educational Institution are of acceptable quality and further improved on continuous basis.

### Functions of CIQA

The functions of Centre for Internal Quality Assurance would be following

1) To maintain quality in the services provided to the learners.
2) To undertake self-evaluative and reflective exercises for continual quality improvement in all the systems and processes of the Higher Educational Institution.
3) To contribute in the identification of the key areas in which Higher Educational Institution should maintain quality.
4) To devise mechanism to ensure that the quality of Open and Distance Learning programmes and Online programmes matches with the quality of relevant programmes in conventional mode.
5) To devise mechanisms for interaction with and obtaining feedback from all stakeholders namely, learners, teachers, staff, parents, society, employers, and Government for quality improvement.
6) To suggest measures to the authorities of Higher Educational Institution for qualitative improvement.
7) To facilitate the implementation of its recommendations through periodic reviews.
8) To organize workshops/seminars/symposium on quality related themes, ensure participation of all stakeholders, and disseminate the reports of such activities among all the stakeholders in Higher Educational Institution.

9) To develop and collate best practices in all areas leading to quality enhancement in services to the learners and disseminate the same all concerned in Higher Educational Institution.
10) To collect, collate and disseminate accurate, complete and reliable statistics about the quality of the programme(s).
11) To ensure that Programme Project Report for each programme is according to the norms and guidelines prescribed by the Commission and wherever necessary by the appropriate regulatory authority having control over the programme;
12) To put in place a mechanism to ensure the proper implementation of Programme Project Reports.
13) To maintain a record of Annual Plans and Annual Reports of Higher Educational Institution, review them periodically and generate actionable reports.
14) To provide inputs to the Higher Educational Institution for restructuring ofprogrammes in order to make them relevant to the job market.
15) To facilitate system based research on ways of creating learner centric environment and to bring about qualitative change in the entire system.
16) To act as a nodal coordinating unit for seeking assessment and accreditation from a designated body for accreditation such as NAAC etc.
17) To adopt measures to ensure internalization and institutionalization of quality enhancement practices through periodic accreditation and audit.
18) To coordinate between Higher Educational Institution and the Commission for various qualities related initiatives or guidelines.
19) To obtain information from other Higher Educational Institutions on various quality benchmarks or parameters and best practices.
20) To record activities undertaken on quality assurance in the form of an annual report of Centre for Internal Quality Assurance.
21) It will be mandatory for Centre for Internal Quality Assurance to submit Annual Reports to the Statutory Authorities or Bodies of the Higher Educational Institution about its activities at the end of each academic session. A copy of report in the format specified by the Commission, duly approved by the statutory authorities of the Higher Educational Institution shall be submitted annually to the Commission.

After enrolling in BA – JMC Programmeat Mangalayatan University in ODL mode, student will exhibit understanding in areas such as critical thinking, effective communication and develop problem solving, scientific temperament with right set of ethics and attitude towards human values, national building, community development, environment and sustainability. After completion of BA - JMC. Programme, student will participate in multiple functional areas of arts and humanities.

# MANGALAYATAN UNIVERSITY, ALIGARH

## CENTRE FOR DISTANCE AND ONLINE EDUCATION

# PROGRAMME PROJECT REPORT

## BACHELOR OF LIBRARY AND INFORMATION SCIENCE

## 2023-24

## Introduction

Mangalayatan University focuses on providing quality education through distance learning, matching with the parameter of regular program and producing capable administrative leaders who are prepared with the necessary library management & research skills to make high-quality administrative.

The B.L.I.Sc. programme at our university create high level of intellectual capacity in learners, providing opportunity for learners to pursue high level studies, providing opportunity for higher education studies to the learners who have been deprived of higher education due to being employed in government non-government organization.

## A. Programme's Mission and Objectives

### Mission

To develop broad and balanced knowledge and understanding of fundamental concepts, principles, and theories related to Library and Information Science.To produce competent information professionals who can facilitate the flow of information in a rapidly changing society.

### Objectives

- To import education to the students to meet the varied and changing information needs of individual and groups in a society.
- To trained the students to keep pace with the magnanimous developments in Library Science field.
- To provide students with learning experiences that help to in still deep interests in learning Library and Information Science;
- To develop broad and balanced knowledge and understanding of fundamental concepts, principles, and theories related to Library and Information Science;
- To equip students with skills essential to carry out library housekeeping activities and to provide various library and information services using Information and Communication Technologies; and
- To impart students with the knowledge and skill base that would enable them to undertake further studies in Library and Information Science and in related areas or in multidisciplinary areas that involve Library and Information Science

## B. Relevance of the Program with HEI's Mission and Goals

The vision and mission of HEI, Mangalayatan University, Aligarh are:

### Vision:

To be an institution where the most formative years of a young mind are spent in the guided pursuit of excellence while developing a spirit of inquisitive questioning, an ability to excel in the pressure of a fast-changing professional world, and a desire to grow into a personality than a person, in an environment that fosters strong moral and ethical values, teamwork, community service and environment consciousness.

**Mission:**

- To be the enablers of the confluence of academic rigor and professional practicality.
- To bring global best practices to students through widespread use of technology.
- To empower our faculty to constantly develop new skills and excel professionally.
- To provide the best campus environment to students and faculty with all facilities to nurture their interest.

A Bachelor's Degree in Library and Information Science trains students in modern Library administration and can prepare them for higher study or careers in academic, corporate, military, museum, or special research libraries. Degree Programme may allow students to focus on their particular interests. Recipients of a Bachelor's Degree in Library and Information Science quality for Library support positions, depending on the library. Graduates from this programme are prepared to work in a variety of libraries and information environments using people skills, problem-solving skills and their ability to organize access and evaluate information.

The Bachelor's Degree in Library and Information Science program of the University strives to realize its vision and mission by rectifying student centric issues on priority and also to empower local community with the help of various social clubs running in University like NSS, KADAM and Alumni association. The University Promotes Multidisciplinary and Allied research in various fields that supports and harnesses joyful learning environment. The goals of ODL (Open Distance Learning) program is to provide educational facilities to all qualified and willing persons who are unable to join regular courses due to personal or professional reasons. There are many potential learners who cannot afford to join regular courses due to professional responsibilities and personal commitments. For such cases B.L.I.Sc. through ODL mode can be helpful in increasing knowledge base and skill up-gradation.
The program aims to provide alternative path to wider potential learners who are in need of refresher courses to update their skills.

## C. Nature of Prospective Target Group of Learners

This program is specifically designed to cater the need of students who are not able to study through regular mode. Working Professionals, Housewives, Students from rural area, students who do not wish to prefer regular courses due to various reasons & students who cannot afford costly regular programmes, also those who are willing to develop their professional skills in Library and Information Science are our target group learners.
The candidates desirous of taking admission in B.L.I.Sc. program shall have to meet the eligibility norms as follows-

1. *To obtain admission in* B.L.I.Sc. program *offered through ODL mode, the learner must have completed graduation in any stream.*

The ODL-B.L.I.Sc. program offered by Mangalayatan University aims specially for Working Professionals, Housewives, Students from rural area, students who do not wish to prefer regular courses due to various reasons. This gives an opportunity to the distance learner to attend distance programmes offer by the university to those who can't spare enough time to attend regular classes.

## D. Appropriateness of Programme to be conducted in ODL mode to acquire specific skills and competence

The University has identified the following Programme Learning Outcomes and Programme Specific Outcomes as acquisition of specific skills and competence in B.L.I. Sc. Program.

**Programme Outcomes (PO's)**

After completing the programme through ODL Mode, students will be able to:

- PO 1: Develop workforce for libraries and information centres for effective and efficient service, professional values, devotion and attitudes.
- PO 2: Train students to work in the modern library administrative environment at an advanced level.
- PO 3: Impart education and training in knowledge communication and knowledge management.
- PO 4: Equip the students with competent skill essential for carrying out advanced information technology in libraries.
- PO 5: Enable the students to carry out research in many disciplines of Library and Information Science

**Programme Specific Outcomes:**

After completing the programme through ODL Mode, students will be able to:

- PSO1: Prepare students for careers in academic, corporate, museum, special, and research libraries by instructing them in contemporary library administration.
- PSO2: Provide instruction and training to aspiring library professionals.
- PSO3: Create staff members for information centres and libraries who will provide quality services and uphold professional standards.
- PSO3: To give students the knowledge and abilities they need to use ICT to carry out a variety of library and information Centre maintenance tasks.
- PSO4: To help LIS students become qualified professionals in their area by teaching employability skills based on ethical literacy, effective communication, and critical thinking.
- PSO5: Allow students to learn continuously for their own personal development.

## E. Instructional Design

The program is divided into two semesters and minimum credit requirement is 40 to get B.L.I.Sc. degree in ODL mode from Mangalayatan University. Minimum time period for acquiring BLISc. degree will be one year and maximum time period to acquire B.L.I.Sc. degree is 2 Years.

**Evaluation Scheme**

| Semester-I | | | | | | |
|---|---|---|---|---|---|---|
| **S.N.** | **Course Code** | **Course Name** | **Credit** | **Continuous Assessment Marks** | **Term End Exam Marks** | **Grand Total** |
| | | | | **Max.Marks** | **Max.Marks** | |
| 1 | BLO-1101 | Foundations of Library and Information Science | 4 | 30 | 70 | 100 |
| 2 | BLO-1102 | Knowledge Organisation Classification (Theory) | 4 | 30 | 70 | 100 |
| 3 | BLO-1103 | Knowledge Organisation Classification (Practice) | 4 | 30 | 70 | 100 |
| 4 | BLO-1104 | Knowledge Organisation Cataloguing (Theory) | 4 | 30 | 70 | 100 |
| 5 | BLO-1105 | Knowledge Organisation Catalouging (Practice) | 4 | 30 | 70 | 100 |
| **Total** | | | **20** | **150** | **350** | **500** |

| Semester-II | | | | | | |
|---|---|---|---|---|---|---|
| S.N. | Course Code | Course Name | Credit | Continuous Assessment Marks | Term End Exam Marks | Grand Total |
| | | | | Max.Marks | Max.Marks | |
| 1 | BLO-1201 | Management of Libraries and Information Centers | 4 | 30 | 70 | 100 |
| 2 | BLO-1202 | Information Sources and Services | 4 | 30 | 70 | 100 |
| 3 | BLO-1204 | Basics of Information and Communication Technology (Theory) | 4 | 30 | 70 | 100 |
| 4 | BLO-1205 | Basics of Information and Communication Technology (Practical) | 4 | 30 | 70 | 100 |
| 5 | BPO-1200 | Project | 4 | 0 | 100 | 100 |
| **Total** | | | **20** | **120** | **380** | **500** |

**MOOCS**

The University shall give flexibility in opting for MOOC (Massive Online Open Courses) by the students pertaining to the prescribed curriculum and also the Credits earned in the MOOC courses may be dealt as part of the evaluation scheme as per UGC (Open and Distance Learning Programmes and Online Programmes) Regulations,2020.

**Syllabi and Course Materials**

Syllabi, PPR and self-learning materials are developed mostly by experienced faculty members of Mangalayatan University in consultation with contents experts and the same will be forwarded to CIQA and BoS/Academic Council/ Executive Council for further suggestions and approval.

## Semester I

## Course Name: Foundations of Library and Information Science

### Course Code: BLO-1101 Credits: 4

**Course Objective:** To develop an understanding about the foundations of Library & Information Science and importance of different types of libraries in modern society.

**Course Outcomes (COs):**

| S. No. | Course Outcomes (COs) |
|---|---|
| 1. | Comprehend the concept, objectives and development of libraries and its importance to the society |
| 2. | Understand the professional ethics of librarianship and the five laws of library science with their implications on various services of the libraries |
| 3. | Examine the importance of Library legislation and features of library acts |
| 4. | Familiarize with the role of various National and International Library Associations and Organizations |

**Block I: Information, Knowledge and Society**

**Unit 1:** Information: Meaning, Characteristics;
**Unit 2:** Data, information, Knowledge Wisdom, Knowledge Society;
**Unit 3:** Information Transfer Cycle: Generation, Storage and Dissemination of Information;
**Unit 4:** Library and Information Science as a Discipline

**Block II: Contribution of Indian LIS Professionals in The Development of Library Profession**

**Unit 5:** Ranganathan, S.R; Kaula, P N; Mangla, P B;
**Unit 6:** Essentials of Library and Information Science
**Unit 7:** Librarianship as a Profession; User Education;
**Unit 8:** Extension Service;
**Unit 9:** Library Building

**Block III: Conceptual Framework, History, Development and Types of Libraries**

**Unit 10:** Social Foundation of Libraries;
**Unit 11:** History of Libraries;
**Unit 12:** Development of libraries in India, U.S.A. and Britain;
**Unit 13:** Types of Libraries.

**Block IV: Laws and Legislation Relating To Libraries and Information Centers**

**Unit 14:** Five Laws of Library Science;
**Unit 15:** Library Legislation-Need and essential Features;
**Unit 16:** Library Acts in India;
**Unit 17:** Intellectual Property Right.

**Block V: Library Associations**

**Unit 18:** Role and contribution of National Organizations such as UGC, ILA, IASLIC;
**Unit 19:** Role and contribution of International Organizations such as LA, ALA IFLA, FID, UNESCO, ASLIB in the growth and development of Libraries
**Unit 20:** Major Library Networks: DELNET, INFLIBNET/e-Shod Sindhu

**Text and Reference Books**


1. Feather, J. The information society: a study of continuity and change. Ed. 5, Facet Publishing, London, 2008.
2. Khanna, J. K. Library and society, Research Publication, Kurukshetra, 1987.
3. Krishan Kumar. Library organization, Vikas, New Delhi, 1993.
4. Martin, W J. The information society, Aslib, London, 1988.
5. Ranganathan, S R. Five laws of library science. Ed. 2, Sarada Ranganathan Endowment for Library Science, Bangalore, 1989.


**Reference Books**


1. Singh, S P. Special libraries in the electronic environment, Bookwell, New Delhi, 2005.
2. Ministry of Education (India): A Report of the Advisory Committee for Libraries, Manager of Publications.
3. Venktappaiah, V and Madhusudan, M. Public library legislation in the new millennium, Bookwell, New Delhi, 2006.
4. Dhiman, Anil K. & Yashoda Rani. Learn Library and Society, New Delhi: Ess Ess Publication, 2005.
5. Venkatappaiah, V. (1994). Model Library Legislation: Model Public library act and rules made therein for the constituent state and union territories, New Delhi: Concept Publishing Company, 1994.

## Course Name: Knowledge Organization Classification (Theory)

**Course Code: BLO-1102** **Credits: 4**

**Course Objective:** To develop an understanding of the concepts, theories and importance of library classification, and its use in the organization of knowledge in libraries.

**Course Outcomes (COs):**

| S. No. | Course Outcomes (COs) |
|---|---|
| 1. | Understand the meaning, purpose, functions, theories and canons of library classification |
| 2. | Analyze the characteristics, merits and demerits of different species of library classification schemes |
| 3. | Highlight salient features of major classification schemes |
| 4. | Elucidate various facets of notation and call number |
| 5. | Review current trends in library classification |

**Block I: Library Classification**

**Unit 1:** Classification: Definition, Need, Purpose
**Unit 2:** Terminology of Classification
**Unit 3:** General Theory of Classification
**Unit 4:** Species of Classification

**Block II: Major Classification**

**Unit 5:** Major Schemes of Classification: An Overview
**Unit 6:** DDC,
**Unit 7:** CC,
**Unit 8:** UDC,

**Block III: Normative Principles of Classification**

**Unit 9:** Work of Classification in three Planes: Canons and their applications in Standard Schemes
**Unit 10:** Fundamental Categories
**Unit 11:** Phase Relation and Common Isolates

**Block IV: Mnemonics**

**Unit 12:** Definition, types, Canons and their applications in Standard Schemes
**Unit 13:** Hospitality in Notational System: Canons and Devices
**Unit 14:** Notation: Need, Purpose, Types and Qualities
**Unit 15:** Mechanics

**Block V: Facet Sequence**

**Unit 16:** Concept and Principles
**Unit 17:** Postulation Steps in Practical Classification
**Unit 18:** Book Number and Collection Number
**Unit 19:** Library Classification and Trends

**Text and Reference Books**


1. Hunter, Eric J. Classification made Simple, Taylor and Francis, 2002
2. Krishan Kumar. Theory of classification, Vikas, New Delhi, 1993
3. Shabhahat, Husain. Library Classification: Facets and Analysis, 2nd rev ed., B.R. Publications, Delhi, 2002.


**Reference Books:**


1. Ranganathan, S. R. (1962). Elements of library classification. Bombay: Asia Publishing
2. Bavakutty, M. (1981). Canons of library classification. Trivandrum: Kerala library Association.
3. Ranganathan, S. R. & Gopinath, M. A. (1989). Prolegomena to Library Classification.
4. Foskett, AC. Subject Approach to information, 5th ED, London, LA,1996
5. Ranganathan, S R. Descriptive account of the colon classification, Sarada Ranganathan Endowment for Library Science, Bangalore, 1990.
6. Sayers, W C B. Manual of classification for librarians. Rev. by Arthur Maltby. Ed. 5, Andre Deutsch, London, 1995.
7. Parkhi, R.S. Library Classification: evolution of a dynamic theory. Delhi: Vikas Publishing House, 1972.
8. Ohdedar, A. K. & Sengupta, B. Library Classification. Calcutta: The World Press, 1977.
9. Langridge, Derek. Approach to Classification: for Students of librarianship. London: Clive Bingley,1973


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## Course Name: Knowledge Organization Classification (Practice)

## Course Code: BLO-1103 Credits: 4

**Course Objective:** To equip the students with the practical knowledge of Library Classification for organization of knowledge in libraries using various schemes for simple and complex titles.

**Course Outcomes (COs):**

| S.No. | Course Outcomes (COs) |
|---|---|
| 1. | Classify and construct the class numbers for complex titles using DDC and CC |
| 2. | Synthesize class numbers by using the tables and 'add to instructions' of DDC scheme |
| 3. | Use of different schedules, manual and relative index of Classification Schemes |

**Block I: Dewey Decimal Classification (19th Edition) - Part 1**

**Unit 1:** Introduction, Structure and Organization

**Unit 2:** Definitions: Notes and Instructions
**Unit 3:** Introduction to Three Summaries and Steps in Classifying documents
**Unit 4:** Relative Index and its Use

**Block II: Dewey Decimal Classification (19th Edition) - Part 1**

**Unit 5:** Study of Tables and Schedules
**Unit 6:** Auxiliary Tables and Devices
**Unit 7:** Practical Classification

**Block III: Colon Classification (6th Edition): Preliminaries**

**Unit 8:** Introduction, Structure and Organization
**Unit 9:** Schedules and Techniques
**Unit 10:** Steps in Classification

**Block IV: Colon Classification (6th Edition)**

**Unit 11:** Humanities and Social Sciences
**Unit 12:** Biological Sciences
**Unit 13:** Physical Sciences and Generalia

**Text and Reference Books**


1. Dewey, Melvil: Decimal Classification and Relative Index. 19th ed. New York, Lake Placed Club, 1979.
2. Ranganathan, SR: Elements of Library Classification. 3rd ed. Bombay, Asia Pub. House, 1962.
3. Ranganathan, SR: prolegomena to Library Classification. Assisted by M A Gopinath. 3rd ed. Bangalore, SRELS, 1969.
4. Dewey, Melvil. Dewey Decimal Classification. Ed. 22 &23, Forest Press, Dublin, USA, 2012.
5. Ranganathan, S R. Elements of Library Classification, Sarda Ranganathan Endowment for Library Science, Bangalore, 1989.
6. Satija, M P. The theory and practice of the Dewey Decimal Classification system, Chandos Publishing, Oxford, 2007.


**Reference Books:**


1. Dewey, Melvil. Dewey Decimal Classification and Relative Index [22nd]. Ohio: OCLC, 2003.
2. Mitchell, Joan S**.** Dewey Decimal Classification and Relative Index [23rd] Ohio: OCLC. 3,2011.
3. Satija, M.P. Exercises in the 22nd edition of the Dewey decimal classification. New Delhi: Ess Ess Publication, 2004.
4. Sehgal, R.L. (1994). Classification: Theory and Practice. New Delhi: Ess Ess Publication.

## Course Name: Knowledge Organization Cataloguing (Theory)

## Course Code: BLO-1104 Credits: 4

**Course Objective:** To equip the students with the theoretical aspects of cataloguing theory for developing an understanding about the concept of library cataloguing, development of catalogue codes and recent trends in cataloguing.

**Course Outcomes (COs):**

| S. No. | Course Outcomes (COs) |
|---|---|
| 1. | Understand the concept and objectives of library catalogue |
| 2. | Know about the normative principles of cataloguing |
| 3. | Comprehend various forms (inner and outer) of library catalogue |
| 4. | Review the features and development of different cataloguing codes |
| 5. | Understand various approaches of deriving subject headings |
| 6. | Understand the concept of co-operative and centralized cataloguing |
| 7. | Examine the current trends in library cataloguing |
| 8. | Understand the complexities in rendering of entries and alphabetization |

**Block I: Library Catalogue**

**Unit 1:** Definition, Need, Objective & Functions
**Unit 2:** History and Development of Library Catalogue Codes
**Unit 3:** Normative Principles of Cataloguing.
**Unit 4:** Cataloguing and Classification: Symbiotic relationship Forms of Library Catalogue

**Block II: Types, Functions, Codes And Entries Of Cataloguing**

**Unit 5:** Types of Catalogues: Dictionary, Classified
**Unit 6:** Library Catalogue Codes – CCC and AACR-II: Historical Development Centralized and Cooperative Cataloguing,
**Unit 7:** Kinds of Entries
**Unit 8:** Data Elements in Different Types of Entries
**Unit 9:** Filing of Entries in Classified and Alphabetical Catalogues

**Block III: Subject Cataloguing**

**Unit 10:** Concept and Principles of Subject Cataloguing, Chain Procedure, Lists of Subject Headings
**Unit 11:** Centralized and Cooperative Cataloguing

**Block IV: Bibliographic Standards**

**Unit 12:** ISBD, MARC, CCF, etc., ISBN ISSN, ISO – 2709/Z39.2, FRBR, FRSAD, FRAD, RDA
**Unit 13:** CIS and CIP, Prenatal Cataloguing
**Unit 14:** Union Catalogue
**Unit 15:** Rules for Compilation
**Unit 16:** NUCSSI, IndCat, WORLDCAT

**Unit 17:** Machine Readable Catalogue, OPAC & Web OPAC

**Block V: Indic Names**

**Unit 18:** Problems and Rendering

**Unit 19:** Cataloguing Rules according to A.A.C.R.II and CCC for Joint authors, Corporate Authors and Pseudonyms. Cataloguing of Non-book Materials

**Unit 20:** Microfilms, Gramophone Records, Maps, Computer files

**Text And Reference Books**


1. American Library Association, et al. Anglo-American cataloguing Rules.Rev. Ed, Library Association, London, 1998
2. Blackwell, UG and Eric, Hunter. Cataloguing, 2nd Ed., 2002.
3. Coates, EJ. Subject Catalogue: Headings and Structure London, L.A., 1988.
4. Girja Kumar and Krishna Kumar**.** Theory of cataloguing. Rev. Ed.5, South Asia Books, New Delhi, 1993.
5. Hunter, E J and Bakewell, K G B. Advanced cataloguing. Clive Bingley, London, 1989.
6. Hunter, Eric J., ed. Examples illustrating Anglo- American Cataloguing Rules. London: Library Association, 1973.
7. Taylor, Arlene G. Wynar's Introduction to Cataloging and Classification. Westport: Libraries Unlimited, 2004.
8. Maxwell, Robert L. Maxwell's handbook for AACR2: explaining and illustrating the Anglo-American Cataloguing Rules through the 2003 update. New Delhi: Indiana publishing house, 2009.
9. Dhiman, Anil Kumar. Cataloguing of Non-Book Materials. New Delhi: Ess Ess,2004
10. Sinha, Kamla. Digital Information Preservation and online Cataloguing. Delhi: Vista International Publishing House, 2009.


**Reference Books:**


1. Girja Kumar &Krishan Kumar (1975). Theory of cataloguing. New Delhi: Vikas Publishing House
2. Sharma, Pandey S. K. (1986). Cataloguing Theory. New Delhi: EssEss Publication.
3. Viswanathan, C. G. (1983). Cataloguing: Theory and Practice. Lucknow: Print House.
4. Shera, Jesse H. & Eagan, Margret E. (1956). Classified Catalog: basic principles and practices. Chicago: American Library Association.
5. Sengupta, B (1974). Cataloguing: Its theory & practice. Calcutta: World Press.
7. Krishan Kumar (2001). An Introduction to AACR-2 (Anglo-American Cataloguing Rules). New Delhi: Vikas Publishing.
8. Siddiqui, JA and Husain, Mohd Sabir. Library Cataloguing with AACR-II. New Delhi, Ess Ess Publications, 2018. ISBN 978-93-87698-03-1
9. Siddiqui, JA; Husain, Mohd. Sabir and Sharma, BK. Hindi Granthon ki Suchikaran Pirkriya. Agra, Y. K. Publishers, 2018. ISBN 978-93-80668-97

## Course Name: Knowledge Organization Cataloguing (Practice)

## Course Code: BLO-1105 Credits: 4

**Course Objective:** To equip students with the practical aspects of using AACR-2, CCC and to derive subject headings using Sear's List of Subject Headings and Chain Procedure.

**Course Outcomes:**

| S. No. | Course Outcomes (COs) |
|---|---|
| 1. | Use the AACR-2 and CCC cataloguing codes for cataloguing of printed documents in a library |
| 2. | Preparation of catalogue for single personal author, joint personal author and pseudonymous works |
| 3. | Preparation of catalogue for simple personal name entries in Hindi and Urdu by AACR-2 |
| 4. | Prepare different types of entries in order to fulfill various search approaches of users |
| 5. | Practically identify and describe various bibliographic elements of the documents |
| 6. | Derive subject headings using Sear's List of Subject Headings and Chain Procedure method for subject entries |

**Block I: AACR-2R-Part 1**

**Unit 1:** Preliminaries
**Unit 2:** Single Personal Author
**Unit 3:** Shared Responsibility and Editorial Directions
**Unit 4:** Choice among Different Names and References
**Unit 5:** Serious and Multi volumes

**Block II: AACR-2R-Part 2**

**Unit 6:** Subject Headings
**Unit 7:** Corporate Bodies
**Unit 8:** Uniform Titles and Serials
**Unit 9:** Cataloguing of Non-Print Media

**Block III: Classified Catalogue Code- Part 1**

**Unit 10:** Preliminaries to Classified Catalogue Code
**Unit 11:** Class Index Entry and Tracing
**Unit 12:** Personal Authors
**Unit 13:** Corporate Authors

**Block IV: Classified Catalogue Code- Part 2**

**Unit 14:** Analytical Entries and Composite Books
**Unit 15:** Series
**Unit 16:** Multi-Volume Publication
**Unit 17:** Periodical Publications

**Text and Reference Books**


1. American Library Association. Anglo-American cataloguing rules. Rev Ed. 2,. Library Association, London, 1998.
2. Miller, Joseph, Ed. Sears List of Subject Headings. Ed 15. Wilson, New York, 1994.
3. Ranganathan, S R. Classified catalogue code with additional rules for dictionary catalogue code. Ed. 5 (with amendments), Sarada Ranganathan Endowment for Library Science, Bangalore, 1989.
4. Ranganathan, S R. Cataloguing Practice, 2nd Ed, Reprint, 1989.
5. Sears, Berwick. Sears List of Subject Headings, Latest Edition, 2010.


## Reference Books:


1. Verma, A. K. (1986). AACR-2: Entries and Procedure. Delhi: Vishwa-Kala Prakashan
2. Krishan Kumar (1987). Introduction to AACR-2 (Anglo-American Cataloguing Rules). New Delhi: Vikas Publishing.
3. Ranganathan, S. R. & Bhattacharyya, G. (1990). Cataloguing practice. Banglore: Sarda Ranganatha Endowment for Library Science.
4. American Library Association & Library of Congress (1967). Anglo-American cataloguing rules. Chicago: American Library Association.
5. Hunter, Eric J. (1989). Introduction to AACR-2 (Anglo-American Cataloguing Rules). London: Clive Bingley.
6. Miller, Joseph ed. (2010). Sears List of Subject Heading. New York: H.W. Wilson Company.
7. American Library Association & Others (1978). Anglo-American Cataloguing Rules. London: The Library Association.


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## Semester-II

## Course Name: Management of Libraries and Information Centers

## Course Code: BLO-1201 Credits: 4

**Course Objective:**

To equip students with an understanding of the concept and principles of library management and its application in the organization and management of building, operations, services and human resource of the library.

**Course Outcomes (COs):**

| S. No. | Course Outcomes (COs) |
|---|---|
| 1. | Understand the concept and scope of library management |
| 2. | Elaborate principles and functions of library management |
| 3. | Efficiently carry out various operations of Library and Information Centers |
| 4. | Comprehend the concept of Financial Management and Human Resource Management |
| 5. | Designing of library and information system/ MIS |
| 6. | Maintain the library statistics and prepare annual report |

**Block I: Essentials of Management**

**Unit 1:** Concept, history and functions of Management
**Unit 2:** Principles of Management & their application in Libraries and Information Centers
**Unit 3:** Elements of Management Process: POSDCORB
**Unit 4:** Concept, Policy, Elements and Principles and TQM

**Block II: Library Management-General aspects**

**Unit 5:** HRM
**Unit 6:** Job Description: Analysis, Specification and Evaluation**,** Selection and Recruitment
**Unit 7:** Motivation
**Unit 8:** Training and Development, Performance Appraisal
**Unit 9:** Sources of Library Finance

**Block III: Library Management-General aspects**

**Unit 10:** Library Authority and Library Committee
**Unit 11:** Staffing, Different Sections of Libraries and their working
**Unit 12:** Selection – tools for book and non-book materials
**Unit 13:** Handling of Government Documents and Manuscripts

**Block IV: Collection Development and Management**

**Unit 14:** Acquisition, Technical and Circulation, Serial Control Sections and their processing
**Unit 15:** System analysis, Design of Library system
**Unit 16:** Preservation and Conservation of Library Resources (printed and digital)
**Unit 17:** Stock Verification

**Block V: Financial Management and Annual Report**

**Unit 18:** Financial Management in Libraries, Budget Estimation – Line Budget, Program Budget, Performance Budget
**Unit 19:** Organizational Structure: Centralized and Decentralized
**Unit 20:** Library Statistics, Annual Report: Compilation, Contents and Style

**Text and Reference Books**


1. Katz,W A. Collection development: the selection of materials for libraries, Holt, Rinehart and Winston, New York,2004.
2. Ranganathan, SR: Library Book Selection. Bombay: Asia Pub. House, 1966.
3. Ranganathan, S R. Library administration, Ess Ess, New Delhi, 2006.
4. Krishan Kumar. Library management in electronic environment, Har-Anand Publications, New Delhi, 2007.
5. Krishan Kumar. Library Administration and Management, Vikas, New Delhi
6. Matthews, J. Strategic planning and management for library managers, Libraries Unlimited, London, 2005.
7. Mittal, R. Library administration: theory and practice, Ess Ess, New Delhi, 2007.

**8.** Singh, R. K. (2008). Human Resource Management in Libraries. New Delhi: Shree Publishing, 2008.
**9.** Mahapatra, P.K. Human Resource Management in Libraries. New Delhi: Ess Ess Publication, 2002.

**Reference Books:**

1. Seetharama, S. Guidelines for planning of libraries and information centers, IASLIC, Calcutta, 1990.
2. Stueart, R D and Moran, B B. Library and information centers management. Libraries Unlimited, London, 2007.
3. Mahapatra, PK and Chakrabarti, B: Preservation in Libraries. New Delhi: EssEss, 2003
4. Adhikari, Rajiv: Library Preservation and Automation. Delhi: Rajat Publications, 2002.

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## Course Name: Information Sources and Services

## Course Code: BLO-1202 Credits: 4

**Course Objective:** To develop and understand the concept, nature and distinguishing features of various categories of Information and Reference sources and services. To understand the criteria of major information and reference sources available in libraries.

**Course Outcomes (COs)**

| S. No. | Course Outcomes (COs) |
|---|---|
| 1. | Understand the concept of reference and information sources and services provided in libraries |
| 2. | Criteria of evaluation of different sources of information |
| 3. | Understand the reference interview and various techniques of searching information |
| 4. | Understand the latest trends in Reference & Information Sources and Services |

**Block I: Information Sources**

**Unit 1:** Concept of Information Sources
**Unit 2:** Primary, Secondary, Tertiary Sources of Information

**Block II: Evaluation of Various Information Sources**

**Unit 3:** Bibliographic Sources – INB and BNB
**Unit 4:** Encyclopedias – General and Special
**Unit 5:** Dictionaries and Special Yearbooks
**Unit 6:** Biographical Source, Geographical Source

**Block III: Reference Sources and Services**

**Unit 7:** Concept need and purpose of Reference Sources & services
**Unit 8:** Types: Print and electronic
**Unit 9:** Basic Reference Sources & Services criteria of their evaluation

**Unit 10:** Reference Interview and Search Techniques

**Block IV: Electronic Sources and Services**

**Unit 11:** Electronic Sources: Definition, need, purpose, Characteristics, types, nature and different databases
**Unit 12:** World Wide Web: Services & Facilities
**Unit 13:** Websites & Sources – Subject Gateways, Forums, Bulletin Board etc.

**Block V: Information Services**

**Unit 14:** Information Services: Concept, Types and Need
**Unit15:** Types of Services: Literature Search, Documentation Services,Translation Service, Document Delivery Service etc.
**Unit 16:** CAS and SDI Service
**Unit 17:** Electronic Information Service

**Text and Reference Books**


1. Bradford, SC: Documentation. 2nd ed. London, Lockwood, 1953.
2. Cheney, F N) and Williams, W J. "Fundamental reference sources", Ed.3, ALA, Chicago, 2000.
3. Foskett (D J). "Information service in libraries", Ed.2, Archon Book Hamden, Connecticut, 1967.
   Guha, B: Documentation and Information: services, techniques and systems. 2nd rev ed., Calcutta, World Press, 1983.
4. Katz, William A. "Introduction to Reference Work: Reference Service and Reference Process, V.2. Ed. 5, McGraw-Hill, New York, 2001.
5. Kawatra, PS: Fundamentals of Documentation with special reference to India. New Delhi, Sterling, 1983.
6. Khanna, JK: Documentation and Information Services: systems and techniques. Agra, Y K Publishers, 2000.
7. Krishan Kumar. "Reference Service", Ed. 5, Vikas Publishing, New Delhi, 1996.
8. Lancaster, FW: Information Retrieval Systems: Characteristics, Testing and Evaluation. New York, John Wiley, 1968.
9. Prasher, RG: Index and Indexing. New Delhi, Medallion Press, 1989.
10. Ranganathan, S R. "Reference Service", Ed 2, Ranganthan Endowment for Library Science, Bangalore, 1966.
11. Sukula, Shiva: Information Retrieval. New Delhi, Ess Ess Publications, 2014.


**Reference Books/Resources:**


1. Rusa Reference Guidelines. [http://www.ala.org/ ala/ rusa/ rusaprotools/refernceguide/ guidelinesinformation. htm]
2. Walford, A J. "Guide to Reference Books", V.3. Ed. 4, Library Association, London, 1980.
3. Singh, S. (1986). *Reference Service in Academic Libraries in India.* New Delhi: Ess Ess Publications.
4. Kohl, D.F. (1942). *Reference Services and Library Instruction: A Handbook for Library Management.*

5. Dhiman, A.K. and Rani, Y. (2005). Information and Reference Sources and Services. New Delhi: Ess Ess Publications.

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## Course Name: Basics of Information and Communication Technology (Theory)

## Course Code: BLO-1204 Credits: 4

**Course Objective:** To understand the concept of Computers and various types of computer languages, library automation planning and implementation and to study different modules of library management and software packages.

**Course Outcomes (COs)**

| S. No. | Course Outcomes (COs) |
|---|---|
| 1. | Understand the basics of computers, planning and implementation of automation in various library housekeeping operations and services |
| 2. | Evaluate and assess the feasibility of various library automation software and their functionalities |
| 3. | Understand the concept and purpose of a digital library and the new concepts of mining and retrieving the data |
| 4. | Define the computer networks and their types, topologies, protocols and Standards |
| 5. | Understand the concept of internet security, its solutions and cyber laws prevalent in India, Application Artificial Intelligence in Libraries |

**Block I: Computer Technology**

**Unit 1:** Computer: Definition, Developments and Computer Generations
**Unit 2:** Classification of Computers
**Unit 3:** Basic Components of a Computer, Computer Peripherals
**Unit 4:** Computer Hardware: Components, Functions
**Unit 5:** Processors, Memory, Storage and Input/output Peripherals
**Unit 6:** Operating Systems, Functions and their commands: Windows and UNIX/Linux

**Block II: Information Technology**

**Unit 7:** Concept of Information Technology. Types of Information Technology.
**Unit 8:** Programming Languages, Algorithm & Flow Charting
**Unit 9:** Communication Technology – General Aspects. Reprographic Technology – General Aspects. Micrographic Technologies – General Aspects

**Block II: Library Automation & Software Packages**

**Unit 10:** Library Automation: Concept and need of library automation, Planning and Implementation
**Unit 11:** Automation of in- house Operations: Acquisition, Cataloguing, Circulation, Serials Control, OPAC & Web OPAC, Report generation
**Unit 12:** Library Automation Software (Management &Digital Library), Selection of Library Software Packages

**Unit 13:** General Features of SOUL, Alice for Windows, Libsys, KOHA.
**Unit 14:** Digital Library: Definition, Purpose, Scope, Data Warehousing, Data Mining, Meta Data: Concept and Types, Web Tools, Retrospective Conversion

**Block IV: Networking, Cyber Security & Artificial Intelligence**

**Unit 15:** Definition, Need, Client Server Architecture
**Unit 16:** Network Types & Topologies
**Unit 17:** Basics of Internet and its Techniques

**Block V: National Knowledge Networks**

**Unit 18:** OCLC, ERNET
**Unit 19:** Internet Security: Concept, Issues and Solutions
**Unit 20:** Cyber Laws with Special reference to India

**Text and Reference Books**


1. Deepali, Talagala. Web interface for CDS/ISIS: GENISIS web v.3.0, Sri Lanka Library Association, Colombo, 2003.
2. Haravu, L J. Library Automation Design, Principles and Practice, Allied Publishers, New Delhi, 2004.
3. Kaul. H. K. Library Networks: An Indian Experience. New Delhi: Virgo Publications, 1999.
4. Rajaraman, V. Fundamentals of Computers. 3rd Ed. – New Delhi. Prentice-Hall of India ,1997
5. Chowdhury, C.G. and Chowdhary. Organizing Information from the shelf to the web. London: Facet Publishing, 2007.
6. Kumar, PSG: Computerization of Indian Libraries. Delhi, B. R. Publishing, 1987.
7. Pandey, SK Sharma: Library Computerization: theory and practice. New Delhi, Ess Ess, 1993.
8. Satyanarayana, NR: A manual of Library Automation and Networking. 2nd ed. Lucknow, New Royal Book, 2003.
9. Dhawan, A: Computers for Beginners. New Delhi, Frank Bros, 1990.
10. Sehgal, RL: An introduction to Library Networks. New Delhi, EssEss, 1996.
11. Devrajan, G and Rahelamma, AV: Library Computerization in India. New Delhi, EssEss, 1990.
12. Siddiqui, J. A: Information Technology Application in Libraries. New Delhi, Shree Publishers & Distributors. 2019. ISBN 978-81-8329-988-6.
13. Sukula, Shiva: Demystifying Databases: A hands-on Guide to Database Management. New Delhi, Ess Ess Publications, 2016.


**Reference Books:**


1. Rajaraman,V. Introduction to Information Technology, 2007. Prentice-Hall of India, New Delhi.
2. Tanenbaum, Andrew S**.** Computer Networks. 3rd Ed, New Delhi. Prentice-Hall of India, 1997.
3. UNESCO. CDS/ISIS for windows: Reference Manual. V1.5, UNESCO, Paris, 2004.
4. Sahoo, K.C. Information Management with IT application. Ludhiana: Medallion Press, 2004.
5. Meron, S. Protection of Intellectual Property in Cyber Space. Delhi: Author Press, 2003.
6. Javidi, B. Optical and Digital Techniques for Information Security, New York: Springer, 2005.
7. Purser, S. A Practical guide to managing Information Security. Boston: Artech House, 2004.

8. Pace, A.K. The Ultimate Digital Library: Where the New Information Players meet. New Delhi: Indiana Publishing House, 2009.

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## Course Name: Basics of Information and Communication Technology (Practical)

## Course Code: BLO-1205 Credits: 4

**Course Objective:**

To provide hands-on training on standard modules of computers and to practices popular library automation software packages.

**Course Outcomes (COs)**

| S. No. | Course Outcomes (COs) |
|---|---|
| 1. | Familiarize with housekeeping operations using library management software and Digital Library packages |
| 2. | Create database for different categories of documents |
| 3. | Generate barcode labels and membership cards |
| 4. | Search online databases |

**Block I:**

**Unit 1:** Setting of Desktop,
**Unit 2:** Use of Operating System,
**Unit 3:** Use of Word Processing Software;
**Unit 4:** Spread Sheet Management Software
**Unit 5:** Power Point Presentation Software

**Block II:**

**Unit 6:** Installation and Use of Library Management Software (all modules);
**Unit 7:** Generation of Various Reports using Library Management Software

**Block III:**

**Unit 8:** Searching Information from Internet using Different Search Engines;
**Unit 9:** Searching Web OPAC,
**Unit 10:** World Cat.
**Unit 11:** lndCat.

**Block IV:**

**Unit 12:** Searching different types of Databases by adopting various search strategies and filters
**Unit 13:** Database Creation and Library Software Installation

**Text and Reference Books**


1. Haravu, L J. Library Automation Design, Principles and Practice, Allied Publishers, New Delhi, 2004.
2. Kaul, H.K. Library Networks: An Indian Experience. New Delhi: Virgo Publications, 1999.
3. Rajaraman,V. Fundamentals of Computers. 3rd Ed. – New Delhi. Prentice-Hall of India ,1997
4. Kumar, PSG: Computerization of Indian Libraries. Delhi, B. R. Publishing, 1987.
5. Pandey, SK Sharma: Library Computerization: theory and practice. New Delhi, EssEss, 1993.
6. Dhawan, A: Computers for Beginners. New Delhi, Frank Bros, 1990.
7. Sehgal, RL: An introduction to Library Networks. New Delhi, Ess Ess, 1996.
8. Devrajan, G and Rahelamma, AV: Library Computerization in India. New Delhi, EssEss, 1990.
9. Shiva Sukula: Information Technology: Bridge to the Wired Virtuality, New Delhi, EssEss Publications, 2008.
10. Shiva Sukula: Electronic Resource Management: What, why and how, New Delhi, EssEss Publications, 2010


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## Course Name: Project

## Course Code: BPO-1200 Credits: 4

**Course Objective:** To visit the different libraries as per convenience all over India. To compile annotated bibliography of various resources.

**Course Outcomes (COs):**

| S. No. | Course Outcomes (COs) |
|---|---|
| 1. | Communication &Confidence |
| 2. | Persistence |
| 3. | Teamwork |
| 4. | Resilience & ability to deal with change |

**Note:** Each student shall have to undergo for the educational tour, decided by the Department.

**Faculty and Support Staff**

The University has identified the requisite faculty and support staff as mandated by UGC and formally they shall be allocated the required positions from amongst the existing faculty exclusively for ODL mode or fresh appointments as required so, shall be initiated for which Letter of Intent have been issued to the prospective faculty and staff. The course material prepared by this university will be on par with any open university/Distance education centre in the country.

List of Faculty associated with BLISc program is as follows:-

| S. No. | Name of Faculty | Designation | Nature of Appointment | Qualification | Subject |
|---|---|---|---|---|---|
| 1 | Dr. Deepmala | Assistant Professor | Full Time | Ph.D | Library Science |
| 2 | Dr. Dhiraj Sharma | Assistant Professor | Full Time | Ph.D | Library Science |

**Delivery Mechanism**

The ODL of MU follows a modern ICT (Information & Communication Technology) enabled approach for instruction. The methodology of instruction in ODL of MU is different from that of the conventional/regular programs. Our ODL system is more learner-oriented and the learner is an active participant in the teaching-learning process. ODL of MU academic delivery system comprises:

*A. Print Material:*

The printed material of the programme supplied to the students will be unit wise for every course.

*B. Counselling Sessions:*

Normally, counselling sessions are held as per a schedule drawn beforehand by the Subject Coordinator. There will be 6 counselling/ contact classes for 4 credit courses will be held on the campus on Saturday and on Sunday of 2-hour duration for each course in face-to-face mode (In case of 2 credit course contact hours are required 6 hours and in case of 6 credit course contact hours required 18 hours). Contact classes will be held in the campus on Saturdays and on Sundays.

*C. Medium of Instruction*

Medium of Course Instruction: English
Medium of Examination: English

**Student Support Systems**

Universities study Centres or Learner Support Centre shall be headed by a coordinator, not below the rank of Assistant professor and shall be augmented with academic and non-academic staff depending on the learner.

The university has made appropriate arrangements for various support services including counselling schedule and resource-oriented services evaluation methods and dates both on and off line modes for easy and smooth services to the students of distance mode. At present the university have only one study centre on the campus. The institution is not promoting any study centres outside the campus. All student support services will be provided to the student through a single window method/mode onsite and online.

## F. Procedure for Admissions, Curriculum, Transaction and Evaluation

**Admission Process**

Admission to the B.L.I.Sc. Programme will be done on the basis of screening of candidate's eligibility on first come first serve basis. The University will follow the reservation policy as per norms of the Government. Admission shall not be a right to the students and MU, DDOE shall retain the right to cancel any admission at any point of time if any irregularity is found in the admission process, eligibility etc.

**Maximum Duration**

A. The maximum duration of the B.L.I.Sc. Programme is two years. Thereafter, students seeking completion of the left-over course(s) will be required to seek fresh admission.
B. The student can complete his/her programme within a period of 2 years failing which he/she shall seek fresh admission to complete the programme.

**Eligibility**
Any Graduate from a recognised University is eligible for admission into B.L.I.Sc. programme.

**Fee Structure**

| **Name of the Program** | **Degree** | **Duration** | **Year** | **Tuition Fee/Year** | **Exam Fee/Year** | **Total (in Rs.)** |
|---|---|---|---|---|---|---|
| Bachelor of Library and Information Science (B.L.I.Sc.) | PG | 1-2 Years | 1 | 15500 | 2000 | 17500 |

**Activity Schedule**

| S.NO. | Name of the Activity | Tentative months schedule (specify months) during year | | | |
|---|---|---|---|---|---|
| | | From (Month) | To (Month) | From (Month) | To (Month) |
| 1 | Admission | Jul | Sep | Jan | Mar |
| 2 | Assignment submission (if any) | Sep | Oct | Mar | Apr |
| 3 | Evaluation of Assignment | Oct | Nov | Apr | May |
| 4 | Examination | Dec | Dec | Jun | Jun |
| 5 | Declaration of Result | Jan | Jan | Jul | Jul |
| 6 | Re-registration | Jul | Jul | Jan | Jan |
| 7 | Distribution of SLM | Jul | Sep | Jan | Mar |
| 8 | Contact Programmes (counselling, Practicals.etc.) | Sep | Nov | Mar | May |

**Credit System**

MU, CDOE proposes to follow the 'Credit System' for most of its programs. Each credit amounts to 30 hours of study comprising all learning activities. Thus, 8 credit course requires 240 hours, 6 credit course requires 180 hours, 4 credit course requires 120 hours and 2 credit course requires 60 hours of study. This helps the student to understand the academic effort to complete a course. Completion of an academic programme requires successful clearing of both, the assignments and the term-end examination of each course in a programme.

| **Duration of The Programme** | **Credits** | **Name of The Programme** | **Level of The Programme** |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1 Yr. | 40 | B.L.I.Sc. | PG (Professional) |

**Assignments**

Distance Education learners have to depend much on self-study. In order to ascertain the writing skill and level of comprehension of the learner, assignment work is compulsory for all learners. Each assignment shall consist of a number of questions, case studies and practical related tasks. The Assignment Question Papers will be uploaded to the website within a scheduled time and the learners shall be required to respond them within a specified period of time. The response of the learner is examined by a faculty member.

**Evaluation:** The evaluation system of the programme is based on two components:

A. **Continuous Evaluation in the form of assignments (weightage 30%):** This Component carries a weightage of 30%. There will be at least one graded assignment and test per course. These assignments are to be submitted to the Co-ordinator of the DDOE/Study Centre to which the student is assigned or attached with.

B. **Term-end examination (weightage 70%):** This will be held twice every year in the months of June and December. The students are at liberty to appear in any of the examinations conducted by the University during the year. A student will be allowed to appear in the Term-End Examination only after she/he has registered for that course and submitted the assignment. For appearing in the Examination, every student has to submit an Examination form through online (www.mangalayatan.in)/ or offline before the due dates as given in the schedule of operations. If a student misses any term-end examination of a course for any reason, s/he may appear for any of them or all the courses subject to the maximum of 8 courses in the subsequent term-end examinations. This facility will be available until a student secures the minimum pass grade in the courses but up to a maximum period of four semesters, since the date of registration of the course is valid for four semesters. Beyond this period s/he may continue for another four semesters by getting Re-registration by paying fee again. In that case, the score of qualified assignments and/or term-end examination will be retained and the student will be required to complete the left-out requirements of such re-registered courses. Minimum requirement for passing a course will be 40% marks.

## G. Laboratory Support and Library Resources

The library of Mangalayatan University aims to empower the teaching mission and intellectual culture of the community through availability through an organized collection of information as well as instruction in its access, relevance and evaluation.
The University Library enriches advance learning and discovery by providing access to a broad array of resources for education, research and creative work to ensure the rich interchange of ideas in the pursuit of knowledge.

The Centre for Distance Education of Mangalayatan University has initiated the process of setting up a dedicated Library for ODL program and acquiring printed books and e-books for this purpose. The required International and National subject journals are also provided. We have a full functioning community radio service onboard (90.4 FM). We already have annual journal subscriptions and the capacity can be enlarged at later stages as the University lines up with more online journals.

The collection of the library is rich and diverse especially in terms of the breadth and depth of coverage. Collection encompasses subjects in Management, Commerce, Information Technology, Computer Applications, and other allied areas. This collection further includes Books, Research Journals, Project Reports/Dissertations and online Journals.

The University has well equipped Computer Laboratories having required library management and digital library softwares, Lecture Capturing Systems, Audio Video facilities, ICT enabled class rooms, Wi-Fi facilities etc.

## H. Cost estimate of the Programme and the provisions

Initial expenses have been done by the University in terms of provision of infrastructure, manpower, printing of Self Study Material etc. The University intends to allocate expenses out of the total fee collection as per following details:

a) SLM Development and Distribution : 20%
b) Postal and ICT Expenses : 10%
c) Salary and other administrative expenses : 60%
d) Future Research development reserve : 10%

Once programmes are operational, the programme budget from fee receipts will be planned as per the guidelines of University Grants Commission.

## I. Quality Assurance

The University has established the Centre for Internal Quality Assurance (CIQA) in the University campus. The CIQA will monitor and maintain the quality of the ODL programmes. It has the following objectives in making the compliances of quality implementations.

### Objectives

The objective of Centre for Internal Quality Assurance is to develop and put in place a comprehensive and dynamic internal quality assurance system to ensure that programmes of higher education in the Open and Distance Learning mode and Online mode being implemented by the Higher Educational Institution are of acceptable quality and further improved on continuous basis.

### Functions of CIQA

The functions of Centre for Internal Quality Assurance would be following

1) To maintain quality in the services provided to the learners.
2) To undertake self-evaluative and reflective exercises for continual quality improvement in all the systems and processes of the Higher Educational Institution.
3) To contribute in the identification of the key areas in which Higher Educational Institution should maintain quality.
4) To devise mechanism to ensure that the quality of Open and Distance Learning programmes and Online programmes matches with the quality of relevant programmes in conventional mode.
5) To devise mechanisms for interaction with and obtaining feedback from all stakeholders namely, learners, teachers, staff, parents, society, employers, and Government for quality improvement.
6) To suggest measures to the authorities of Higher Educational Institution for qualitative improvement.
7) To facilitate the implementation of its recommendations through periodic reviews.
8) To organise workshops/ seminars/ symposium on quality related themes, ensure participation of all stakeholders, and disseminate the reports of such activities among all the stakeholders in Higher Educational Institution.
9) To develop and collate best practices in all areas leading to quality enhancement ins ervices to the learners and disseminate the same all concerned in Higher Educational Institution.

10) To collect, collate and disseminate accurate, complete and reliable statistics about the quality of the programme(s).
11) To ensure that Programme Project Report for each programme is according to the norms and guidelines prescribed by the Commission and wherever necessary by the appropriate regulatory authority having control over the programme;
12) To put in place a mechanism to ensure the proper implementation of Programme Project Reports.
13) To maintain a record of Annual Plans and Annual Reports of Higher Educational Institution, review them periodically and generate actionable reports.
14) To provide inputs to the Higher Educational Institution for restructuring of programmes in order to make them relevant to the job market.
15) To facilitate system-based research on ways of creating learner centric environment and to bring about qualitative change in the entire system.
16) To act as a nodal coordinating unit for seeking assessment and accreditation from a designated body for accreditation such as NAAC etc.
17) To adopt measures to ensure internalization and institutionalization of quality enhancement practices through periodic accreditation and audit.
18) To coordinate between Higher Educational Institution and the Commission for various quality related initiatives or guidelines.
19) To obtain information from other Higher Educational Institutions on various quality benchmarks or parameters and best practices.
20) To record activities undertaken on quality assurance in the form of an annual report of Centre for Internal Quality Assurance.
21) It will be mandatory for Centre for Internal Quality Assurance to submit Annual Reports to the Statutory Authorities or Bodies of the Higher Educational Institution about its activities at the end of each academic session. A copy of report in the format as specified by the Commission, duly approved by the statutory authorities of the Higher Educational Institution shall be submitted annually to the Commission.

After enrolling in Bachelor of Library and Information Science (B.L.I.Sc.) Programme of Mangalayatan University in ODL mode, student will able to make a career as information professionals in a variety of roles and settings. Students demonstrate knowledge in information organization and presentation as well as systems for organizing information and facilitating information access by describing and/or proposing valid solutions to typical professional problems in these areas.

# MANGALAYATAN UNIVERSITY, ALIGARH

## CENTRE FOR DISTANCE AND ONLINE EDUCATION

# PROGRAMME PROJECT REPORT

## MASTER OF LIBRARY AND INFORMATION SCIENCE

## 2023-24

## Introduction

Mangalayatan University focuses on providing quality education through distance learning, matching with the parameter of regular program and producing capable administrative leaders who are prepared with the necessary library management & research skills to make high-quality administrative.

The M.L.I.Sc. programme at our university create high level of intellectual capacity in learners, providing opportunity for learners to pursue high level studies, providing opportunity for higher education studies to the learners who have been deprived of higher education due to being employed in government non-government organization.

## A. Programme's Mission and Objectives

### Mission

To provide educational opportunities for higher education through distance mode for a large segment of the population, including those in employment, women (including housewives) and adults who wish to upgrade their education or acquire knowledge in various fields of study.

### Objectives

- To spread the light of education till the smallest & darkest corner.
- To provide access to higher education to all segments of the society;
- To offer high-quality, innovative and need-based programmes at different levels, to all those who require them;
- To promote, coordinate and regulate the standards of education offered through open and distance learning in the country.
- To spread more literacy in the society.

## B. Relevance of the Program with HEI's Mission and Goals

The vision and mission of HEI, Mangalayatan University, Aligarh are:

### Vision:

To be an institution where the most formative years of a young mind are spent in the guided pursuit of excellence while developing a spirit of inquisitive questioning, an ability to excel in the pressure of a fast-changing professional world, and a desire to grow into a personality than a person, in an environment that fosters strong moral and ethical values, teamwork, community service and environment consciousness.

### Mission:

- To be the enablers of the confluence of academic rigor and professional practicality.
- To bring global best practices to students through widespread use of technology.
- To empower our faculty to constantly develop new skills and excel professionally.

- To provide the best campus environment to students and faculty with all facilities to nurture their interest.

A Master's Degree in Library and Information Science trains students in modern Library administration and can prepare them for higher study or careers in academic, corporate, military, museum, or special research libraries. Degree Programme may allow students to focus on their particular interests. Recipients of a Master's Degree in Library and Information Science quality for Library support positions, depending on the library. Masters from this programme are prepared to work in a variety of libraries and information environments using people skills, problem-solving skills and their ability to organize access and evaluate information.

The Master's Degree in Library and Information Science program of the University strives to realize its vision and mission by rectifying student centric issues on priority and also to empower local community with the help of various social clubs running in University like NSS, KADAM and Alumni association. The University Promotes Multidisciplinary and Allied research in various fields that supports and harnesses joyful learning environment. The goals of ODL (Open Distance Learning) program is to provide educational facilities to all qualified and willing persons who are unable to join regular courses due to personal or professional reasons. There are many potential learners who cannot afford to join regular courses due to professional responsibilities and personal commitments. For such cases M.L.I.Sc. through ODL mode can be helpful in increasing knowledge base and skill up-gradation.

The program aims to provide alternative path to wider potential learners who are in need of refresher courses to update their skills.

**C. Nature of Prospective Target Group of Learners**

This program is specifically designed to cater the need of students who are not able to study through regular mode. Working Professionals, Housewives, Students from rural area, students who do not wish to prefer regular courses due to various reasons & students who can not afford costly regular programmes, also those who are willing to develop their professional skills in Library and Information Science are our target group learners.

The candidates desirous of taking admission in M.L.I.Sc. program shall have to meet the eligibility norms as follows-

1. *To obtain admission in M.L.I.Sc. program offered through ODL mode, the learner must have completed the degree of* B.L.I.Sc./equivalent program.

The ODL-M.L.I.Sc. program offered by Mangalayatan University aims specially for Working Professionals, Housewives, Students from rural area, students who do not wish to prefer regular courses due to various reasons. This gives an opportunity to the distance learner to attend distance programmes offer by the university to those who can't spare enough time to attend regular classes.

**D. Appropriateness of Programme to be conducted in ODL mode to acquire specific skills and competence**

The University has identified the following Programme Learning Outcomes and Programme Specific Outcomes as acquisition of specific skills and competence in M.L.I. Sc. Program.

## Programme Outcomes (PO's)

After completing the programme through ODL Mode, students will be able to:

**PO1:** Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of major concepts, principles, theories and laws of various subjects in Library and Information Science.

**PO2:** Professional skills: Ability to understand and classify simple, compound and complex documents using standard classification schemes; capability to catalogue all types of documents using standard catalogue codes and metadata standards; ability to carry out library housekeeping operations and to provide library and information services by standard procedures.

**PO3:** Critical thinking/Development of solutions: Capability to critically analyze subjects of documents to classify them properly and to derive subject headings for subject cataloguing, indexing purposes and ability to think critically for solving various problems pertaining to the management of Libraries and Information Centers.

**PO4**: Ethics: Capable of demonstrating the ability to identify ethical issues related with Intellectual Property Rights while providing library services and able to understand basic philosophy and ethics of librarianship to make them conscientious librarians.

**PO5**: Modern tool usage: Understanding of concepts of information technology and its application to libraries and capable of using digital technology for communication purpose, for library housekeeping operations, and for searching information from OPAC, Internet and online databases.

**PO6:** Communication: Ability to communicate effectively in oral and written forms with users, colleagues and authorities in an effective manner.

**PO7:** Employability and Lifelong learning: Ability to seek job opportunities as library professionals; capable of self-paced and self-directed learning aimed at personal and professional development; for improving knowledge and skills and for re-skilling through continuing educational opportunities.

## Programme Specific Outcomes:

After completing the programme through ODL Mode, students will be able to:

**PSO1**: To familiarize with the basic concepts of information, its nature, importance and role in the development of society as well as concepts of communication of information, economics and management of information and knowledge.

**PSO2:** To gain understanding of concepts of research methodology in general and to develop research aptitudes and skills applied in library and information science field.

**PSO3:** To make learn the concepts relating to information and communication technology such as communication tools and techniques; internet communication; data security; procedure of digitization, development of digital libraries, web and web designing.

## E. Instructional Design

The program is divided into two semesters and minimum credit requirement is 40 to get M.L.I.Sc. degree in ODL mode from Mangalayatan University. Minimum time period for acquiring M.L.I.Sc. degree will be one year and maximum time period to acquire M.L.I.Sc. degree is 2 Years.

**Evaluation Scheme**

| **Semester-I** | | | | | | |
|---|---|---|---|---|---|---|
| **S.N.** | **Course Code** | **Course Name** | **Credit** | **Continuous Assessment Marks** | **Term End Exam Marks** | **Grand Total** |
| | | | | **Max. Marks** | **Max. Marks** | |
| 1 | MLIS-101 | Knowledge, Information and Communication | 4 | 30 | 70 | 100 |
| 2 | MLIS- 102 | Knowledge Organization | 4 | 30 | 70 | 100 |
| 3 | MLIS-103 | Research Methodology & Statistical Techniques | 4 | 30 | 70 | 100 |
| 4 | MLIS-104 | Information Sources & Systems | 4 | 30 | 70 | 100 |
| **Any one of the following** | | | | | | |
| 5(a) | MLIS-105 | Print and Electronic Sources & Literature in Natural Sciences | 4 | 30 | 70 | 100 |
| 5(b) | MLIS-106 | Print and Electronic Sources & Literature in Social Sciences | 4 | 30 | 70 | 100 |
| 5(c) | MLIS-107 | Print and Electronic Sources & Literature in Medical Sciences | 4 | 30 | 70 | 100 |
| **Total** | | | 20 | 150 | 350 | 500 |
| | | | | | | |
| **Semester-II** | | | | | | |
| **S.N.** | **Course Code** | **Course Name** | **Credit** | **Continuous Assessment Marks** | **Term End Exam Marks** | **Grand Total** |
| | | | | **Max.Marks** | **Max.Marks** | |
| 1 | MLIS-201 | Academic Library System | 4 | 30 | 70 | 100 |
| 2 | MLIS- 202 | Information Storage &Retrieval | 4 | 30 | 70 | 100 |
| 3 | MLIS-203 | Information Technology (Theory) | 4 | 30 | 70 | 100 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | MLIS-204P | Information Technology (Practical) | 4 | 30 | 70 | 100 |
| 5 | MLIS-207 | Dissertation | 4 | 0 | 100 | 100 |
| **Total** | | | 20 | 120 | 380 | 500 |

**MOOCS**

The University shall give flexibility in opting for MOOC (Massive Online Open Courses) by the students pertaining to the prescribed curriculum and also the Credits earned in the MOOC courses may be dealt as part of the evaluation scheme as per UGC (Open and Distance Learning Programmes and Online Programmes) Regulations, 2020.

**Syllabi and Course Materials**

Syllabi, PPR and self-learning materials are developed mostly by experienced faculty members of Mangalayatan University in consultation with contents experts and the same will be forwarded to CIQA and BoS/ Academic Council/ Executive Council for further suggestions and approval.

## Semester-I

## Course Name: Knowledge, Information and Communication

## Course Code: MLIS-101 Credits: 4

**Course Objective:**

To develop an understanding of the concept of Knowledge, Information and Communication aspects in libraries.

**Course Outcomes (COs):**

| S. No. | Course Outcomes (COs) |
|---|---|
| 1. | Familiarize with the conceptual difference between the data, information and knowledge. |
| 2. | Equip students to understand the generation and use of information. |
| 3. | Develop a thorough knowledge about the role of information and Information Industry. |
| 4. | Understand the concept of IPR, Copyright and Data Security |
| 5. | Understand the concept of marketing of information products and services |
| 6. | Equip the students with the Strategies and Techniques & Promotion of LIS Products and Services |

**BLOCK I Information and Communication**

**Unit 1** Information, Characteristics, Nature, Value and Use

**Unit 2** Conceptual difference between data, information and knowledge

**Unit 3** Communication of Information: Information generation, Communication Process, Channels, Models and Barriers

**Unit 4** Trends in Scientific Communication

**BLOCK II Information Industry, IPR and Data Security**

**Unit 5** Information Industry-Generators, Providers and Intermediaries, Information as an asset and Resource

**Unit 6** Intellectual Property Rights Acts

**Unit 7** Concept of freedom, Censorship, Data security and fair use

**Unit 8** National Policy on Library and Information Systems and Services

**BLOCK III Knowledge Management**

**Unit 9** Knowledge Management: Definition, concept, need, basic tools, Knowledge Management Systems: Basic components

**Unit 10** Approaches and Architecture of Knowledge Management

**Unit 11** Trends in Knowledge Management, Role of Knowledge Managers

**BLOCK IV Fundamental Concepts of Marketing of LIS Products**

**Unit 12** Marketing of LIS Products: Definition, needs, and purpose

**Unit 13** Marketing Environment: Producer, Consumer – Buyer Behaviou

**Unit 14** Marketing Information System

**Unit 15** Market Segmentation and Marketing Mix

**BLOCK V Strategies and Techniques & Promotion of LIS Products and Services**

**Unit 16** Strategic Planning

**Unit 17** Marketing Research and Marketing Process

**Unit 18** LIS Products and Services as a Marketable Commodity

**Unit 19** Pricing, Distribution Channels and Communication Strategies

**Unit 20** Advertising, Sales Promotion, Public Relations and E-Marketing

**Text Books:**


1. Butcher, Helen. "Meeting Manager's Information Needs", ASLIB. London,1998.
2. Kotler, Philip and Armstrong, Gary. "Principle of Marketing", Prentice- Hall of India. New Delhi,2003.
3. Sharma, P. "Knowledge Management", New Delhi: A.P.H. Publishing,2004.
4. Khan, M.T.M. "Information Organization and Communication". New Delhi: Ess Ess Publishing,998.

5. Gupta, D. K. et al. “Marketing Library and Information Services: International Perspectives”, K.G. Saur, Munich, 2006.
6. Kotler, Philip. “Marketing Management”., Prentice Hall, Delhi,2000.
7. Vickery, B.C. & Vickery, A. “*Information Science in Theory and Practice”,* London: Butterworth,1987.
8. Sharma, S. & Gopal, S. “Applications of Knowledge Management in Digital Era”, New Delhi: GNOSIS,2011
9. Kawatra, P.S. “An introduction to Information Systems”. New Delhi: A.P.H. Publishing, 2000.
10. Menon, S. “Protection of Intellectual property in cyber space”, New Delhi: Authorspress,2003.
11. Secker, J. “Copyright and e-learning: A guide to Practitioners” London: Facet Publishing,2010
12. Angrew, G. “Digital rights management: A librarian’s guide to technology and practice” ,U.K.: Chandos Publishing,2008.

**Reference Books:**

1. Parashar, R.G. “Information and its Communication”, New Delhi: Medallion Press, 1991.
2. Olive, A. Conceptual modeling of information systems. Berlin: Springer-Verlag,2007.
3. Losse, R. M. “The Science of Information”, San Diego: Academic Press,1990.
4. Rikowski, R. “Knowledge Management: Social, cultural and theoretical perspectives”, U.K.: Chandos Publishing, 2007.

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## Course Name: Knowledge Organization

## Course Code: MLIS- 102 Credits: 4

**Course Objective:**

To develop an understanding of the concepts of library classification, classification theories and their implication for the development of library classification systems.

**Course Outcomes (Cos)**

| S. No. | Course Outcomes (COs) |
|---|---|
| 1. | Understand the general theory of classification and Universe of Knowledge. |
| 2. | Understand the modes of formation of subjects and methods for revision of major Classification Schemes. |
| 3. | Grasp an understanding of special classification schemes. |
| 4. | Understand the contributions of significant people in the field of cataloguing. |
| 5. | Know the Web based cataloguing systems. |
| 6. | Understand subject cataloguing with the help of PRECIS, POPSI and Chain Indexing. |

**BLOCK I Classification Contributions and Universe of Knowledge**

**Unit -1** General theory of Classification: Contributions of Richardson, W.C. Berwick Sayers, H.E. Bliss,

**Unit - 2** Universe of Knowledge: Mapping and Problems

**Unit - 3** Contribution of S.R. Ranganathan and CRG

**BLOCK II Formation of Subjects, Features of Classification Schemes & Notations**

**Unit - 4** Modes of formation of Subjects and Methods of Scholarship vis-à-vis revision **of** CC, UDC and DDC

**Unit - 5** Features of Special Classification Schemes

**Unit - 6** Notation: Definition, Kinds and Function

**BLOCK - III Contributions, Resource Description and Access and Online Cataloguing**

**Unit - 7** Contributions of Cutter, Lubetzky, Ranganathan in the field of Cataloguing.

**Unit - 8** Resource Description and Access (RDA) : Concept and Structure.

**Unit - 9** Online Cataloging: OPACs and Web OPAC with examples at national and international level.

**BLOCK – IV Subject Cataloguing & Subject Headings**

**Unit - 10** Subject Cataloguing: Definition and General Principles

**Unit - 11** Choice and Rendering of Subject Headings: LCSH, POPSI, PRECIS

**Unit - 12** Thesaurus: Need and Guiding Principles for Compilation

**BLOCK -V Union Catalogue, Indexing & Abstracting**

**Unit - 13** Layout and rules for the Union Catalogues of Books, Periodicals

**Unit - 14** Indexing and Abstracting Journals and

**Unit – 15** National Bibliographies.

**Unit - 16** Compilation of Local, National and International Union Catalogues, Application of IT

**Text and Reference Books**


1. Mills, J. A. Modern Outline of Library Classification, Bombay: Asia Publishing House,1960.
2. Ranganathan, S.R.. Prolegomena to Library Classification, (3rd ed). Bangalore: Sarada Ranganathan Endowment for Library Science,1967.
3. Husain, S. Library Classification: Facts and Analysis, New Delhi: BR Publishing, 2004.
4. Kumar, K. Theory of Classification, (4th ed), New Delhi: Vikas Publishing, 1988.

5. Ranganathan, S.R. Elements of Library Classification (3rd ed.). Bombay: Asia Publishing, 1962.
6. Fritz, D. A. Cataloguing with AACR-II & MARC21: for books Electronics Resources, Sound Recording, Video Recording & Serials. New Delhi: Pentagon Press, 2009.
7. Maxwell, R. L. Maxwell's Handbook for Anglo- American Cataloguing Rules2: Explaining & illustrating through the 2003 update New Delhi: Indiana Publishing House,2009.
8. Parmeshwaran, M . Anglo American Cataloguing Rules and CCC (s), New Delhi: Ess Ess Publications,1984
9. Agrawal, S.S. & Kaula., P.N. Catalogue entries & procedure: A guide to cataloguing work according to ALA, AACR, CCC, New Delhi: Lakshmi Book Store, 1972.

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## Course Name: Research Methodology & Statistical Techniques

## Course Code: MLIS-103 Credits: 4

**Course Objective:**

To understand the concept of Research Design, Tools and Techniques for carrying out the research in various fields of Library and Information Science.

**Course Outcomes (COs):**

| S. No. | Course Outcomes (COs) |
|---|---|
| 1. | Understand the concept of research design, tools and techniques |
| 2. | Understand the designing of a Research Proposal |
| 3. | Develop a thorough understanding of research data analysis, interpretation and presentation |
| 4. | Use different statistical techniques and statistical packages |
| 5. | Develop skills for writing and evaluating a research report |
| 6. | Develop skills for Research Ethics & Plagiarism |

**BLOCK-I Introduction of Research**

**Unit - 1** Research: Meaning, Need, Importance and kinds

**Unit - 2** Identification, Formulation of Problems

**Unit - 3** Hypothesis: Definition, Types, Need and Purpose

**BLOCK- II Research Design, Methods and Techniques**

**Unit - 4** Research Design: Concept and Types

**Unit - 5** Scientific Method of Research; Ranganathan's Spiral of Scientific Method

**Unit - 6** Research Methods: Historical, Descriptive, Case Study, Exploratory

**Unit - 7** Research Techniques and Tools: Questionnaire, Interview, Observation Methods

**BLOCK -III Statistical Techniques**

**Unit - 8** Presentation of Data: Tabular, Graphic, Bar Diagram and Pie Chart etc.

**Unit - 9** Sampling Techniques: Procedure, Types

**Unit - 10** Descriptive Statistics: Measures of Central Tendency (Mean, Mode, Median)

**Unit - 11** Measures of Dispersion: Variance and Standard Deviation

**BLOCK-IV Statistical Inference, Bibliometrics and Report Writing**

**Unit - 12** Regression Analysis, Testing of Hypothesis: Chi-Square Test, f-test, t-test, **z**-test

**Unit – 13** Bibliometrics: Concept, Need, Laws of Bibliometrics and their Applications

**Unit - 14** Citation Analysis, Content Analysis

**Unit - 15** Statistical packages – SPSS, (introduction)

**Unit - 16** Report Writing

**BLOCK-V Research and Publication Ethics and Plagiarism**

**Unit - 17** Publication ethics: definition, introduction and importance

**Unit - 18** Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types

**Unit - 19** Violation of publication ethics, authorship and contributorship

**Unit - 20** Plagiarism

**Recommended Books**
**Text Books:**


1. Busha ,C.H. and Harter ,S.P. " Research Methods in Librarianship: Techniques and Interpretation". New York: Academic Press,1980.
2. Carpenter ,R.L.and Vasu ,E.S. " Statistical Methods for Librarians", Chicago: ALA,1978.
3. Kothari ,C.R. "Research Methodology: Methods and Techniques" 3rd rev. ed., New Age International, New Delhi, 2015.
4. Krishan Kumar " Research methods in Library and Information Science"Rev. Ed, Har-Anand Publications,New Delhi, 1999..
5. Powell, R R and Silipigni ,C L. "Basic Research Methods for Librarians", Ed. 4, Libraries Unlimited, Westport, 2004.

6. Rao, I.K.R. “Quantitative methods for Library and Information Science”, Bombay: Wiley Eastern, 1983.

**Reference Books:**

1. Simpson, I.S. “Basic statistics for librarians’, London: Clive Bingley, 1983.
2. Singh, S P. “Research Methods in Social Sciences: A Manual for Designing Questionnaires., Kanishka, New Delhi,2002
3. Slater,M, Ed. “Research Methods in Library and Information Studies”, Library Association Publishing, London, 1990.

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## Course Name: Information Sources & Systems

## Course Code: MLIS-104 Credits: 4

**Course Objective:**

This paper will familiarize students with the various Information sources and systems.

**Course Outcomes (COs)**

| S. No. | Course Outcomes (COs) |
|---|---|
| 1. | Acquaint themselves with the information sources and systems |
| 2. | Comprehend the data centers, Information analysis, and referral centers |
| 3. | To familiarize with electronic and web resources |
| 4. | Assess the National Information Policy |
| 5. | Assess the National and International Systems |
| 6. | Study Global Information Systems, Resource Sharing , Library Consortium and Networks |
| 7. | Learn about various Information Services and Information Products |

**BLOCK-I Information Systems and Organisations**

**Unit – 1** Primary, Secondary and Tertiary Sources: Definition, need and types

**Unit- 2** Information Organisation as a System: Basic Concepts, Types and Characteristics of an Information System.

**Unit-3** Kinds of Information System: Libraries, Documentation Centres and Information Centers

**Unit -4** Data Centres, Information Analysis Centres, Referral Centres and Clearing Houses

**Unit-5** Archives and Translation Pools: Functions and Services

**BLOCK-II National Information Systems, Electronic and Web Sources**

**Unit - 6** Planning and Design of National Information System

**Unit - 7** National Information Policy

**Unit - 8** National Documentation Centers: NISCAIR, DESIDOC, NASSDOC, SENDOC, NDCMC, ENVIS, etc.

**BLOCK-III Electronic Sources & Web Sources**

**Unit - 9** Electronic Sources & Web Sources: Definition, Need and types

**Unit - 10** CD-ROMs and Multimedia

**Unit - 11** Electronic Books, Electronic Journals and Electronic Databases

**Unit - 12** World Wide Web: Services & Facilities

**Unit - 13** Websites & Sources – Subject Portals, Digital Libraries, Discussion- Forum Bulletin-Boards, Consortia, Wikis, Blogs & RSS

**BLOCK-IV Global Information Systems & Resource Sharing, Library Networks and Library Consortia**

**Unit - 14** Programmes and Activities of UNESCO, UNISIST and IFLA.

**Unit - 15** INIS, AGRIS, INSPEC and MEDLARS.

**Unit – 16** Programmes and Activities of INFLIBNET and DELNET

**Unit - 17** CSIR E-Journals Consortium, UGC-INFONET, Digital Library Consortium

**BLOCK V Information Services and Information Products**

**Unit - 18** Information Services: Definition, need, purpose & types

**Unit - 19** Literature Search: procedure & methodology

**Unit - 20** Documentation Services, Translation Services, CAS, SDI, Document

Delivery Service, Alert Services, Information, Products, Newsletter, In-house Journal, State of the Art Report, Trend, Report, etc

**Recommended Books**


1. Atherton, Pauline. “Handbook for information system and services”, UNESCO, Paris,1997.
2. Baman ,P. “Studies on information systems, services and programs in India and abroad”,Ajanta, Delhi, 1993.
3. Barua, B P. “National policy on library and information systems and services for India: perspectives and projections”, Popular Prakashan, New Delhi, 1992.
4. Burch, J G and Grudnitski, G). “Information systems: theory and practice, Wiley, Singapore, 1986.

5. Guha,B. “ Documentation and its facets”, The World Press, Kolkata, 1983.

**Reference Books:**

1. Kent,A. “Resource sharing in libraries: why, how, when next action step”, Marshal Dekker, New York, 1974.
2. Neelameghan, A) and Prasad, K N, Eds. “Information systems, networks and services in India”, 2 Vols, Ranganathan Centre for Information Studies, Chennai, 1998.
3. Rowley, J. “The basics of information system”, Ed 2, Library Association, London, 1996.
4. Vickery,B C. “Information Systems”, Butterworths, Washington, 1973.

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## Course Name: Print and Electronic Sources & Literature in Natural Sciences

## Course Code: MLIS-105 Credits: 4

**Course Objective:**

This paper will familiarize students with the various print and Electronic Sources and Literature in the field of Natural Sciences.

**Course Outcomes (COs)**

| S. No. | Course Outcomes (COs) |
|---|---|
| 1. | To understand the Historical Development of Print and Electronic Resources |
| 2. | To Comprehend the research trends in Natural Sciences |
| 3. | To familiarize with users needs |
| 4. | To assess and evaluate the information sources |
| 5. | Assess the National and International Systems |
| 6. | To study the activities the research institutions and professional organizations |

**BLOCK I Historical Development**

**Unit 1** Scope of the Discipline and its Development;

**Unit 2** Research Trends in Natural Sciences: Physical

**Unit 3** Research Trends in Natural Sciences: Biological Sciences

**BLOCK II User Studies and Information Seeking Behaviour**

**Unit 4** Information Needs of Users;

**Unit 5** Information Seeking Behaviour;

**Unit 6** User Studies: Importance,

**Unit 7** User Studies: Objectives and Types;

**Unit 8** Planning User Survey;

**Unit 9** Methods of User Services

**BLOCK III Information Sources and Evaluation**

**Unit 10** Primary,

**Unit 11** Secondary

**Unit 12** Tertiary Sources;

**Unit 13** Evaluation of Secondary Sources: Print and Electronic Resources;

**BLOCK IV Databases and Internet Services**

**Unit 14** Networked and Distributed Databases;

**Unit 15** Consortia and Subject Gateways;

**Unit 16** Internet Resources and Services;

**BLOCK V Activities of Research Institutions**

**Unit 17** Activities of Research Institutions and Professional Organizations in the

Growth and Development of Natural Sciences with Particular Reference to India, UK and USA

**Text and Reference Books**


1. Walford, A J. "Guide to Reference Books", V.3. Ed. 4, Library Association, London, 1980.
2. Rusa Reference Guidelines. [http://www.ala.org/ala/rusa/ rusaprotools/refernceguide/ guidelinesinformation.htm]
3. Singh, S. (1986). Reference Service in Academic Libraries in India. New Delhi: Ess Ess Publications.
4. Kohl, D.F. (1942). Reference Services and Library Instruction: A Handbook for Library Management.
5. Dhiman, A.K. and Rani, Y. (2005). Information and Reference Sources and Services. New Delhi: Ess Ess Publications.

## Course Name: Print and Electronic Sources & Literature in Social Sciences

## Course Code: MLIS-106 Credits: 4

**Course Objective:**

This paper will familiarize students with the various print and Electronic Sources and Literature in the field of Social Sciences.

**Course Outcomes (COs)**

| S. No. | Course Outcomes (COs) |
|---|---|
| 1. | Acquaint themselves with the primary sources of information and their criteria of evaluation |
| 2. | Comprehend the print and online secondary sources of information in Social Sciences. |
| 3. | Evaluate the print and online tertiary sources of information in Social Sciences. |
| 4. | To assess and evaluate the information sources |
| 5. | Assess the National and International Systems in Social Science |

**BLOCK I Historical Development & Primary Sources**

**Unit 1** History of Social Sciences

**Unit 2** Definition, Terminology, Branches and Land marks in Social Sciences.

**Unit 3** Primary Sources: Periodicals, Government bulletins, Standards, Dissertations, Monographs, Memoirs

**BLOCK II Web Sources**

**Unit 4** Web based sources

**Unit 5** Evaluation of representative sources in each category

**Unit 6** User Studies: Importance,

**Unit 7** User Studies: Objectives and Types;

**BLOCK III Information Sources and Evaluation (Secondary Sources)**

**Unit 8** Secondary Sources: Bibliographies,

**Unit 9** Dictionaries,

**Unit 10** Treatises,

**Unit 11** Directory,

**BLOCK IV Information Sources and Evaluation (Tertiary sources)**

**Unit 12** Tertiary sources: Trade Catalogues,

**Unit 13** Guides to the literature and Bibliography of bibliographies

**Unit 14** Web based sources

**Unit 15** Evaluation of representative sources in each category

**BLOCK V Information Systems and Networks in Social Sciences**

**Unit 16** Information Systems and Networks in Social Sciences: Need and Purpose

**Unit 17** Study of Select Social Science Information Systems at National & International levels.

**Text and Reference Books**


1. Kohl, D.F. (1942). Reference Services and Library Instruction: A Handbook for Library Management.
2. Dhiman, A.K. and Rani, Y. (2005). Information and Reference Sources and Services. New Delhi: Ess Ess Publications.
3. Walford, A J. "Guide to Reference Books", V.3. Ed. 4, Library Association, London, 1980.
4. Rusa Reference Guidelines. [http://www.ala.org/ala/rusa/ rusaprotools/refernceguide/ guidelinesinformation.htm]
5. Singh, S. (1986). Reference Service in Academic Libraries in India. New Delhi: Ess Ess Publications.


## Course Name: Print and Electronic Sources & Literature in Medical Sciences

## Course Code: MLIS-107 Credits: 4

**Course Objective:**

This paper will familiarize students with the various print and Electronic Sources and Literature in the field of Medical Sciences.

**Course Outcomes (COs)**

| S. No. | Course Outcomes (COs) |
|---|---|
| 1. | Acquaint themselves with the primary sources of information and their criteria of evaluation. |
| 2. | Comprehend the print and online secondary sources of information in Medical Sciences. |
| 3. | Evaluate the print and online tertiary sources of information in Medical Sciences. |
| 4. | Assess the National and International Systems in Medical Sciences. |

**BLOCK I Historical Development &Primary Sources**

**Unit 1** Medical/Health Sciences: Definition, Scope, Development, Modern Trends.

**Unit 2** Primary Sources: Periodicals,

**Unit 3** Standards,

**Unit 4** Patents and Dissertation.

**Unit 5** Evaluation of representative types of sources in each category.

**BLOCK II Secondary Sources**

**Unit 6** Secondary Sources: Indexing Journal: Drug Indexes, Index Medicus

**Unit 7** Abstracting Journals: British Medicine, Excerpta Medica.

**Unit 8** Reviews.

**Unit 9** Dictionaries and Encyclopedias.

**Unit 10** Evaluation of Secondary Sources: Print and Electronic Resources;

**BLOCK III Tertiary Sources**

**Unit 11** Tertiary Sources: Directories,

**Unit 12** Guides to medical literature.

**Unit 13** Web based Tertiary Sources.

**Unit 14** Evaluation of representative types of sources in each category

**BLOCK IV Information Systems and Networks**

**Unit 15** Information Systems and Networks in Medical/Health Sciences: Need and purpose.

**Unit 16** Medical/Health Information Systems at National and International Levels: IndMED, MedIND, MEDLARS.

**BLOCK V Activities of Research Institutions**

**Unit 17** Activities of Research Institutions and Professional Organizations in the

Growth and Development of Medical Sciences with special reference to India, UK and USA.

**Text and Reference Books**


1. Kohl, D.F. (1942). Reference Services and Library Instruction: A Handbook for Library Management.
2. Dhiman, A.K. and Rani, Y. (2005). Information and Reference Sources and Services. New Delhi: Ess Ess Publications.
1. Walford, A J. "Guide to Reference Books", V.3. Ed. 4, Library Association, London, 1980.
2. Rusa Reference Guidelines. [http://www.ala.org/ala/rusa/ rusaprotools/refernceguide/ guidelinesinformation.htm]
3. Singh, S. (1986). Reference Service in Academic Libraries in India. New Delhi: Ess Ess Publications.


## Semester-II

## Course Name: Academic Library System

## Course Code: MLIS-201 Credits: 4

**Course Objective:** This paper will provide insights to students about the role of academic libraries in institutions, collection development policies and library finance.

**Course Outcomes (COs):**

| S. No. | Course Outcomes (COs) |
|---|---|
| 1. | Understand the development of academic libraries |
| 2. | Select, acquire, organize and manage academic library collection |
| 3. | Provide various types of library and information services |
| 4. | Develop an understanding about role of UGC |
| 5. | Examine the financial system and HRM process in academic libraries |

**BLOCK -I Academic Libraries and their Development**

**Unit - 1** Academic Libraries: Definition, Objectives, types and Functions

**Unit - 2** History and Development of Libraries with Special Reference to India

**Unit - 3** Role of UGC and UNESCO in the Development of Libraries

**Unit - 4** Study of the recommendations of various Committees and Commissions with regard to Academic Libraries in India

**Unit - 5** Study of Select University Libraries in India: Mangalayatan University, Aligarh Muslim University, Delhi University, Jawaharlal Nehru University

**BLOCK-II Collection Development and Management & Library Organization and Administration**

**Unit - 6** Collection Development: Definition, need, purpose and policies

**Unit - 7** Periodicals, Conference Literature, Grey Literature and Government Publication, Non-Book Materials

**Unit - 8** Electronic Resources and Online Databases

**Unit - 9** Organizational Structure of Academic Libraries: Sections, Book selection principles

**Unit - 10** Staff Manual, Library Surveys, Statistics and Standards, etc.

**BLOCK-III Information Services**

**Unit - 11** Information Services: Definition, need, purpose and types

**Unit - 12** CAS, SDI, Abstracting and Indexing Services, Library Bulletin, Newspaper Clipping Services

**Unit - 13** Resource Sharing and Networking: INFLIBNET, UGC-INFONET Digital Library, Consortium, INDEST.

**BLOCK-IV Finance Management**

**Unit - 14** Finance: Definition, Need and purpose,

**Unit - 15** Sources of Budget, types of Budgeting and Techniques, Allocation of Budget in Academic Libraries

**Block – V Human Resource Management and Infrastructure Planning**

**Unit - 16** Human Resource Management: Definition, need, purpose

**Unit - 17** Nature, Size, Selection, Recruitment,

**Unit - 28** Qualification and Training & Development

**Unit - 19** Academic Library Buildings: Planning, basic elements in designing, Furniture and fittings.

**Unit - 20** Public Relations: Need and Methods

**Recommended Books**


1. Baker, David, Ed. “Resource Management in Academic Libraries”, Library Associations, London,1997.
2. Brophy, Peter. The Academic Library, Library Association, London, 2000.
3. Budd, J M. “The Academic Library: The context, its purpose and its operation”, Libraries Unlimited, London,1988.
4. Chapman, Liz. “Managing acquisitions in library and information services”, 2001. Library Association, London.

5. Dowler., Ed. “Gateways to Knowledge: The Role of Academic Libraries in Teaching, Learning and Research, The MIT Press, London,1997.
6. Deshpande, K S. “University Library System in India”, New Delhi, Sterling, 1985.
7. Ranganathan, S R. “School and College Libraries”, Madras Library Association, Madras.

**Reference Books:**

1. Report of the Library Committee (1957). “University and College Libraries”, New Delhi, UGC, 1965.
2. Srivastava, S N and Verma,S. C. “University Libraries in India”, New Delhi, Sterling,1980.
3. Jordon, Peter. “The Academic Library and its Users, Gower Publishing Limited, London, 1998.
4. Line, Maurice B, Ed. “Academic Library Management, Library Association, London, 1990.

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## Course Name: Information Storage & Retrieval

## Course Code: MLIS-202 Credits: 4

**Course Objective:**

To enable the students to understand the concept of information storage and retrieval.

**Course Outcomes (COs)**

| S.No. | Course Outcomes (COs) |
|---|---|
| 1. | Learn the skills for preparation of Indexes/Abstracts |
| 2. | Assess the role of National and International Abstracting/ Indexing services |
| 3. | Understand the concept and importance of Information storage and consolidation |
| 4. | Comprehend the concept of Vocabulary Control and construction of thesaurus |
| 5. | Understand the use and evaluation of Information Retrieval Systems |
| 6. | Usage the search strategies and refining of information search |

**BLOCK 1 Fundamental Concepts**

**Unit - 1** Concept, Characteristics, Objectives, Types, Operations and Design of ISAR System

**Unit - 2** Compatibility of Information Storage and Retrieval Systems

**Unit - 3** Information Retrieval Process and Search Strategy, Evaluation of ISAR System

**Unit - 4** Vocabulary Control Tools: Classification Schedules, Subject Heading Lists and Thesaurus

**BLOCK 2 Abstracting**

**Unit - 5** Abstracting: Definition, Types, Slant in Abstracting, Guidelines in preparing Abstracts

**Unit - 6** Principles & Canons of Abstracting

**Unit - 7** Study of few Internationally recognized Abstracting /Indexing Services: Sci- Finder, PUB-MED, Web of Science, Scopus

**Unit - 8** Trends in IR

**BLOCK 3 Subject Indexing**

**Unit - 9** Subject Indexing: Concept & Development

**Unit - 10** Assigned Indexing, Derived Indexing: KWIC and KWOC

**Unit - 11** Pre-coordinate Indexing System – Chain Indexing, PRECIS, POPSI

**Unit - 12** Post Coordinate Indexing System – Uniterm

**Unit - 13** Citation Indexing

**BLOCK 4 Bibliographic Description**

**Unit - 14** Principles and Evolution of Bibliographic Description

**Unit - 15** Rules for Bibliographic Description, Standards for Bibliographic Record Formats

**Unit - 16** Metadata Concept, Metadata Standards: Dublin Core, MARC 21, etc.

**BLOCK 5 Search Techniques and Information Retrieval**

**Unit - 17** Man and Machine Retrieval System

**Unit - 18** Search Strategies: Boolean Operations, Proximity Search, Heuristic Search, Navigational Search, etc., Internet Searching and Meta Search Engines

**Unit - 19** Data Mining, Data Harvesting and Semantic Web

**Unit - 20** Knowledge Management Retrieval, Features and elements of online IR

**Recommended Books**


1. Aitchison,J., Gilchrist ,A. and Bawden ,D. "Thesaurus Construction: A Practical Manual", 4th ed. London. Aslib,2000.
2. Chowdhury, G G. "Introduction to Modern Information Retrieval", Library Association, London,2004.

3. Cleveland, Donald B. and Cleveland, Ana D. “Introduction to Indexing and Abstracting”, Libraries Unlimited, Colorado, 2001.
4. Ellis, D. “Progress and Problems in Information Retrieval”, London. Library Association,1996.
5. Ghosh, S N and Satpathi, J N. “Subject Indexing System: Concepts, Methods and Techniques”, IASLIC. Calcutta, 1998.
6. Khan, MTM. “Information: Organisation and Communication”, Ess Ess. New Delhi, 1997.
7. Lancaster, F Wilfred. “Vocabulary Control for Information Retrieval”, Ed. 2, Information Resource Press, Arlington, 1972.
8. Lancaster, F Wilfred. “Indexing and Abstracting in Theory and Practice”, Ed. 3, University of Illinois, Urbana,2003.
9. Chakrabortty, A.R. & Chakrabarti, B. “Indexing: Principles, processes and products”,Calcutta: The World Press,1984.
10. Riaz, M. “Advanced indexing and abstracting practices”, New Delhi: Atlantic publishers,1989.

**Reference Books:**

1. Rowley, J. “The Basics of Information System”, Ed. 2, 1996. Library Association, London,1996.
2. Soergel, D. “Indexing Languages and Thesauri: Construction and Maintenance”, John Wiley and Sons. New York.
3. Walker, G and James, J. “Online Retrieval: a Dialogue of Theory and Practice”, Libraries Unlimited. Englewood. London.
4. Foskett, A C. “Subject Approach to Information”, Ed.5., Library Association. London,1996.
5. Van Rijsbergen , C.J. “Information Retrieval”, 2nd ed. London, Butterworth, 1979. Also available online at: <http://www.dcs.gla.ac.uk/Keith/Preface.html>

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## Course Name: Information Technology (Theory)

## Course Code: MLIS-203 Credits: 4

**Course Objective:**

To understand the various advance applications of Information Technology in libraries with the concept of library automation, planning and implementation and to study different modules of various library management software packages.

**Course Outcomes (COs)**

| S.No. | Course Outcomes (COs) |
|---|---|
| 1. | Study the library software packages for use in different types of libraries |
| 2. | Develop an understanding of proprietary and open-source software |
| 3. | Learn about the importance of Human Computer Interfaces and application of multimedia to libraries |
| 4. | Knowledge about the concept of Telecommunication and Networking in general |

| | |
|---|---|
| 5. | Generate awareness about various types of networks and their applications in library networks for enabling better library facilities |

**BLOCK I Information Technology: Basics**

**Unit – 1** Overview of Information Technology

**Unit - 2** Computer and Communication Technology

**Unit - 3** Application of Information Technology in Libraries

**Unit - 4** Digital Libraries: Planning, Procedure and Implementation

**BLOCK II Internet**

**Unit - 5** Overview of Internet and History

**Unit - 6** Uniform Resource Identifiers, Hyper Text, Hyper Link, Hyper Media

**Unit - 7** Internet Connectivity – Dial-up, Leased Line, ISDN, Cable Modem

**Unit - 8** Internet Protocol – HTTP, HTTPS, FTP, Remote Login, Z39.50, OAIPMH

**Unit - 9** Browsers and E-mail, Search Engine –Types and Evaluation

**BLOCK III Human Computer interfaces & Networking**

**Unit - 10** Human Computer interfaces.

**Unit - 11** Multimedia: Elements and its application to libraries

**Unit - 12** Telecommunication and networking: Concepts, Media, Mode and Components

**Unit - 13** Network Media: UTP, Optical fiber Ethernet, Network Interface Card, Hub, Router, Modem.

**Unit - 14** Network types-LAN, MAN, WAN and their applications in Library Networks

**BLOCK IV Library Software Packages**

**Unit – 15** Library Software Packages: Features and characteristics, Study of available automation softwares

**Unit - 16** Study of Digital Library Software: Greenstone Digital Library Software, D-Space, E-Prints.

**BLOCK V Database Management System (DMS) & System Analysis and Design (SAD)**

**Unit – 17** Database: Definition, Concept, Components and Types, Database Structure: Logical Data Structure, Physical Data Structure

**Unit – 18** Database Management System Models- Structure – Hierarchical, Networking

**Unit – 19** Systems Analysis and Design: Concept and Types

**Unit - 20** Systems design and Development, Implementation & Evaluation

**Recommended Books**


1. Bharihoke D. "Fundamentals of Information Technology", New Delhi. Pentagon Press, 2000.
2. Bradley, P. **"**The Advanced Internet Searching Handbook" 2nd ed. London, Facet, 2002.
3. Boss, R.W. " The Library Management Guide to Automation. 3rd ed. Massachusetts. G.K. Hall.
4. Rajaraman,V. "Introduction to Information Technology", 2007. Prentice-Hall of India, New Delhi.
5. Tanenbaum, Andrew S**. "**Computer Networks", 3rd Ed, New Delhi. Prentice-Hall of India, 1997.
6. Deggan, M., "Digital Future: Strategies for The Information Age. London. Facet, 2001.
7. Gorman, G.E. "Information Services in an Electronic Environment. London. Facet, 2003.
8. Gorman, G.E. "The Digital Factor in Library and Information Services", London. Facet, 2002.
9. Haravu, L.J. "Library automation: design, principles and practice", New Delhi. Allied, 2004.


**Reference Books:**


1. Lancaster, F.W. and Sandore, B. "Technology and Management in Library and Information Services" London. Library Association, 1997.
2. Lazer, P. "Information System Design and Management", Bangalore,Goreman,1982.
3. Goel, A. Computer fundamentals. New Delhi: Pearson Education,2012.
4. Marshal, F. & Kulkarni, L.G. "Computer Networking and The Internet",(5th ed.). New Delhi: Pearson Education,2009.
5. Black, U. " Computer Networks: Protocols, standards and interfaces", (2nd ed.). New Delhi: Prentice-Hall, 2003.


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## Course Name: Information Technology (Practical)

## Course Code: MLIS-204 P Credits: 4

**Course Objective:**

To provide hands-on training on standard modules of popular library automation software packages viz Libsys and KOHA.

**Course Outcomes (COs)**

| S. No. | Course Outcomes (COs) |
|---|---|
| 1. | Create database using Libsys and KOHA |
| 2. | Familiarize with Library software package-KOHA for in-house operations |
| 3. | Generate barcode labels and membership cards using KOHA |
| 4. | Learn search techniques of various CD-ROM & Online Databases |

| | |
|---|---|
| 5. | Create and design Web page for a Library/ Information Centre |

**The practical questions will be set to check IT skills in the following areas: -**

**Unit - 1** Database creation using software packages, Libsys and KOHA

**Unit - 2** Use of Library software packages, LibSys, KOHA for in-house operations, Bar Code

**Unit - 3** Generations, membership cards, machine readable catalogue cards

**Unit - 4** Designing of Digital Library using D-Space

**Unit - 5** Web Page Designing

**Unit - 6** Syntax of HTML Document

**Unit - 7** Formatting of HTML Document

**Unit - 8** FrontPage

**Unit - 9** Creation of Blogs

**Text and Reference Books**


1. Bradley, Phil. "How to Use Web 2.0 in Your Library, Facet Publishing. London, 2007.
2. Donnelly, V. "Designing easy-to-Use Websites: a Hands-on-Approach to Structuring Successful Websites", Addison-Wesley. Boston, 2000.
3. Haravu, L.J. "Library Automation: Design, Principles And Practice", New Delhi. Allied, 2004.
4. Kaul, H.K. "Library Networks: An Indian Experience", New Delhi: Virgo Publications,1999.
5. Rajaraman, V. "Fundamentals of Computers" 3rd Ed. – New Delhi. Prentice-Hall of India ,1997


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## Course Name: Dissertation

## Course Code: MLIS-207 Credits: 4

**Course Objective:**

The main objective of the "Dissertation" is to pursue a current problem in the field of Library & Information science in order to explore its facets thoroughly to come out with solutions or ways in a scientific way.

This will prove useful to the student in applying knowledge and experience acquired during the academic session to real, live and emerging problems in the field.

The Work for Paper shall start in the beginning of the second semester for which each student will be allotted a topic for writing the Dissertation Report, which will be submitted at the end of second

semester on the date to be decided by the Department. The Viva-Voce will be conducted related to the topic of Dissertation.

**Text and Reference Books**


1. Kothari, C.R. "Research Methodology: Methods and Techniques" 3rd rev. ed., New Age International, New Delhi, 2015.
2. Krishan Kumar "Research methods in Library and Information Science" Rev. Ed, Har-Anand Publications, New Delhi, 1999.


**Faculty and Support Staff**

The University has identified the requisite faculty and support staff as mandated by UGC and formally they shall be allocated the required positions from amongst the existing faculty exclusively for ODL mode or fresh appointments as required so, shall be initiated for which Letter of Intent have been issued to the prospective faculty and staff. The course material prepared by this university will be on par with any open university/Distance education centre in the country.

List of Faculty associated with MLISc program is as follows:-

| S. No. | Name of Faculty | Designation | Nature of Appointment | Qualification | Subject |
|---|---|---|---|---|---|
| 1 | Dr. Ashok Kumar Upadhyay | Associate Professor | Full Time | Ph.D | Library Science |
| 2 | Dr. Roshan Khyal | Assistant Professor | Full Time | Ph.D | Library Science |

**Delivery Mechanism**

The ODL of MU follows a modern ICT (Information & Communication Technology) enabled approach for instruction. The methodology of instruction in ODL of MU is different from that of the conventional/regular programs. Our ODL system is more learner-oriented and the learner is an active participant in the teaching-learning process. ODL of MU academic delivery system comprises:

**A. Print Material:**
The printed material of the programme supplied to the students will be unit wise for every course.

**B. Counselling Sessions**
Normally, counselling sessions are held as per a schedule drawn beforehand by the Subject Coordinator. There will be 6 counselling/ contact classes for 4 credit courses will be held on the campus on Saturday and on Sunday of 2-hour duration for each course in face-to-face mode (In case of 2 credit course contact hours are required 6 hours and in case of 6 credit course contact hours required 18 hours). Contact classes will be held in the campus on Saturdays and on Sundays.

**C. Medium of Instruction**

Medium of Course Instruction: English
Medium of Examination: English

**Student Support Systems**

Universities study Centres or Learner Support Centre shall be headed by a coordinator, not below the rank of Assistant professor and shall be augmented with academic and non-academic staff depending on the learner.
The university has made appropriate arrangements for various support services including counselling schedule and resource-oriented services evaluation methods and dates both on and off line modes for easy and smooth services to the students of distance mode.

At present the university have only one study centre on the campus. The institution is not promoting any study centres outside the campus. All student support services will be provided to the student through a single window method/mode onsite and online.

## F. Procedure for Admissions, Curriculum, Transaction and Evaluation

**Admission Process**

Admission to the M.L.I.Sc. Programme will be done on the basis of screening of candidate's eligibility on first come first serve basis. The University will follow the reservation policy as per norms of the Government. An Admission shall not be a right to the students and ODL of MU shall retain the right to cancel any admission at any point of time if any irregularity is found in the admission process, eligibility etc.

**Maximum Duration**

A. The maximum duration of the M.L.I.Sc. Programme is two years. Thereafter, students seeking completion of the left-over course(s) will be required to seek fresh admission.
B. The student can complete his/her programme within a period of 2 years failing which he/she shall seek fresh admission to complete the programme.

**Eligibility**

Any Degree in B.L.I.Sc./equivalent from a recognised University is eligible for admission into M.L.I.Sc. programme.

**Fee Structure**

| Name of the Program | Degree | Duration | Year | Tuition Fee/Year | Exam Fee/Year | Total (in Rs.) |
|---|---|---|---|---|---|---|
| Master of Library and Information Science (M.L.I.Sc.) | PG | 1-2 Years | 1 | 15500 | 2000 | 17500 |

**Activity Schedule**

| S.NO. | Name of the Activity | Tentative months schedule (specify months) during year | | | |
|---|---|---|---|---|---|
| | | From (Month) | To (Month) | From (Month) | To (Month) |
| 1 | Admission | Jul | Sep | Jan | Mar |
| 2 | Assignment submission (if any) | Sep | Oct | Mar | Apr |
| 3 | Evaluation of Assignment | Oct | Nov | Apr | May |
| 4 | Examination | Dec | Dec | Jun | Jun |
| 5 | Declaration of Result | Jan | Jan | Jul | Jul |
| 6 | Re-registration | Jul | Jul | Jan | Jan |
| 7 | Distribution of SLM | Jul | Sep | Jan | Mar |
| 8 | Contact Programmes (counselling, Practicals.etc.) | Sep | Nov | Mar | May |

**Credit System**

MU, CDOE proposes to follow the 'Credit System' for most of its programs. Each credit amounts to 30 hours of study comprising all learning activities. Thus, a 8 credit course requires 240 hours, 6 credit course requires 180 hours, 4 credit course requires 120 hours and 2 credit course requires 60 hours of study. This helps the student to understand the academic effort to complete a course. Completion of an academic programme requires successful clearing of both, the assignments and the term-end examination of each course in a programme.

| Duration of the Programme | Credits | Name of The Programme | Level of The Programme |
|---|---|---|---|
| 1 Yr. | 40 | M.L.I.Sc. | PG |

**Assignments**

Distance Education learners have to depend much on self-study. In order to ascertain the writing skill and level of comprehension of the learner, assignment work is compulsory for all learners. Each assignment shall consist of a number of questions, case studies and practical related tasks. The Assignment Question Papers will be uploaded to the website within a scheduled time and the learners shall be required to respond them within a specified period of time. The response of the learner is examined by a faculty member.

**Evaluation:** The evaluation system of the programme is based on two components:

A. **Continuous Evaluation in the form of assignments (weightage 30%):** This Component carries a weightage of 30%. There will be at least one graded assignment and test per course. These assignments are to be submitted to the Co-ordinator of the CDOE/Study Centre to which the student is assigned or attached with.

**B. Term-end examination (weightage 70%):** This will be held twice every year in the months of June and December. The students are at liberty to appear in any of the examinations conducted by the University during the year. A student will be allowed to appear in the Term-End Examination only after she/he has registered for that course and submitted the assignment. For appearing in the Examination, every student has to submit an Examination form through online (www.mangalayatan.in)/ or offline before the due dates as given in the schedule of operations. If a student misses any term-end examination of a course for any reason, s/he may appear for any of them or all the courses subject to the maximum of 8 courses in the subsequent term-end examinations. This facility will be available until a student secures the minimum pass grade in the courses but up to a maximum period of four semesters, since the date of registration of the course is valid for four semesters. Beyond this period s/he may continue for another four semesters by getting Re-registration by paying fee again. In that case, the score of qualified assignments and/or term-end examination will be retained and the student will be required to complete the left-out requirements of such re-registered courses. Minimum requirement for passing the course will be 40% marks.

## G. Laboratory Support and Library Resources

The library of Mangalayatan University aims to empower the teaching mission and intellectual culture of the community through availability through an organized collection of information as well as instruction in its access, relevance and evaluation.

The University Library enriches advance learning and discovery by providing access to a broad array of resources for education, research and creative work to ensure the rich interchange of ideas in the pursuit of knowledge.

The Centre for Distance and Online Education of Mangalayatan University has initiated the process of setting up a dedicated Library for ODL program and acquiring printed books and e-books for this purpose. The required International and National subject journals are also provided. We have a full functioning community radio service onboard (90.4 FM). We already have annual journal subscriptions and the capacity can be enlarged at later stages as the University lines up with more online journals.

The collection of the library is rich and diverse especially in terms of the breadth and depth of coverage. Collection encompasses subjects in Management, Commerce, Information Technology, Computer Applications, and other allied areas. This collection further includes Books, Research Journals, Project Reports/Dissertations and online Journals.

The University has well equipped Computer Laboratories having required library management and digital library software , Lecture Capturing Systems, Audio Video facilities, ICT enabled class rooms, Wi-Fi facilities etc.

## H. Cost estimate of the Programme and the provisions

Initial expenses have been done by the University in terms of provision of infrastructure, manpower, printing of Self Study Material etc. The University intends to allocate expenses out of the total fee collection as per following details:

| | | |
|---|---|---|
| a) SLM Development and Distribution | : | 20% |
| b) Postal and ICT Expenses | : | 10% |
| c) Salary and other administrative expenses | : | 60% |

d) Future Research development reserve : 10%

Once programmes are operational, the programme budget from fee receipts will be planned as per the guidelines of University Grants Commission.

**I. Quality Assurance**

The University has established the Centre for Internal Quality Assurance (CIQA) in the University campus. The CIQA will monitor and maintain the quality of the ODL programmes. It has the following objectives in making the compliances of quality implementations.

**Objectives**

The objective of Centre for Internal Quality Assurance is to develop and put in place a comprehensive and dynamic internal quality assurance system to ensure that programmes of higher education in the Open and Distance Learning mode and Online mode being implemented by the Higher Educational Institution are of acceptable quality and further improved on continuous basis.

**Functions of CIQA**

The functions of Centre for Internal Quality Assurance would be following

1) To maintain quality in the services provided to the learners.
2) To undertake self-evaluative and reflective exercises for continual quality improvement in all the systems and processes of the Higher Educational Institution.
3) To contribute in the identification of the key areas in which Higher Educational Institution should maintain quality.
4) To devise mechanism to ensure that the quality of Open and Distance Learning programmes and Online programmes matches with the quality of relevant programmesin conventional mode.
5) To devise mechanisms for interaction with and obtaining feedback from all stakeholders namely, learners, teachers, staff, parents, society, employers, and Government for quality improvement.
6) To suggest measures to the authorities of Higher Educational Institution for qualitative improvement.
7) To facilitate the implementation of its recommendations through periodic reviews.
8) To organize workshops/ seminars/ symposium on quality related themes, ensure participation of all stakeholders, and disseminate the reports of such activities among all the stakeholders in Higher Educational Institution.
9) To develop and collate best practices in all areas leading to quality enhancement in services to the learners and disseminate the same all concerned in Higher Educational Institution.
10) To collect, collate and disseminate accurate, complete and reliable statistics about the quality of the programme(s).
11) To ensure that Programme Project Report for each programme is according to the norms and guidelines prescribed by the Commission and wherever necessary by the appropriate regulatory authority having control over the programme;
12) To put in place a mechanism to ensure the proper implementation of Programme Project Reports.
13) To maintain are cord of Annual Plans and Annual Reports of Higher Educational Institution, review them periodically and generate actionable reports.

14) To provide inputs to the Higher Educational Institution for restructuring of programmes in order to make them relevant to the job market.
15) To facilitate system-based research on ways of creating learner centric environment and to bring about qualitative change in the entire system.
16) To act as a nodal coordinating unit for seeking assessment and accreditation from a designated body for accreditation such as NAAC etc.
17) To adopt measures to ensure internalization and institutionalization of quality enhancement practices through periodic accreditation and audit.
18) To coordinate between Higher Educational Institution and the Commission for various quality related initiatives or guidelines.
19) To obtain information from other Higher Educational Institutions on various quality benchmarks or parameters and best practices.
20) To record activities undertaken on quality assurance in the form of an annual report of Centre for Internal Quality Assurance.
21) It will be mandatory for Centre for Internal Quality Assurance to submit Annual Reports to the Statutory Authorities or Bodies of the Higher Educational Institution about its activities at the end of each academic session. A copy of report in the format specified by the Commission, duly approved by the statutory authorities of the Higher Educational Institution shall be submitted annually to the Commission.

After enrolling in Master of Library and Information Science (M.L.I.Sc.) Programme of Mangalayatan University in ODL mode, student will able to make a careers as information professionals in a variety of roles and settings. Students demonstrate knowledge in information organization and presentation as well as systems for organizing information and facilitating information access by describing and/or proposing valid solutions to typical professional problems in these areas.

# MANGALAYATAN UNIVERSITY, ALIGARH

## CENTRE FOR DISTANCE AND ONLINE EDUCATION

# PROGRAMME PROJECT REPORT

# BACHELOR OF SCIENCE

Combination of three subject
(Combination 1: Physics, Chemistry, Mathematics)
(Combination 2: Zoology, Botany, Chemistry)

## 2023-24

## Introduction

Bachelor of Science degree in two combinations with PCM & ZBC is unique at Mangalayatan University in its commitment to both breadth and depth of knowledge after 12th. Its aim and scope is very focused in its approach to preparing a student for higher education as well as for competitive exams. It also provides a sound platform to the students with the requisite background to proceed with confidence for higher studies in the form of M.Sc., MBA, etc. The three-year UG program would require a minimum of **120** credits and four-year UG programme would require a minimum of **160** credits through distance mode including ICT enabled study. Increasing numbers of students have become interested in B.Sc. (PCM/ZBC) program, due to availability of jobs in government sector (through competitive exams) and making careers in higher education.

## A. Programme's Mission and Objectives

**Mission:**

- To cater and ensure excellent theoretical and practical training through teaching, counselling, and mentoring with a view to achieve professional and academic excellence.
- To connect with industry and incorporating knowledge for research enhancement.
- To generate, disseminate and preserve knowledge for the benefit and betterment of society.

**Objectives:**

- To educate and train individuals to be well prepared for higher education.
- To be able to engage independent and life-long learning.
- To develop professionally that ensures existence in the competitive world.

## B. Relevance of the Programme with HEI's Missions and Goals

The Bachelor of Science programme is identifying the assumptions that frame thinking, actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions. The aim of the programme is to transmit concepts and complex information effectively which utilize knowledge to solve theoretical and applied problems. The stakeholder will show scientific temperaments in daily life and understand the moral dimensions of their decisions with responsibility for them including ability to engage in independent and life-long learning.

The goals of ODL (Open Distance Learning) programme is to provide educational facilities to all qualified and willing persons who are unable to join regular courses due to personal or professional reasons. There are many potential learners who cannot afford to join regular courses due to professional responsibilities and personal commitments. The programme's objectives and goals are on the lines of HEIs vision and Mission.

**Vision:**

To be an institution where the most formative years of a young mind are spent in the guided pursuit of excellence while developing a spirit of inquisitive questioning, an ability to excel in the pressure of a fast-changing professional world, and a desire to grow into a personality than a person, in an environment that fosters strong moral and ethical values, teamwork, community service and environment consciousness.

**Mission:**

- To be the enablers of the confluence of academic rigor and professional practicality.
- To bring global best practices to students through widespread use of technology.
- To empower our faculty to constantly develop new skills and excel professionally.
- To provide the best campus environment to students and faculty with all facilities to nurture their interest.

## C. Nature of Prospective Target Group of Learners

The ODL programme of Mangalayatan University (MU) shall target the working professionals as well as those who cannot attend a full-time programme due to constraints. We also welcome those candidates who want to see their career in the field of Basic Sciences. Students may complete their practical work/assignment through virtual lab mode. Desirous candidates of B.Sc. program shall have to meet the eligibility norms as follows:

1. To obtain admission in B.Sc. programme offered through ODL mode, the learner must have completed 10+2 in Science stream.
2. The learner must have Pass at 10+2 examination.

## D. Appropriateness of Programme to be conducted in ODL mode to acquire specific skills and competence

The University has identified the following **Programme Outcomes (PO)** and **Programme Specific Outcomes (PSO)** as acquisition of specific skills and competence in B.Sc. Programme.

**Programme Outcomes (PO)**

- PO1: Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
- PO2: Effective Communication: Transmit concepts and complex information effectively by written, computational and graphical means.
- PO3: Problem Solving: Utilize knowledge to solve theoretical and applied problems by understanding, analysis and synthesis.

- PO4: Scientific Temperament: Show scientific thought process in drawing conclusions from daily life experiences without letting it being affected by biases and prejudices.
- PO5: Ethics: Recognize different value systems including their own, understand the moral dimensions of their decisions, and accept responsibility for them.
- PO6: Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.
- PO7: Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning.

**Programme Specific Outcomes (PSOs)**

- PSO1: Attain a systemic understanding of core concepts, principles and theories along with their applications.
- PSO2: Prepare to develop professionally through lifelong learning, higher education and accept the challenges in research and other creative pursuits in the area of specialization.

**Evaluation Scheme as per NEP-2020**

| **Semester-I** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | **Course Code** | **Course Name** | **Type** | **Credit** | **Continuous Assessment** | **Term End Exam** | **Total** |
| | | | | | **Max. Marks** | **Max. Marks** | |
| 1 | CHO-1111 | Inorganic Chemistry | Core | 4 | 30 | 70 | 100 |
| 2 | ENO-1100 | English Communication | AEC | 2 | 30 | 70 | 100 |
| 3 | BCA-102 | Computer Fundamental & Office Automation | SEC | 2 | 30 | 70 | 100 |
| 4 | CHO-1151 | Chemistry Lab-I | Core | 2 | 0 | 100 | 100 |
| 5 | Combination 1 / 2 | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| Total | | | | 20 | 150 | 550 | 700 |

**Combination 1**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5 | ZCO-1111 | Cytology, Genetics and Infectious Diseases | Core | 4 | 30 | 70 | 100 |
| 6 | BDO - 1111 | Microbiology & Plant Pathology | Core | 4 | 30 | 70 | 100 |
| 7 | ZCO-1151 | Cell Biology & Cytogenetics Lab | Core | 2 | 0 | 100 | 100 |

**Combination 2**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5 | PHO-1111 | Mechanics and Wave Motion | Core | 4 | 30 | 70 | 100 |
| 6 | MAO - 1111 | Calculus | Core | 4 | 30 | 70 | 100 |
| 7 | PHO-1151 | Physics Lab-I | Core | 2 | 0 | 100 | 100 |

| **Semester-II** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | **Course Code** | **Course Name** | **Type** | **Credit** | **Continuous Assessment** | **Term End Exam** | **Total** |
| | | | | | **Max. Marks** | **Max. Marks** | |
| 1 | CHO-1211 | Organic Chemistry | Core | 4 | 30 | 70 | 100 |
| 2 | HNO-1101 | Hindi-I | AEC | 2 | 30 | 70 | 100 |
| 3 | BSO-2100 | Introduction to Computer Application | SEC | 2 | 30 | 70 | 100 |
| 4 | CHO-1251 | Chemistry Lab-II | Core | 2 | 0 | 100 | 100 |
| 5 | Combination 1 / 2 | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| Total | | | | 20 | 150 | 550 | 700 |

**Combination 1**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5 | ZCO-1211 | Biochemistry and Physiology | Core | 4 | 30 | 70 | 100 |
| 6 | BDO - 1211 | Archegoniates&Plant Architecture | Core | 4 | 30 | 70 | 100 |
| 7 | BDO-1251 | Land Plants Architecture | Core | 2 | 0 | 100 | 100 |

**Combination 2**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5 | PHO-1211 | Optics | Core | 4 | 30 | 70 | 100 |
| 6 | MAO - 1211 | Differential Equations | Core | 4 | 30 | 70 | 100 |
| 7 | PHO-1251 | Physics Lab-II | Core | 2 | 0 | 100 | 100 |

| Semester-III | | | | | | | |
|---|---|---|---|---|---|---|---|
| S. No. | Course Code | Course Name | Type | Credit | Continuous Assessment | Term End Exam | Total |
| | | | | | Max. Marks | Max. Marks | |
| 1 | CHO-2111 | Physical Chemistry | Core | 3 | 30 | 70 | 100 |
| 2 | JMO – 1103 | Basics of Still Photography | SEC | 3 | 30 | 70 | 100 |
| 3 | ENO-1101 | Professional Communication | AEC | 2 | 30 | 70 | 100 |
| 4 | CHO-2151 | Chemistry Lab-III | Core | 1 | 0 | 100 | 100 |
| 5 | AGL-1100 | Environmental Studies | VAC | 3 | 30 | 70 | 100 |
| 6 | Combination 1 / 2 | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| Total | | | | 20 | 150 | 550 | 700 |

**Combination 1**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | ZCO-2111 | Molecular Biology, Bioinstrumentation & Biotechniques | Core | 3 | 30 | 70 | 100 |
| 7 | BDO-2111 | Flowering Plants Identification &Aesthetic Characteristics | Core | 4 | 30 | 70 | 100 |
| 8 | ZCO-2151 | Bioinstrumentation & Molecular Biology Lab | Core | 1 | 0 | 100 | 100 |

**Combination 2**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | PHO-2111 | Thermodynamics | Core | 3 | 30 | 70 | 100 |
| 7 | MAO-2111 | Algebra | Core | 4 | 30 | 70 | 100 |
| 8 | PHO-2151 | Physics Lab-III | Core | 1 | 0 | 100 | 100 |

| **Semester-IV** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | **Course Code** | **Course Name** | **Type** | **Credit** | **Continuous Assessment** | **Term End Exam** | **Total** |
| | | | | | **Max. Marks** | **Max. Marks** | |
| 1 | CHO-2211 | Analytical Chemistry | Core | 3 | 30 | 70 | 100 |
| 2 | HNO–2101 | Hindi-II | AEC | 2 | 30 | 70 | 100 |
| 3 | BSO-2101 | E-Marketing | SEC | 3 | 30 | 70 | 100 |
| 4 | ECO-0001 | Renewable Sources of Energy | VAC | 3 | 30 | 70 | 100 |
| 5 | CHO-2251 | Chemistry Lab-IV | Core | 1 | 0 | 100 | 100 |
| 6 | Combination 1 / 2 | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| Total | | | | 20 | 150 | 550 | 700 |

**Combination 1**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | ZCO-2211 | Gene Technology, Immunology and Computational Biology | Core | 3 | 30 | 70 | 100 |
| 7 | BDO-2211 | Economic Botany, Ethnomedicine & Phytochemistry | Core | 4 | 30 | 70 | 100 |
| 8 | BDO-2251 | Genetic Engineering and Counselling Lab | Core | 1 | 30 | 70 | 100 |

**Combination 2**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | PHO-2211 | Circuit Fundamentals and Basic Electronics | Core | 3 | 30 | 70 | 100 |
| 7 | MAO-2211 | Real Analysis | Core | 4 | 30 | 70 | 100 |
| 8 | PHO-2251 | Physics Lab-IV | Core | 1 | 0 | 100 | 100 |

| **Semester-V** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | **Course Code** | **Course Name** | **Type** | **Credit** | **Continuous Assessment** | **Term End Exam** | **Total** |
| | | | | | **Max. Marks** | **Max. Marks** | |
| 1 | CHO-3111 | Quantum Chemistry | Core | 4 | 30 | 70 | 100 |
| 2 | H000201T | Health and Hygiene | ID | 3 | 30 | 70 | 100 |
| 3 | MAV–0005 | Basic Statistics | ID | 3 | 30 | 70 | 100 |
| 4 | Combination 1 / 2 | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| Total | | | | 20 | 150 | 550 | 700 |

**Combination 1**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4 | ZCO-3111 | Diversity of Non-Chordates, Parasitology and Economic Zoology | Core | 4 | 30 | 70 | 100 |
| 5 | BDO-3111 | Plant Physiology, Metabolism & Biochemistry | Core | 4 | 30 | 70 | 100 |
| 6 | ZCO-3151 | Diversity of Chordates and Comparative Anatomy | Core | 2 | 0 | 100 | 100 |

**Combination 2**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4 | PHO-3111 | Electromagnetism | Core | 4 | 30 | 70 | 100 |
| 5 | MAO-3111 | Numerical Methods | Core | 4 | 30 | 70 | 100 |
| 6 | PHO-3151 | Physics Lab-V | Core | 2 | 0 | 100 | 100 |

| **Semester-VI** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | **Course Code** | **Course Name** | **Type** | **Credit** | **Continuous Assessment** | **Term End Exam** | **Total** |
| | | | | | **Max. Marks** | **Max. Marks** | |
| 1 | CHO-3211 | Organometallics, Bioinorganic Chemistry | Core | 4 | 30 | 70 | 100 |
| 2 | B070404T | Web Designing | ID | 3 | 30 | 70 | 100 |
| 3 | BSO-5100 | Internship | SEC | 3 | 0 | 100 | 100 |
| 4 | Combination 1 / 2 | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| Total | | | | 20 | 150 | 550 | 700 |

**Combination 1**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4 | ZCO-3211 | Evolutionary and Developmental Biology | Core | 4 | 30 | 70 | 100 |
| 5 | BDO-3211 | Cytogenetics, Plant Breeding & Nanotechnology | Core | 4 | 30 | 70 | 100 |
| 6 | BDO-3251 | Cytogenetics, Conservation & Environment management | Core | 2 | 0 | 100 | 100 |

**Combination 2**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4 | PHO-3211 | Elements of Quantum and Atomic & Molecular Spectra | Core | 4 | 30 | 70 | 100 |
| 5 | MAO-3211 | Complex Analysis | Core | 4 | 30 | 70 | 100 |
| 6 | PHO-3251 | Physics Lab- VI | Core | 2 | 0 | 100 | 100 |

| | | **Semester-VII** | | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | **Course Code** | **Course Name & code** | **Course Category** | **Credit** | **Continuous Assessment** | **Term End Exam** | **Total** |
| | | | | | **Max. Marks** | **Max. Marks** | |
| 1 | Any one specialization | 1. Mathematical Physics (PHO-4111)<br>2. Solid State Physics (PHO-4112)<br>3. Digital Electronics (PHO-4113) | DSE | 4 each | 30 | 70 | 100 |
| 2 | | 1. Environmental Chemistry (CHO-4111)<br>2. Reaction Mechanism (CHO-4112)<br>3. Advanced Spectroscopy (CHO-4113) | | 4 each | 30 | 70 | 100 |
| 3 | | 1. Linear Algebra (MAO-4111)<br>2. Analytical Geometry (MAO-4112)<br>3. Mathematical Statistics (MAO-4113) | | 4 each | 30 | 70 | 100 |
| 4 | | 1. Systematics And Applied Entomology (ZCO-4111) | | 4 each | 30 | 70 | 100 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2. Biology Of Insects (Morphology, Physiology &Development) (ZCO-4112)<br>3. Economic Zoology and Vermicology (ZCO-4113) | | | | | |
| 5 | | 1. Economic Botany (BDO-4111)<br>2. Ecology and Biostatistics (BDO-4112)<br>3. Molecular Biology & Bioinformatics (BDO-4113) | | 4 each (Botany) | 30 | 70 | 100 |
| 6 | BRM-0001 | Research Methodology | SEC | 4 | 30 | 70 | 100 |
| 7 | Any one specialization | 1. Physics Lab- VII (PHO-4151)<br>2. Industrial Training/Survey/ Research Project (PHO-4152) | DSE | 2 each | 0 | 100 | 100 |
| 8 | | 1. Chemistry Lab- VII (CHO-4151)<br>2. Industrial Training/Survey/ Research Project (CHO-4152) | | 2 each | 0 | 100 | 100 |
| 9 | | 1. Mathematics Lab-I (MAO-4151)<br>2. Industrial Training/Survey/ Research Project (MAO-4152) | | 2 each | 0 | 100 | 100 |
| 10 | | 1. Lab on Environmental Science, Behavioral Ecology, Developmental Biology, Wildlife, Ethology (ZCO-4151)<br>2. Industrial Training/Survey/ Research Project(ZCO-4152) | | 2 each | 0 | 100 | 100 |
| 11 | | 1. Experiments in physiology, Biochemistry & molecular biology(BDO-4151)<br>2. Industrial Training/Survey/ Research Project (BDO-4152) | | 2 each | 0 | 100 | 100 |
| | | **Total** | | 20 | 120 | 480 | 600 |

| | | Semester-VIII | | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | **Course Code** | **Course Name** | **Course Category DSE** | **Credit** | **Continuous Assessment Marks** | **Term End Exam Marks** | **Grand Total** |
| | | | | | **Max. Marks** | **Max. Marks** | |
| 1 | Any one specialization | 1. Nuclear and Particle Physics (PHO-4211)<br>2. Atmospheric Physics (PHO-4212)<br>3. Analog Systems and Applications (PHO-4213) | DSE | 4 each | 30 | 70 | 100 |
| 2 | | 1. Bio-Analytical and Bio-Organic Chemistry (CHO-4211)<br>2. Advanced Physical Chemistry (CHO-4212)<br>3. Advanced Organic Synthesis (CHO-4213) | | 4 each | 30 | 70 | 100 |
| 3 | | 1. Functional Analysis (MAO-4211)<br>2. General Topology (MAO-4212)<br>3. Operations Research (MAO-4213) | | 4 each | 30 | 70 | 100 |
| 4 | | 1. Animal Biotechnology (ZCO-4211)<br>2. Animal Cell Culture (ZCO-4212)<br>3. Wildlife Conservation (ZCO-4213) | | 4 each | 30 | 70 | 100 |
| 5 | | 1. Ecology & Environment (BDO-4211)<br>2. Plant Biotechnology (BDO-4212)<br>3. Herbal Technology (BDO-4213) | | 4 each | 30 | 70 | 100 |
| 6 | | Project/Dissertation | SEC | 4 | 0 | 100 | 100 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | Any one specialization | 1. Physics Lab- VIII (PHO-4251)<br>2. Industrial Training/Survey (PHO-4252) | DSE | 2 each | 0 | 100 | 100 |
| 8 | | 1. Chemistry Lab- VIII (CHO-4251)<br>2. Industrial Training/Survey (CHO-4252) | | 2 each | 0 | 100 | 100 |
| 9 | | 1. Mathematics Lab-I (MAO-4251)<br>2. Industrial Training/Survey (MAO-4252) | | 2 each | 0 | 100 | 100 |
| 10 | | 1. Animal Cell Culture Lab (ZCO-4251)<br>2. Industrial Training/Survey/Research Project (ZCO-4252) | | 2 each | 0 | 100 | 100 |
| 11 | | 1. Plant Identification Technology (BDO-4251)<br>2. Industrial Training/Survey/Research Project (BDO-4252) | | 2 each | 0 | 100 | 100 |
| | | **Total** | | 20 | 120 | 480 | 600 |

**MOOCs**

The University shall give flexibility in opting for MOOCs (Massive Online Open Courses)/SWAYAM by the students pertaining to the prescribed curriculum and also the Credits earned in the MOOCs may be dealt as part of the evaluation scheme as per UGC (Open and Distance Learning Programmes and Online Programmes) Regulations, 2020.

**Syllabi and Course Materials**

Syllabi, PPR and self-learning materials are developed mostly by experienced faculty members of Mangalayatan University in consultation with contents experts and the same will be forwarded to CIQA and BoS/Academic Council/ Executive Council for further suggestions and approval.

# Semester I

**COURSE NAME: INORGANIC CHEMISTRY**
**Course Code: CHO-1111** **Credit: 4**

**Course Objectives:**

The objective of this unit is to explain the concept of an atoms. Accordingly, an attempt has been made to for the arrangement of protons and neutrons in the nucleus and the rules governing the arrangement of electrons in the extra nuclear region of an atom and filling of orbitals belonging to higher energy shells prior to the entry of electrons in the orbitals of lower energy shells. The systematic classification of these elements with respect to their physical/chemical properties also explain in this unit. This unit also covers the driving force that makes the isolated atoms to combine to form the polyatomic molecules or ions as well as to find the answers of certain interesting questions such as: What is a chemical bond? What happens to the energy of the atoms and the molecules? What happens in terms of electronic structure, while bond formation takes place?

**Course Outcomes:**

**After learning this unit, students will be able to**

1. Define Atomic structure
2. Show Chemical Bonding
3. Explain Alkali and Alkaline Earth Metals
4. Illustrate Group 13, 14 and 15 Elements
5. Classify Group 16, 17 and 18 Elements

**Block 1: Atomic Structure**

**Unit 1:** Atoms, theories of atoms**,** Review of: Bohr's theory and its limitations, dual behavior of matter and radiation, de Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Need of a new approach to Atomic structure.
**Unit 2:** Idea of de-Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals,
Schrödinger wave equation, significance of $\Psi$ and $\Psi^2$, quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s, p, d, orbitals, Aufbau and Pauli exclusion principles, Hund's multiplicity rule, Electronic configurations of the elements, effective nuclear charge.
**Unit 3:** History of periodic table, Laws of periodic table: Mendeleev's Law, merits and defects of Mendeleev's periodic table, Modified form of Mendeleev's periodic table, Lothar Meyer's rearrangement, modern periodic law (Moseley's periodic law), merits and demerits of modern periodic table, nomenclature of the element, periodicity of properties, cause of periodicity.

**Block 2: Chemical Bonding**
**Unit 4:** Atomic and ionic radii, ionization energy, electron affinity and electronegativity definition, methods of determination or evaluation, trends in periodic table and applications in predicting and explaining the chemical behaviour.

**Unit 5:** Chemical bond, types of chemical bond, Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions, valence shall electron pair repulsion (VSEPR) theory to $NH_3$, $H_3O^+$, $SF_4$, $CIF_3$, $ICl_2^-$ and $H_2O$,MO theory, homonuclear and heteronuclear (CO and NO) diatomic molecules, multicenter bonding in electron deficient molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.

**Unit 6:** Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, salvation energy and solubility of ionic solids, polarizing power and polarizability of ions, Fajan's rule, Metallic bond- free electron, valence bond and band theories. Weak Interactions – Hydrogen bonding, Vander Waals forces.

**Block 3: Alkali and Alkaline Earth Metals**

**Unit 7:** Hydrogen: Lightest element, protic and aprotic solvents, Isotopes of hydrogen, reactions in non-aqueous solvents.

**Unit 8:** Alkali metals: General characteristics and use of alkali metals, oxides and hydroxides of alkali metals, complexation of alkali metal ions, anomalous behaviour of alkali metals.

**Unit 9:** Alkaline earth metals: General characteristics and uses, halides and hydrides of beryllium, complexation behaviour of alkaline earth metals, anomalous behaviour of beryllium.

**Block 4: Group 13, 14 and 15 Elements**

**Unit 10:** General characteristics and uses, hydrides of boron diborane and borazine, halides of boron and aluminium, oxides of born and borates, anomalous behaviour of boron.

**Unit 11:** General characteristics, oxides of carbon and silicon, halides of carbon, organosilicon compounds: silicones, anomalous behaviour of carbon.

**Unit 12:** General characteristics, hydrides of elements, halides of elements, oxides and oxoacids of elements, anomalous behaviour of nitrogen.

**Block 5: Group 16, 17 and 18 Elements**

**Unit 13:** General characteristics and uses, oxides of sulphur, sulphur di oxide: preparation, properties, uses and structure, sulphur tri oxide: preparation, properties, uses and structure, oxoacids of sulphur: Sulphurous acid, Sulphurous acid, Thiosulphurous acid,

Hyposulphurous acid, Pyrosulphurous acid, sulphuric acid series, Peroxysulphuric acid series, Peroxymonosulphhuric acid, Peroxydisulphuric acid, Thionic acid series, Dithionic acid, Polythionic acid, Halides of sulphur and their properties: Preparation, properties and structure of sulphur halides, Dihalides, Tetrahalides, Dimeric monohalides, Hexahalides, Dimeric pentafluoride, Preparation, properties and structure of sulphur halides, Anomalous behaviour of oxygen.

**Unit 14:** Group 17 elements: general characteristics and uses, physical properties of halogen, Halides and halogen oxides, Oxoacids of halogens, Interhalogen compounds, polyhalides, Basic properties of halogen, Anomalous behavior of fluorine.

**Unit 15:** Noble gases: General characteristics and uses, Compounds of Noble gases, Compounds formation under excited state conditions, Compounds formation through coordination, Compounds formation through dipole induced dipole interaction, Compounds formation through physical trapping, Compounds of xenon, Structure and bonding in xenon compounds, Theories of bonding in xenon compounds.

**Reference/Text Books:**


1. Lee, J.D. Concise Inorganic Chemistry ELBS, 1991.
2. Cotton, F.A., Wilkinson, G. & Gaus, P.L. Basic Inorganic Chemistry, 3rd ed., Wiley.
3. Douglas, B.E., McDaniel, D.H. & Alexander, J.J. Concepts and Models in Inorganic Chemistry, John Wiley & Sons.
4. Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. Inorganic Chemistry:Principles of tructure and Reactivity, Pearson Education India, 2006.
5. Basic Inorganic Chemistry, F. A Cotton, G. Wilkinson, and Paul L. Gaus, 3rd Edition (1995), John Wiley & Sons, New York.
6. Concise Inorganic Chemistry, J. D. Lee, 5th Edition (1996), Chapman & Hall, London


**Course Name: English Communication**

**Course Code: ENO-1100** **Credits: 2**

**Course Objectives**: Understanding the fundamental communication skills being integral to personal, social and professional interactions. To develop the ability to share thoughts, emotions and ideas through various means of communication: both verbal and nonverbal.

**Course Outcomes**
After completion the course, students will be able to develop correct pronunciation. They will be able to communicate effectively.

**Block I. Self-Introduction**
**Unit 1**. Introducing self
**Unit 2**. Speaking about achievements
**Unit 3**. Voicing future aspects

**Block II. Non-Verbal Communication**
**Unit 4**. Types of non- verbal communication
**Unit 5**. Body Language
**Unit 6**. Paralanguage skills

**Block III. Manners and Etiquettes**
**Unit 7**. Personal grooming
**Unit 8**. Dress code
**Unit 9.** Telephone etiquettes
**Unit 10**. Intellectual grooming

**Block IV. Conversation in Real Life Situations**
**Unit 11**. Meeting people
**Unit 12**. Travelling
**Unit 13.** Visiting Places
**Unit 14.** Shopping

**Block V. Public Speaking Skills**
**Unit 15**. Extempore
**Unit 16.** Role Play
**Unit 17**. Group Discussion

**Books Reference:**

- Fluency in English part-1, Macmillan, Delhi,2005, Units 1-18
- Martin Hewing, Advanced English Grammar, CUP, New Delhi, 2010, Unit 1-60.
- Language through Literature (forth coming). Dr. Gauri Mishra, Dr. Ranjana Kaul, Dr. Brat Biswas, Primus Books, Delhi 2005 Chapter 1-17

**Course Name: Computer Fundamental & Office Automation**
**Course Code: BCA-102** **Credits: 2**

**Course Objective:**

Office tools course would enable the students in crafting professional word documents, excel spread sheets, power point presentations using the Microsoft suite of office tools. To familiarize the students in preparation of documents and presentations with office automation tools.

**Course Outcome:** At the end of the course student would be able to:

| S. No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | **Describe** the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming | Knowledge |
| 2. | **Explain** the concept of operating system and its function | Understand |
| 3. | **Illustrate** the concept of call by vaue and call by reference | Apply |
| 4. | **Contrast** on compile and debug programs | Analyze |
| 5. | **Design** programs connecting documents | Create |

**Block-I: Introduction to Computers**

**Unit-1**: Introduction, Characteristics of Computers, Block diagram of computer.
**Unit-2**: Types of computers and features, Mini Computers, Micro Computers, Mainframe Computers, Super Computers.
**Unit-3**: Types of Programming Languages (Machine Languages, Assembly Languages, High Level Languages). Data Organization, Drives, Files, Directories.
**Unit-4**: Types of Memory (Primary And Secondary) RAM, ROM, PROM, EPROM. Secondary Storage Devices (FD, CD, HD, Pen drive)
**Unit-5**: I/O Devices (Scanners, Plotters, LCD, Plasma Display) Number Systems Introduction to Binary, Octal, Hexadecimal system Conversion, Simple Addition, Subtraction, Multiplication

**Block-II: Algorithm and Flowcharts**

**Unit-6**: Algorithm: Definition, Characteristics, Advantages and disadvantages,
**Unit-7:** Definition, Define symbols of flowchart,
**Unit-8:** Examples Flowchart
**Unit-9:** Advantages and disadvantages, Examples.

**Block-III: Operating System and Services in O.S.**
**Unit-10**: Dos – History, Files and Directories,
**Unit-11:** Internal and External Commands,
**Unit-12:** Batch Files,
**Unit-13:** Types of O.S.

**Block-IV: Windows Operating Environment**
**Unit-14:** Features of MS – Windows,
**Unit-15:** Control Panel,
**Unit-16:** Taskbar, Desktop, Windows Application, Icons,
**Unit-17:** Windows Accessories, Notepad, Paintbrush.

**Block-V: Editors and Word Processors**
**Unit-18:** Basic Concepts, Examples: MS-Word, **Unit-19:** Introduction to desktop publishing.
**Unit-20:** Purpose, usage, command, MS-Excel, Creation of files in MS-Access, Switching between application, MS-PowerPoint.

**BOOKS RECOMMENDED/SUGGESTED READING:**


1. Norton Peter, "Introduction to computers", 4th Ed., TMH, 2001.
2. Alex Leon & Mathews Leon, "Fundamentals of Information Technology", Leon Techworld, 1999.
3. Vikas Gupta, "Comdex Computer Kit", Wiley Dreamtech, Delhi, 2004 4. P. K. Sinha & Priti Sinha, "Computer Fundamentals", BPB Publications, 1992.
5. V. Raja Raman, "Introduction to Computers", PHI, 1998.
6. Alex Leon & Mathews Leon, "Introduction to Computers", Vikas Publishing House, 1999.
7. Computer Architecture and Organization, Nicholas carter, Scaum Series TMH Adaptation, 2010


**Course Name: Chemistry Lab -I**
**Course Code: CHO-1151** **Credit: 2**

**Course Objective:** The objective of Chemistry Lab-I is to provide basic knowledge of experimental determination. The determination of various elements using different

techniques, molecular weight determination of polymer and water quality analysis is also explain in details.

**Course Outcomes:** At the end of this study, students will be able to:

1. Determine the iron content using standard methods.
2. Explain the theory and practical of transition temperature.
3. Evaluate the molecular weight of polymer.
4. Understand the concept of surface tension and its determination.
5. Define the DO and BOD in water sample.

**List of Experiments:**

1. Spectro-photometric Determination of iron in water sample using standard addition method.
2. To determine the transition temperature of hydrated sodium bromide by solubility method.
3. Determination of molecular weight of a polymer (e.g. Polystyrene) by viscometric method.
4. To determine the surface tensions of methyl alcohol, ethyl alcohol & n-hexane at room
5. Temperature and also calculate the atomic parachors of C, H &; O.
6. To determine DO &; BOD of a given water sample.

Recommended Books:

1.Practicle Organic Chemistry F.G. Mann and B.C. Saunders " Pearson" 2. Elementary Practical Organic Chemistry I. Vogle Pearson"

**Subject Code: ZCO-1111**

**Subject: Cytology, Genetics and Infectious Diseases** **Credit:4**

**Course outcomes:** The student at the completion of the course will be able to:

- Understand the structure and function of all the cell organelles.
- Know about the chromatin structure and its location.
- To be familiar with the basic principle of life, how a cell divides leading to the growth of an organism and also reproduces to form new organisms.
- How one cell communicates with its neighboring cells?
- Understand the basic principles of genetics and how genes (earlier called factors) are inherited from one generation to another.
- Understand the Mendel's laws and the deviations from conventional patterns of inheritance.
- Comprehend how environment plays an important role by interacting with genetic factors.
- How to detect chromosomal aberrations in humans and study the pattern of inheritance by pedigree analysis in families.

**Block-I: Structure and Function of Cell Organelles I**

**Unit-I** Plasma membrane: chemical structure—lipids and proteins**,** Cell-cell interaction: cell adhesion molecules, cellular junctions

**Unit-2** Endomembrane system: protein targeting and sorting, endocytosis, exocytosis, Cytoskeleton: microtubules, microfilaments, intermediate filaments

**Unit-3** Mitochondria: Structure, oxidative phosphorylation,

**Unit-4** Peroxisome and ribosome: structure and function

**Block-2 Nucleus and Chromatin Structure**

**Unit-5** Structure and function of nucleus in eukaryotes, Chemical structure and base composition of DNA and RNA

**Unit-6** DNA supercoiling, chromatin organization, structure ofchromosomes,Types of DNA and RNA

**Unit-7** Cell division: mitosis and meiosis, Cell cycle and its regulation, apoptosis

**Unit-8** Signal transduction: intracellular signaling and cell surface receptors, via G-protein linked receptors, JAK-STAT pathway

**Block-3 Mendelism and Sex Determination**

**Unit-9** Basic principles of heredity: Mendel's laws, monohybrid and dihybrid crosses, Complete and Incomplete Dominance

**Unit-10** Penetrance and expressivity, Genic Sex-Determining Systems, Environmental Sex Determination, Sex Determination in *Drosophila,* Sex Determination in HumansSex-linked characteristics and Dosage compensation

**Unit 11** Extensions of Mendelism: Multiple Alleles, Gene Interaction, The Interaction Between Sex and Heredity: Sex-Influenced and Sex-Limited Characteristics, Cytoplasmic Inheritance.

**Unit 12** Genetic Maternal Effects, Genomic Imprinting, Anticipation, Interaction Between

**Block 4 Genes and Environment**

**Unit-13** Environmental Effects, on Gene Expression, Inheritance of Continuous Characteristics

**Unit 14** Human karyotype, Chromosomal anomalies: Structural and numerical aberrations with examples, Pedigree analysis, Patterns of inheritance: autosomal dominant, autosomal recessive, X-linked recessive, X-linked dominant

**Unit-15** Introduction to pathogenic organisms: viruses, bacteria, fungi, protozoa, and worms.

**Unit-16** Structure, life cycle, pathogenicity, including diseases, causes, symptoms and control common parasites: *Trypanosoma, Giardiaand Wuchereria*

***Books Recommended/Suggested Reading:***


1. Lodish et al: Molecular Cell Biology: Freeman & Co, USA (2004).
2. Alberts et al: Molecular Biology of the Cell: Garland (2002).
3. Cooper: Cell: A Molecular Approach: ASM Press (2000).
4. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman (2004).
5. Lewin B. Genes VIII. Pearson (2004).
6. Watson et al. Molecular Biology of the Gene. Pearson (2004).
7. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne, Janis KubyKuby Immunology. W
8. Delves Peter J., Martin Seamus J., Burton Dennis R., Roitt Ivan M. Roitt's Essential Immunology, 13th Edition. Wiley Blackwell (2017).
9. Shetty Nandini Immunology Introductory Textbook. New Age International. (2005)

**Subject Code: BDO-1111**
**Subject: Microbiology & Plant Pathology** **Credit:4**

**Course outcomes:** After the completion of the course the students will be able to:
1. Develop understanding about the classification and diversity of different microbes including viruses, Algae, Fungi & Lichens & their economic importance.
2. Develop conceptual skill about identifying microbes, pathogens, biofertilizers & lichens.
3. Gain knowledge about developing commercial enterprise of microbial products.
4. Learn host –pathogen relationship and disease management.
5. Learn Presentation skills (oral & writing) in life sciences by usage of computer & multimedia.
6. Gain Knowledge about uses of microbes in various fields.
7. Understand the structure and reproduction of certain selected bacteria algae, fungi and lichens
8. Gain Knowledge about the economic values of this lower group of plant community.

**Block-I:**
**Unit-1** Introduction to Indian ancient, Vedic and heritage Botany and contribution of Indian Botanists, in contextwith the holistic development of modern science and technology, has to be taught, practiced and assessed viaclass interaction/ assignments / self-study mentioned under Continuous Internal Evaluation (CIE).
**Unit-2** Microscopy –Light, phase contrast, electron, scanning and transmission electron microscopy, staining techniques forlight microscopy, sample preparation for electron microscopy.
**Unit 3** Common equipment of microbiology lab and principleof their working – autoclave, oven, laminar air flow, centrifuge. Colorimetry and spectrophotometry, immobilizationmethods, fermentation and fermenters.Cell structure of Eukaryotic and prokaryotic cells, Gram positive and Gram-negative bacteria, Structure of a bacteria;Bacterial Chemotaxis and Quorum sensing, Bacterial Growth curve, factors affecting growth of microbes;measurement of growth; Batch culture, fed batch culture and continuous culture; Synchronous growth of microbes;Sporulation and reproduction and recombination in bacteria.
**Unit-4** Viruses, general characteristics, viral culture, Structure of viruses, Bacteriophages, Structure of T4 &, λ-phage; Lyticand Lysogenic cycles, viroid, Prions & mycoplasma & phytoplasma, Actinomycetes & plasmids and their economicuses.

**Block-2**
**Unit-5** Range of thallus organization in Algae, Pigments, Reserve food –Reproduction - Classification and life cycle of *–Nostoc, Chlorella, Volvox, Hydrodictyon, Oedogonium, Chara; Sargassum, Ectocarpus, Polysiphonia*
**Unit-6** Economic importance of algae - Role of algae in soil fertility- biofertilizer – Nitrogen fixation- Symbiosis; Commercialproducts of algae –biofuel, Agar.
**Unit-7** General characteristics, nutrition, life cycle, Economic importance of Fungi, Classification upto class. Distinguishingcharacters of Myxomycota:
**Unit-8** General characters of Mastigomycotina, Zygomycota: *Rhizopus,* **Ascomycota:***Saccharomyces, Penicillium, Peziza.* **Basidiomycotina:** *Ustilago, Puccinia, Agaricus;* **Deuteromycotina:** *Fusarium,Alternaria*. Heterothallism, Physiological specialization, Heterokaryosis &Parasexuality.

**Block-3 Mushroom Cultivation, Lichenology & Mycorrhiza**

**Unit-9** Mushroom cultivation, General account of lichens, reproduction and significance; *Mycorrhiza: ectomycorrhiza* and *endomycorrhiza* and their significance.

**Unit-10** Disease concept, Symptoms, Etiology& causal complex, Primary and secondary inoculum, Infection, Pathogenicityand pathogenesis.

**Unit-11** Koch's Postulates. Mechanism of infection (Brief idea about Pre-penetration, Penetration and Postpenetration),

**Unit-12** Disease cycle (monocyclic, polycyclic and polyetic). Defense mechanism with special reference toPhytoalexin, Resistance- Systemic acquired and Induced systemic fungicides- Bordeaux mixture, Lime Sulphur,Tobacco decoction, Neem cake & oil

**Block-4 Diseases and Control**

**Unit-13** Symptoms, Causal organism, Disease cycle and Control measures of –Early & Late Blight of Potato, False Smut of

**Unit-14** Rice/ Brown spot of rice, Black Stem Rust of Wheat, *Alternaria* spot' and 'White rust of Crucifers, Red Rot ofSugarcane, Wilting of Arhar, Mosaic diseases on tobacco and cucumber, yellow vein mosaic of bhindi; Citrus Canker,Little leaf of brinjal; Damping off of seedlings.

**Unit-15** Disease management: Quarantine, Chemical, Biological, Integratedpest disease management

**Unit-16** Food fermentations and food produced by microbes, amino acids, Production of antibiotics, enzymes, vitamins,alcoholic beverages, organic acid & genetic recombinant vaccines. Mass production of bacterial biofertilizers, bluegreen algae

***Books Recommended/Suggested Reading:***


1. Lodish et al: Molecular Cell Biology: Freeman & Co, USA (2004).
2. Alberts et al: Molecular Biology of the Cell: Garland (2002).
3. Cooper: Cell: A Molecular Approach: ASM Press (2000).
4. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman (2004).
5. Lewin B. Genes VIII. Pearson (2004).
6. Watson et al. Molecular Biology of the Gene. Pearson (2004).
7. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne, Janis KubyKuby Immunology. W
8. Delves Peter J., Martin Seamus J., Burton Dennis R., Roitt Ivan M. Roitt's Essential Immunology, 13th Edition. Wiley Blackwell (2017).
9. Shetty Nandini Immunology Introductory Textbook. New Age International. (2005)


**Subject Code:** ZCO-1151

**Subject: Cell Biology & Cytogenetics Lab** **Credit: 2**

**Course outcomes:** At the completion of the course students will learn Hands-on:

1. To use simple and compound microscopes.
2. To prepare slides and stain them to see the cell organelles.
3. To be familiar with the basic principle of life, how a cell divides leading to the growth of an organism and also reproduces to form new organisms.
4. The chromosomal aberrations by preparing karyotypes.

5. How chromosomal aberrations are inherited in humans by pedigree analysis in families.
6. The antigen-antibody reaction.

**BLOCK-I:**
1. To study different cell typessuchasbuccal epithelial cells, neurons,striated muscle cells using Methylene blue.
2. To study the different stages of Mitosis in root tip of onion.
3. To study the different stages of Meiosis in grasshopper testis.
4. To prepare molecular models of nucleotides, amino acids, dipeptidesusing bead and stick method.
5. To check the permeability of cells using salt solution of differentconcentrations.

**BLOCK-II:**
1. Study of parasites (Eg. Protozoans, helminths *etc*.) from permanent slides.
2. To learn the procedures for preparation of temporary and permanent stained/unstained slides.

**BLOCK-III:**
1. Study of mutant phenotypes of *Drosophila.*
2. Preparation of polytene chromosomes.
3. Study of sex chromatin (Barr bodies) in buccal smear and hair budcells (Human).
4. Preparation of human karyotype and study the chromosomalaberrations with respect to number, translocation, deletion etc.from the pictures provided.
5. To prepare family pedigrees.

**BLOCK-IV:**
**Virtual Labs (Suggestive sites)**
https://www.vlab.co.in
https://zoologysan.blogspot.com
www.vlab.iitb.ac.in/vlab
www.onlinelabs.in
www.powershow.com
https://vlab.amrita.edu
https://sites.dartmouth.edu

***Books Recommended/Suggested Reading:***
1. Lodish et al: Molecular Cell Biology: Freeman & Co, USA (2004).
2. Alberts et al: Molecular Biology of the Cell: Garland (2002).
3. Cooper: Cell: A Molecular Approach: ASM Press (2000).
4. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman (2004).
5. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne, Janis KubyKuby Immunology. W HFreeman (2007).
6. Kesar, Saroj and Vashishta N. (2007). Experimental Physiology: Comprehensive Manual. Heritage Publishers, New Delhi

**Course Name: Mechanics and Wave Motion**
**Course Code: PHO-1111** **Credits: 4**

**Course Objectives:** To acquire basic knowledge about Newton's laws of motion, Rotational energy and rotational inertia, Central forces and Simple harmonic motion.
**Course Outcomes:** After learning this course, students will be able to

1. Explain the dynamics of system of particles.
2. Explain the rotational mechanics.
3. Define gravitation and central force motion.
4. Understand simple harmonic motion.
5. Illustrate wave motion.

**Block I: Dynamics of System of Particles**
**Unit-1:** Inertial and Non-inertial reference frames, Newton's laws of motion, Galilean Transformations; Galilean Invariance
**Unit-2:** Work, kinetic and potential energy, Conservative and Non-conservative forces,
**Unit-3:** Conservation of energy, linear momentum,
**Unit-4:** Collision in one and two dimensions

**Block II: Rotational Mechanics**
**Unit-5:** Angular momentum and Torque
**Unit-6:** Rotational energy and rotational inertia for simple bodies,
**Unit-7:** Combined translation and rotational and motion of a rigid body on horizontal and inclined planes, Simple treatment of the motions of a top.
**Unit-8:** Relations between elastic constants, bending of Beams and Torsion of Cylinder.

**Block III: Gravitation and Central Force Motion**
**Unit-9:** Law of gravitation, Potential and Field due to Spherical Shell and Solid Sphere
**Unit-10:** Escape and orbital velocity, Kepler's laws
**Unit-11:** Motions of planets and satellites Geo-stationary satellites
**Unit-12:** Central forces, Two particle central force problem, Reduced mass,

**Block IV: Simple Harmonic Motion**
**Unit-13:** Simple harmonic motion, differential equation of S. H. M. and its solution,
**Unit-14:** Applications and uses of complex notation,
**Unit-15:** Damped harmonic oscillator
**Unit-16:** Forced vibrations, composition of simple harmonic motion.

**Block V: Wave Motion**
**Unit-17:** Differential equation of wave motion, Plane progressive waves in fluid media
**Unit-18:** Reflection of waves, phase change on reflection,
**Unit-19:** Superposition, stationary waves, pressure and energy distribution, phase and group velocity

**Recommended books-**


- EM Purcell, Ed: "Berkeley Physics Course, Vol. 1, Mechanics" (McGraw-Hill).
- RP Feymman,RB Lighton and M Sands; "The Feymman Lectures in Physics", Vol. 1 (BI Publications, Bombay, Delhi, Calcutta, Madras).

- J.C. Upadhyay: 'Mechanics'. Ram Prasad Publications, Agra.
- D.S, Mathur "Mechanics". S Chand Publication, New Delhi.

**Course Name: Calculus**
**Course Code: MAO-1111** **Credits: 4**

**Course Objectives:** To equip the students to understand the concepts, properties, fundamental theorems, and aspects of the differential and integral calculus of single variable functions.

**Course Outcomes:** On successful completion of this course, students shall be able to 1. Define limits, continuity and differentiability of single variable functions.

2. Explain mean value theorems, partial differentiation and applications of differential calculus.
3. Interpret curvature, asymptotes and tracing of curves.
4. Explain fundamental theorem of integral calculus along with properties of definite and indefinite integrals.
5. Utilize reduction formulae along with double and triple integrals.

**Block I: Limit, Continuity and Differentiability**
**Unit 1:** $\varepsilon-\delta$ definition of the limit of a function and algebra of limits
**Unit 2:** Continuous functions and Classification of discontinuities
**Unit 3:** Differentiability and Chain rule of differentiability
**Unit 4:** Successive differentiation and Leibnitz's theorem

**Block II: Differential Calculus-I**
**Unit 5:** Rolle's theorem, Lagrange's and Cauchy mean value theorems
**Unit 6:** Expansion of functions (in Taylor's and Maclaurin's series)
**Unit 7:** Partial differentiation and Euler's theorem
**Unit 8:** Jacobians, Maxima and Minima (for functions of two variables)

**Block III: Differential Calculus-II**
**Unit 9:** Tangents and normal (polar form only)
**Unit 10:** Curvature and Asymptotes
**Unit 11:** Tests for concavity and convexity, Points of inflexion
**Unit 12:** Tracing of curves in cartesian and polar coordinates

**Block IV: Integral Calculus-I**
**Unit 13:** Integral as a limit of sum, Properties of definite integrals
**Unit 14:** Fundamental theorem of integral calculus, Summation of series by integration
**Unit 15:** Infinite integrals, Differentiation and integration under the integral sign
**Unit 16:** Beta and Gamma functions

**Block V: Integral Calculus-II**
**Unit 17:** Reduction formulae
**Unit 18:** Quadrature and Rectification
**Unit 19:** Volumes and surfaces of solids of revolution

**Unit 20:** Double and triple integrals

**Recommended Books:**

- H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002.
- G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2007.
- T. M. Apostol, Calculus Vol I, Wiley & Sons (Asia) Pvt. Ltd.
- Gorakh Prasad, Differential Calculus, Pothishala Pvt. Ltd., Allahabad

**Course Name: Physics Lab-I**
**Course Code: PHO-1151** **Credits: 2**

**Course Objectives:** To acquire basic knowledge about moment of inertia, the surface tension by Jaeger's method and rotational inertia, Central forces and Simple harmonic motion.

**Course Outcomes:** After learning this course, students will be able to

1. Explain the perpendicular axes for moment of inertia.
2. Experimental conformation of the moment of inertia of irregular body using inertial table apparatus.
3. Experimental understanding the surface tension by Jaeger's method.
4. Study of oscillations under a bi filar suspension.

**Lab Experiment List**

1. Moment of inertia of a flywheel
2. Moment of inertia of an irregular body by inertia table
3. Modulus of rigidity by statistical method (Barton's apparatus)
4. Modulus of rigidity by dynamical method (sphere / disc / Maxwell's needle)
5. Young's modulus by bending of beam
6. Young's modulus and Poisson's ratio by Searle's method
7. Poisson's ratio of rubber by rubber tubing
8. Surface tension of water by capillary rise method
9. Surface tension of water by Jaeger's method
10. Coefficient of viscosity of water by Poiseuille's method
11. Acceleration due to gravity by bar pendulum
12. Frequency of AC mains by Sonometer
13. Height of a building by Sextant
14. Study the wave form of an electrically maintained tuning fork / alternating current sourcewith the help of cathode ray oscilloscope.

**Suggested Readings:**


1. B.L. Worsnop, H.T. Flint, "Advanced Practical Physics for Students", Methuen & Co., Ltd., London, 1962, 9e
2. S. Panigrahi, B. Mallick, "Engineering Practical Physics", Cengage Learning India Pvt. Ltd., 2015, 1e
3. R.K. Agrawal, G. Jain, R. Sharma, "Practical Physics", Krishna Prakashan Media (Pvt.) Ltd., Meerut, 2019
4. S.L. Gupta, V. Kumar, "Practical Physics", Pragati Prakashan, Meerut, 2014, 2e

# Semester II

**COURSE NAME: ORGNIC CHEMISTRY**

**COURSE CODE: CHO-1211** **CREDIT: 4**

**Course Objective:**

Objective of this chapter is to provide students with a brief detail on the basic fundamentals of the organic chemistry. Topics covered in this chapter such as hybridization, delocalized bonding and electronic effects, isomerism, aliphatic and aromatic hydrocarbons. The chapter is developed to stimulate interest of the reader into the organic chemistry and at the same time to build the deep understanding of the fundamental concepts of organic chemistry.

**Course Outcomes:**

After learning this chapter, students will be able to:
1. Explain the Fundaments of Organic Chemistry
2. Define Isomerism
3. Classify Aliphatic Hydrocarbons
4. Illustrate Aromatic Hydrocarbons, Alkyl and Aryl Halides
5. Identify Alcohols, Phenols and Ethers

**Block 1: Fundamentals of Organic Chemistry**

**Unit 1:** Modern definition of organic Chemistry, importance of organic Chemistry, classification of organic compounds, purification of organic compounds, qualitative and quantitative estimation of elements, determination of molecular masses, calculation of empirical and molecular formula, tetrahedral concept of carbon, nomenclature of organic compounds.

**Unit 2:** Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bonding, van der Waals interactions, inclusion compounds, clatherates, charge transfer complexes, resonances, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding.

**Unit 3:** Curved arrow notation, drawing electron movements with allows, half-headed and double- headed arrows, homolytic and heterolytic bond fission, Types of reagents – electrophiles and nucleophiles, Types of organic reactions, Energy considerations. Reactive intermediates – Carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples). Assigning formal charges on intermediates and other ionic species. Methods of determination of reaction mechanism (product analysis, intermediates, isotope effects, kinetic and stereochemical studies).

**Block 2: Isomerism, stereoisomerism, geometrical and optical isomerism**

**Unit 4:** Concept of isomerism, stereoisomerism: general introduction, chain isomerism, position isomerism, functional isomerism, tautomerism, metamerism.
**Unit 5:** optical isomerism – elements of symmetry, molecular chirality, enantiomers, stereogenic center, optical activity, properties of enantiomers, chiral and achiral

molecules with two stereogenic centers, disasteromers, threo and erythro diastereomers, meso compounds, resolution of enantionmer, inversion, retention and recemization. Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature.

**Unit 6:** Geometric isomerism – determination of configuration of geometric isomers, E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds. Conformational isomerism – conformational analysis of ethane and n-butane; conformations of cyclohexane, axial and equatorial bonds, conformation of mono substituted cyclohexane derivatives, Newman projection and Sawhorse formulae, Fischer and flying wedge formulae, Difference between configuration and conformation.

**Block 3: Aliphatic Hydrocarbons**

**Unit 7: Alkanes:** (Upto 5 Carbons). Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. Reactions: Free radical Substitution: Halogenation.

**Unit 8: Alkenes:** (Upto 5 Carbons) Preparation: Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). Reactions: cisaddition (alk. $KMnO_4$) and trans-addition (bromine), Addition of HX (Markownikoff's and antiMarkownikoff's addition), Hydration, Ozonolysis, oxymecuration-demercuration, Hydroboration-oxidation.

**Unit 9: Alkynes**: (Upto 5 Carbons) Preparation: Acetylene from $CaC_2$ and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinaldihalides. Reactions: formation of metal acetylides, addition of bromine and alkaline KMnO4, ozonolysis and oxidation with hot alk. $KMnO_4$.

**Block 4: Aromatic Hydrocarbons, Alkyl and Aryl Halides**

**Unit 10:** Nomenclatures of benzene derivatives, The aryl group, Aromatic nucleus and side chain, Structure of benzene, Molecular formula and Kekule structure, Resonance and MO picture, Aromaticity: the Huckel's rule, aromatic ions, Methods of preparation, Properties (Physical and Chemical properties of benzene), Reduction of benzene (Birch reduction), Orientation and ortho/para ratio.

**Unit 11:** Alkyl and Aryl Halides: Alkyl Halides (Upto 5 Carbons) Types of Nucleophilic Substitution (SN1, SN2 and SNi) reactions. *Preparation:* from alkenes *and* alcohols.
*Reactions:* hydrolysis, nitrite & nitro formation, nitrile & isonitrile formation. Williamson's ether synthesis: Elimination vs substitution.

**Unit 12:** Aryl Halides *Preparation:* (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer & Gattermann reactions. *Reactions (Chlorobenzene):* Aromatic nucleophilic substitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: $KNH_2/NH_3$ (or $NaNH_2/NH_3$).

Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.

**Block 5: Alcohols, Phenols and Ethers**

**Unit 13:** Alcohols: Preparation: Preparation of 1o, 2o and 3o alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters. Reactions: With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. $KMnO_4$, acidic dichromate, conc. $HNO_3$). Oppeneauer oxidation *Diols:* (Upto 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement.

**Unit 14:** Phenols: (Phenol case) Preparation: Cumene hydroperoxide method, from diazonium salts. Reactions*:* Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer-Tiemann Reaction, Gattermann-Koch Reaction, Houben– Hoesch Condensation, Schotten – Baumann Reaction.

**Unit 15:** Ethers (aliphatic and aromatic): Cleavage of ethers with HI. Aldehydes and ketones (aliphatic and aromatic): (Formaldehye, acetaldehyde, acetone and benzaldehyde); *Preparation:* from acid chlorides and from nitriles. *Reactions* – Reaction with HCN, ROH, $NaHSO_3$, $NH_2$-G derivatives. Iodoform test. Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation. Clemensen reduction and Wolff Kishner reduction. Meerwein-Pondorff Verley reduction.

**Reference/Text Books:**


1. Graham Solomon, T.W., Fryhle, C.B. & Dnyder, S.A. *Organic Chemistry,*John Wiley & Sons (2014).
2. McMurry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India Edition, 2013.
3. Sykes, P. *A Guidebook to Mechanism in Organic Chemistry,* Orient Longman, New Delhi (1988).
4. Finar, I.L. *Organic Chemistry* (Vol. I & II), E.L.B.S.
5. Morrison, R.T. & Boyd, R.N. *Organic Chemistry*, Pearson, 2010.
6. Graham Solomon, T.W., Fryhle, C.B. & Dnyder, S.A. Organic Chemistry,John Wiley & Sons (2014).
7. McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.
8. Sykes, P. A Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi (1988).
9. Eliel, E.L. Stereochemistry of Carbon Compounds, Tata McGraw Hill education, 2000.
10. Finar, I.L. Organic Chemistry (Vol. I & II), E.L.B.S.
11. Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.
12. Bahl, A. & Bahl, B.S. Advanced Organic Chemistry, S. Chand, 2010.

**Course Name: Hindi-I**
**Course Code: HNO–1101** **Credits: 2**

## Course Objective:

1- छात्रों में पठन कला को निपुणता का विकास करना।
2- छात्रों को क्षेत्रीय लोकोक्तियों एवं मुहावरों का संपूर्ण ज्ञान कराना।
3- छात्रों को निबंध, संवाद, सारांश, पत्र इत्यादि लिखने की कला कुशलता उत्पन्न करने का प्रयास करना।
4- छात्रों को व्याकरण संबंधी नियमों का पूर्ण ज्ञान कराना।

## Course Outcomes:

सीओ 1: हिंदी भाषा और उसके साहित्य की उत्पत्ति को समझना।
सीओ 2: साहित्य के इतिहास की अवधारणा को समझना।
सीओ 3: हिन्दी साहित्य के वर्गीकरण का आधार समझना।
सीओ 4: हिंदी नाटक, लघुकथा और उपन्यास के विकास के इतिहास को समझना।

### Block 1: **जयाकर प्रसाद 'अजात शत्रु'**

**इकाई .1** उद्देय; प्रस्तावना; हिन्दी साहित्य एवं भाषा का इतिहास; आधुनिक काल में हिन्दी गद्य के उदय तथा विकास।

**इकाई.2** उर्दू साहित्य; अजानात्रुः कथासार; अजानात्रुः नाट्यकला; अजानात्रुः संवाद योजना; अजानात्रुः देाकाल और वातावरण; अजानात्रुः अभिनेयता; अजानात्रुः प्रतिपाद्य/उद्देय; अजानात्रु।

**इकाई.3** भाषौली; अजानशत्रुः रस–योजना; अजानशत्रुः गीति–योजना; अजानशत्रुः पात्र–योजना; प्रमुख नारी पात्र।

### Block 2:

**इकाई .4** उद्देश्य; नवाब हमीदुल्लाहः एक परिचय; परम्परा, प्रगति और स्वरूप।

**इकाई .5** हमीदुल्लाह के नाटकों में नारी; 'दुलारी बाई' और 'ख्याल भारमली' में लोकनाट्य शैली; ''ख्याल भारमली'' मंगलाचरण की विशिष्टता; सूत्रधार – अभिनेत्री का प्रयोग; भोपा–भोपी का प्रयोग; गायन मण्डली का प्रयोग; गायन मण्डली का प्रयोग।

**इकाई.6** भारमली की लोककथा; लोकसंवाद और लोकभाषा; अंग्रेजी शब्द और भाषा का प्रयोग; लोकगीत; लोकनृत्य; लोकवाद्य; पूर्वदीप्ति शैली; हास्य और व्यंग्य; निष्कर्ष।

### Block 3:

**इकाई. 7** उद्देश्य; प्रस्तावना; जन्म एवं बाल्यकाल; शिक्षा–दीक्षा; राजेन्द्र यादवः व्यक्तित्व तथा कृतित्व।

**इकाई** .8 राजेन्द्र यादवः कृतित्व; लेखन का प्रारम्भ तथा प्रेरणा; बहुमुखी प्रतिभा; साहित्य की समीक्षा; सम्पादक व अनुवादक।

**इकाई .9** राजेन्द्र यादव की रचना–दृष्टि तथा चिन्तन पर युग का प्रभाव; राजेन्द्र यादव के उपन्यास; राजेन्द्र यादव की प्रकाशित रचनाएँ; उपसंहार।

### Block 4:

**इकाई .10** उद्देश्य; प्रस्तावना; नवजागरण का प्रभाव; प्रिन्टिंग प्रेस की स्थापना; पत्र–पत्रिकाओं का प्रकाशन; अनुवाद की भूमिका; नवजागरण का सामान्य परिचय; भारतेन्दु युगीन निबन्धों में नवजागरण का स्वरूप।

**इकाई** .11 समाज सुधार; धर्म सुधार की आवश्यकता पर बल; नारी चेतना; देशभक्ति और राष्ट्रीय चेतना; आचार्य शुक्ल का निबन्ध साहित्य; निबन्ध साहित्य की परिस्थितियाँ; निबन्ध की विशेषताएँ; निबन्धकार शुक्लजी का वैशिष्ट्य।

**इकाई .12** आचार्य हजारी प्रसाद द्विवेदी के निबन्धों में लालित्य तत्व; आचार्य हजारी प्रसाद द्विवेदी के निबन्धों में सांस्कृतिक तत्व; आचार्य हजारी प्रसाद द्विवेदी के निबन्धों में जीवटता; ललित निबन्ध की विकास यात्रा। **इकाई .13** विद्यानिवास मिश्र का व्यक्तित्व एवं उनका साहित्य संसार; पं. विद्यानिवास मिश्र के निबन्धों का प्रतिपाद्य; भक्तिकाल का काल विभाजन और नामकरण; भारतेन्दु युग का काल विभाजन और नामकरण; आदिकालीन जैन साहित्य; सिद्ध–नाथ साहित्य; रासो साहित्य।

**इकाई .14** कबीरदास; निर्गुण एवं सगुण भक्ति; आदिकालीन जैन साहित्य; रामभक्ति काव्य के सामन्तवाद विरोधी मूल्य; भक्ति आन्दोलन।

**इकाई .15** सूफी प्रेमाख्यानक काव्य; निर्गुण काव्यधारा की ज्ञानमार्गी शाखा; सूफी प्रेमाख्यान; कृष्णभक्ति काव्य की कथ्यगत विशेषता।

Block 5:

**इकाई .16** रीतिकालीन काव्यभाषा; पुनरुत्थानवाद की अवधारणा; छायावाद; भारतेन्दु युगीन नाटक ; तुलनात्मक भाषाविज्ञान; राष्ट्रभाषा और राजभाषा।

**इकाई .17** हिन्दी शब्द की उत्पत्ति एवं विकास; पिजिन और क्रियोल में अन्तर; विज्ञापन की भाषा; भाषा और सामाजिक सन्दर्भ; सार्वभौमिक व्याकरण; हिन्दी की स्वनिम व्यवस्था; अर्थग्रहण की प्रक्रिया; मौखिक तथा लिखित वार्तालाप; ऐतिहासिक ध्वनि प्रक्रिया परिवर्तन; संसक्ति।

**इकाई .18** भाषा शिक्षण के क्षेत्र; व्यतिरेकी विश्लेषण; बहिरंग आलोचना और अंतरंग आलोचना; भाषा शिक्षण की विधि; नुक्कड़ नाटक 'औरत' में स्त्री की समस्याएँ; 'धोखा' निबन्ध की
शैलीगत विशेषताएँ; सप्रसंग व्याख्या।

**इकाई** .19 शुक्ल जी के निबन्धों के भाव और मनोविकार; आचार्य रामचन्द्र शुक्ल की भाषा–शैली; 'संस्कृति और जातीयता'; रेखाचित्र और संस्मरण; ठकुरी बाबा की तत्वों के आधार; प्रेमचंद द्वारा रचित 'कलम का सिपाही'।

**इकाई .20** आत्मकथा 'क्या भूलूँ क्या याद करूँ'; 'किन्नर देश की ओर' की शैली और भाषागत विशेषता; 'अदम्य जीवन' की शिल्पगत विशेषता; 'आक्टेवियो पॉज' नामक साक्षात्कार; व्यंग्य निबन्धकार की दृष्टि से हरिशंकर परसाई; जीवनी और आत्मकथा की तुलना।

**Course Name: Introduction to Computer Applications**

Course Code: BSO-2100 Credits: 2

**Course Objective:**

This is a basic paper for Business Administration students to familiarize with basic principles of computer system including computer arithmetic, hardware, operating system, software applications, internet and world-wide web and their applications in the relevant fields.

**Course Learning Outcomes :** After completing the course, the student shall be able to:

| **Course Outcome** | **Cognitive level** |
|---|---|
| **CO1**-Define the concept of Computer Fundamentals. | Remember |
| **CO2-** Describe the conversion of one base to another base Number System. | Understand |
| **CO3**- Explain the needs of hardware and software required for a computation task. | Understand |
| **CO4** - Demonstrate the use of Operating system. | Understand |
| **CO5** -Demonstrate how a document to be prepared and formatted. | Understand |

*Block I: Computer Basics*

**Unit 1:** Introduction, Characteristics of a Computer, Evolution of Computer, Generations of Computer. **Unit 2:** Classification of Computers, Applications of Computer, Computer Applications in various fields of Science and management,

**Unit 3:** Block Diagram of Digital Computers.

*Block II: Number Systems & Software*

**Unit 4: Number System:** Introduction, Classification of Number System, Types of Number System,
**Unit 5:** Conversions from One Base to Another, Conversion using Shortcut Method.
**Unit 6: Software:** Introduction, Definition & types of Software, Uses of smart-phone, Uses of ICT.

*Block III: Hardware and Memory*

**Unit 7: Hardware:** Introduction, Computer Peripherals Devices, Input and Output Devices with examples.
**Unit 8: Memory:** Introduction, Classification, Hierarchical Chart (Primary memory, Secondary memory,
**Unit 9:** RAM, ROM, PROM, EPROM, EEPROM).

*Block IV: Operating System and DBMS*

**Unit 10: Operating System:** Introduction, Functions of an Operating System, Classification of Operating System (Multi-user, Multiprocessing, Multitasking, Real time).
**Unit 11: DBMS:** Introduction of database, Database Management System (DBMS),
**Unit 12: A**pplication of DBMS.

*Block V: MS Office*

**Unit 13: MS Word:** Introduction, Basic Formatting in MS Word, Advanced Formatting, Printing Documents, Print Preview.
**Unit 14: MS Excel**: Introduction, Workbook, Worksheet, Formatting in excel, Working with formulas, Printing worksheets.
**Unit 15: MS PowerPoint**: Introduction, Creating a Presentation, Basic Formatting in PowerPoint, Inserting charts, Inserting tables, Printing presentations.

**Books Recommended/Suggested Readings:**


1. Rajaraman, "Fundamentals of Computers", Prentice Hall of India, 3rd Edition.
2. Alexis Leon and Mathews Leon," Introduction to computers", Leon Techworld.
3. Yashwant Kanetkar "Unix Shell Programming" BPB.


**Course Name: Chemistry Lab-II**
**Course Code: CHO-1251** **Credits: 2**

**Course Objective:** The objective of Chemistry Lab-II is to provide basic knowledge of different types of elements, functional groups etc. The qualitative estimation of elements, functional group and determination of their physical properties is provided in this study.
**Course Outcomes:** At the end of this study, students will be able to:

1. Determine various types of elements.
2. Identify the functional group present in the compound.
3. Examine the inorganic mixture analysis.
4. Define the separation and identification of ions from Groups zero, I, II, III, IV, V and VI.

**List of Experiments:**

1. Qualitative Organic Analysis:
(A) Detection of elements (X, N, S) (B) Detection of functional groups :

[Ph–OH, –COOH, >C=O, –CHO, R–O–R, –OH, Hydrocarbons, Halogens-containing compounds, $–CONH_2$ , Ar-NH 2 , $Ar-NO_2$ ]

2. Qualitative Inorganic Mixture Analysis:

Inorganic mixture analysis, separation and identification of ions from Groups zero, I, II, III, IV, V and VI, not containing more than 5 ions (2 cations & 2 anions) including interfering anion.

**Recommended Books:**

1.Practicle Organic Chemistry F.G. Mann and B.C. Saunders " Pearson" 2. Elementary Practical Organic Chemistry I. Pearson"

**Subject Code: ZCO-1211**
**Subject: Biochemistry and Physiology** **Credit: 4**

Block 1: Structure and Function of Biomolecules

Unit-1: Structure and Biological importance of carbohydrates (Monosaccharides, Disaccharides, Polysaccharides and Glycoconjugates), Lipids (saturated and unsaturated fatty acids, Tri-acylglycerols, Phospholipids, Glycolipids, Steroids)

Unit-2: Structure, Classification and General properties of α-amino acids; Essential and non-essential α-amino acids, Levels of organization in proteins; Simple and conjugate proteins.

Unit-3: Nomenclature and classification of enzymes; Cofactors; Specificity of enzyme action, Isozymes; Mechanism of enzyme action

Unit-4: Enzyme kinetics; Factors affecting rate of enzyme-catalyzed reactions; Derivation of Michaelis-Menten equation, Concept of Km and Vmax, Lineweaver-Burk plot; Enzyme inhibition, Allosteric enzymes and their kinetics; Regulation of enzyme action

Block 2: Metabolism of Carbohydrates and Lipids

Unit-5: Metabolism of Carbohydrates: glycolysis, citric acid cycle, gluconeogenesis, phosphate pentose pathway, Glycogenolysis and Glycogenesis

Unit-6: Lipids --- Biosynthesis of palmitic acid; Ketogenesis, 8 13, β-oxidation and omega -oxidation of saturated fatty acids with even and odd number of carbon atoms

Unit-7: Catabolism of amino acids: Transamination, Deamination, Urea cycle, Nucleotides and vitamins

Unit-8: Review of mitochondrial respiratory chain, Oxidative phosphorylation, and its regulation

Block 3: Digestion and Respiration
Unit-9: Structural organization and functions of gastrointestinal tract and associated glands, Mechanical and chemical digestion of food; Absorptions of carbohydrates, lipids, proteins, water, minerals and vitamins; Histology of trachea and lung
Unit-10: Mechanism of respiration, Pulmonary ventilation; Respiratory volumes and capacities; Transport of oxygen and carbon dioxide in blood Respiratory pigments, Dissociation curves and the factors influencing it; Control of respiration
Unit-11: Components of blood and their functions, Haemostasis: Blood clotting system, Blood groups: Rh factor, ABO and MN
Unit-12: Structure of mammalian heart, Cardiac cycle; Cardiac output and its regulation, Electrocardiogram, Blood pressure and its regulation, Structure of kidney and its functional unit; Mechanism of urine formation

Block 4: Nervous System and Endocrinology
Unit-13: Structure of neuron, resting membrane potential, Origin of action potential and its propagation across the myelinated and unmyelinated nerve fibers, Types of synapse
Unit-14: Endocrine glands - pineal, pituitary, thyroid, parathyroid, pancreas, adrenal; hormones secreted by them, Classification of hormones; Mechanism of Hormone action
Unit-15: Muscular System Histology of different types of muscle; Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction; Characteristics of muscle twitch; Motor unit, summation and tetanus

**Subject Code: BDO-1211**
**Subject: Archegoniates and Plant Architecture** **Credit:4**

**Course outcomes**: After the completion of the course the students will be able to:
1. Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms
2. Understanding of plant evolution and their transition to land habitat.
3. Understand morphology, anatomy, reproduction and developmental changes therein through typological study and create a knowledge base in understanding the basis of plant diversity, economic values & taxonomy of plants
4. Understand the details of external and internal structures of flowering plants.

**Block 1**
**Unit-I** Unique features of archegoniates, Bryophytes: General characteristics, adaptations to land\ habit, Range of thallus organization.
**Unit-2** Classification (up to family), morphology, anatomy andreproduction of *Riccia*, *Marchantia* , *Anthoceros and Sphagnum*. (Developmental details not tobe included). economic importance of bryophytes .
**Unit-3** General characteristics, Early land plants (*Rhynia*). Classification (up to family) withexamples
**Unit-4** Heterospory and seed habit, stelar evolution, economic importance of Pteridophytes.

**Block-2 Gymnosperms**

**Unit-5** Classification and distribution of gymnosperms; Salient features of Cycadales, Ginkgoales,Coniferales and Gnetales, their examples, structure and reproduction; economic importance

**Unit-6** General account of Cycadofilicales, Bennettitales and Cordaitales; Geological time scale;Brief account of process of fossilization & types of fossils and study techniques.

**Unit-7** Contributionof Birbal SahniMorphology and modifications of roots; Stem, leaf and bud.

**Unit-8** Types of inflorescences;flowers, flower parts, fruits and types of placentation; Definition and types of seeds

**Block-3 Plant Anatomy**

**Unit-9** Meristematic and permanent tissues, Organs (root, stem and leaf).

**Unit-10** Apicalmeristems & theories on apical organization - Apical cell theory.

**Unit-11** Histogen theory, Tunica -Corpus theory.

**Unit-12** Secondary growth - Root and stem- cambium (structure and function) annularrings, Anomalous secondary growth - *Bignonia, Boerhaavia, Dracaena,Nyctanthes*

**Block-4 Reproductive Botany**

**Unit-13** Plant Embryology, Structure of microsporangium, microsporogenesis, , Structure ofmegasporangium and its types, megasporogenesis.

**Unit-14** Structure and types of female gametophyte,types of pollination, Methods of pollination, Germination of pollen grain, structure of malegametophyte,

**Unit 15** Fertilization, structure of dicot and monocot embryo, Endosperm, Doublefertilization, Apomixis and polyembryony.

**Unit-16 Palynology:** Pollen structure, pollen morphology, pollen allergy , Applied Palynology:

Basic concepts, Palaeopalynology, Aeropalynology, Forensic palynology, Role in taxonomic, evidences.

***Books Recommended/Suggested Reading:***

Gangulee H. S. and K. Kar 1992. College Botany Vol. I and II. (New Central Book Agency)

2. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.

3. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.

4. Rashid A (1999) An Introduction to Pteridophyta, Vikas Publishing House Pvt. Ltd. New Delhi.

5. Sharma OP (1990) Textbook of Pteridophyta. MacMillan India Ltd. Delhi.

6. Vashishtha BR, Sinha AK and Kumar A (2010) Botany for Degree Students – Pteridophyta, S. Chand and Company,

7. Vashishtha BR, Sinha AK and Kumar A (2010) Botany for Degree Students – Gymnosperms, S. Chand and

8. Parihar NS (1976) Biology and Morphology of Pteridophytes. Central Book Depot.

9. Bhatnagar SP (1996) Gymnosperms, New Age International Publisher.

10. Pandey BP (2010) College Botany Vol II S. Chand and Company, New Delhi

**Subject Code**: BDO-1251
**Subject: Land Plants Architecture** **Credit: 2**

**Course outcomes:**
1. The students will be made aware of the group of plants that have given rise to land habit and the flowering plants. Through field study they will be able to see these plants grow in nature and become familiar with the biodiversity.
2. Students would learn to create their small digital reports where they can capture the zoomed in and zoomed out pictures as well as videos in case they are able to find some rare structure or phenomenon related to these plants.
3. Develop an understanding by observation and table study of representative members of phylogenetically important groups to learn the process of evolution in a broad sense.
4. Understand morphology, anatomy, reproduction and developmental changes therein through typological study and create a knowledge base in understanding plant diversity, economic values & taxonomy of lower group of plants.
5. Understand the composition, modifications, internal structure &architecture of flowering plants for becoming a Botanist.

**BLOCK-I:**
**Bryophytes:**
Marchantia- morphology of thallus, W.M. rhizoids and scales, V.S. thallus through Gemma cup, W.M. gemmae (all temporary slides), V.S. antheridiophore, archegoniophore, L.S. sporophyte (all permanent slides). *Sphagnum*- morphology, W.M. leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, L.S. capsule and protonema..

**BLOCK-II:**
**Pteridophytes:**
*Lycopodium*: Habit, stem T. S. stobilus V. S., *Selaginella*: Habit, rhizophore T. S, stem T . S, axis with strobilus, V.S. of strobilus, Megasporophyll and microsporophyll.
*Equisetum* - Habit, rhizome and stem T.S. and V. S. of strobilus.
*Azolla* –Habitat & its structure

**BLOCK-III:**
**Gymnosperms**
1. *Cycas* –seedling, coralloid root and coralloid root T. S., T. S. of leaflet and Rachis, micro and megasporophyll, male cone V. S., microsporophyll T. S. entire and V. S. of ovule. *Pinus* - Branch of indefinite growth, spur shoot, T. S of old stem and needle R.L.S and T. L. S. of stem, male and female cone, V.S. of male and female cone.
2. *Ephedra* &*Thuja*: Habit, stem T. S (young and mature), leaf T. S, male and female strobilus, V. S. of male and female cone, ovule V. S. and seed.

**BLOCK-IV:**
**Palaeobotany & Palynology**
1. Morphology of *Rhynia*and fossils gymnosperms & other groups.
2. Visit Birbal Sahni Institute of Palaeosciencesor virtual conference with their scientists

to learn fossilization.
3. Mark and know about Indian geographical sites rich in plant fossils.

**BLOCK-V:**
**Angiosperm Morphology**
1. To study diversity in leaf shape, size and other foliar features.
2. To study monopodial and sympodial branching.
3. Morphology of Fruits
4. Inflorescence types- study from fresh/ preserved specimens
5. Flowers- study of different types from fresh/ preserved specimens
6. Fruits- study from different types from fresh/preserved specimens
7. Study of ovules (permanent slides/ specimens/photographs)- types (anatropous, orthotropous, amphitropous and campylotropous)
8. Modifications in Roots,stems, leaves and inflorescences

**BLOCK-VI:**
**Plant Anatomy:**
Normal & Anomalous secondary thickening - *Bignonia, Dracaena, Boerhaaviadiffusa, Nyctanthes*
Study of primary and secondary growth in the root and stem of monocots and dicots by section cutting and permanent slides.
Study of internal structure of dicot and monocot leaves.
Study of structure of stomata.

**BLOCK-VII:**
**Reproductive Botany**
1. Structure of anther, microsporogenesis and pollen grains
2. Structure of ovule and embryo sac development (through slides).
3. Study of embryo development in monocots and dicots.
4. Vegetative propagation by means of cutting, budding and grafting exercises.
5. Study of seed germination.
6. Study of pollen morphology of the following plants –*Hibiscus, Vinca, Balsam, Ixora, Crotalaria, Bougainvillea* by microscopic observation.
**7.** Calculation of pollen viability percentage using in vitro pollen germination techniques

**BLOCK-VIII:**
**Commercial Uses and Production technology**
1. *Azolla* production
2. Production technology of Resins
3. Production and propagation of Ornamental *Pteris*, Cycadales, Coniferales for landscaping.
4. Lab method for qualitative testing/ extraction of Ephedrine ,Taxol and *Thuj*a oil.

**Suggested Readings:**
Pandey, BP and Trivedi, P.S. 1997. Botany Vol. I(10th edition). Vikas Publishing House.
Pandey, BP; Misra; Trivedi, P.S. 1997. Botany Vol. II. Vikas Publishing House.
Pandey, BP and Chadha. 1997. Botany Vol. III. Vikas Publishing House.
Santra, SC and Chatterjee. 2005. College Botany Practical Vol. I. New Central Book Agency (P) Ltd.

Kumar, S and Kashyap. 2003. Manual of Practical Algae. Campus Books International, New Delhi
Bendre and Kumar A text book of Practical Botany. Vol I,II., Rastogi Pub. Meerut.
Suresh Kumar , Amar Singh Kashyap Manual of Practical Algae.. Campus Books Internet , New Delhi.
Santra, SC. 2005. College Botany Practical Vol. II. New Central Book Agency (P) Ltd.

**Course Name: Optics**
**Course Code: PHO-1211** **Credits: 4**

**Objectives:** To acquire the knowledge of Interference, Fresnel diffraction, Diffraction gratings and Polarization of a light.

**Course outcomes:**
- Explain the geometrical optics • Define the interference of light.
- Explain the diffraction.
- Outline polarization of light wave.

**Block I: Geometrical Optics**
**Unit-1:** Fermat's Principle: - Optical Path, Fermat's Principle of Least Time or Extremum
Path. Examples of Fermat's Principle: (i) Reflection & (ii) Refraction.
**Unit-2:** Lenses: - Transverse Magnification of a Spherically Refracting Surface; Lagrange and Helmholtz Laws
**Unit-3:** Cardinal Points of a Coaxial Optical System; Graphical Construction of Image using Cardinal Points;
**Unit-4**: Deviation produced by a Thin Lens; Equivalent Focal Length of Two Thin Lenses separated by a distance;
**Unit-5:** Thick Lenses; Focal Length of a Thick Lens; Cardinal Points of a Thick Lens.

**Block II: Interference**
**Unit-6:** Interference of a light, the principle of superposition, Two-slit interference
**Unit-7:** Division of Amplitude and Division of Wave front; Fresnel's Biprism; Stoke's treatment.
**Unit-8:** Interference in Thin Films: Parallel and Wedge-shaped Films; Fringes of Equal Inclination (Haidinger Fringes)
**Unit-9:** Fringes of Equal Thickness (Fizeau Fringes). Newton's Rings: Measurement of Wavelength and Refractive Index; Michelson's Interferometer.
**Unit-10:** Temporal and Spatial Coherence; Theory of Partial Coherence; Coherence Time and Coherence Length

**Block III: Diffraction**
**Unit-11:** Fresnel diffraction: - Fresnel's Assumptions; Fresnel's Half-Period Zones for Plane Wave;
**Unit-12:** Explanation of Rectilinear Propagation of Light; Theory of a Zone Plate: Multiple Foci of a Zone Plate; Comparison of a Zone plate with a convex lens.
**Unit-13:** Diffraction due to: (i) a Straight Edge and (ii) a Rectangular Aperture (Slit), (iii) a

Small Circular Aperture, Fresnel's Integrals; Cornu's Spiral.
**Unit-14:** Fraunhofer diffraction: Diffraction due to (i) a Single Slit, (ii) a Double Slit &
**Unit-15:** Plane Transmission Grating; Rayleigh's criterion of resolution; Resolving Power and Dispersive Power of a Plane Diffraction Grating.

**Block IV: Polarization**
**Unit-16:** Polarization of light wave; Production of plane polarized light; Brewster's law;
Malus law; Double Refraction;
**Unit-17:** Retardation plates; Optical activity
**Unit-18:** Nicol prism, polaroid, Half shade and Biquartz polarirneter

**Recommended books:**
- Fundamentals of Optics: Francis Arthur Jenkins and Harvey Elliott White, McGraw-Hill, 1976.
- Optics: Ajoy Ghatak, Tata McGraw Hill, 2008.
- Optics: Eugene Hecht and A R Ganesan, Pearson Education, 2002.
- Light and Optics: Principles and Practices, Abdul Al-Azzawi, CRC Press, 2007.

**Course Name: Differential Equations**
**Course Code: MAO-1211** **Credits: 4**

**Course Objectives:** The main objectives of this course are to introduce the students to the exciting world of Differential Equations and their applications.

**Course Outcomes:** At the end of the course **Differential Equations**, student will be able to

1. Define linear differential equations with constant coefficient
2. Explain first order differential equations including separable, homogeneous, exact and linear.
3. Apply the method of find the solution of Differential equations of the first order but not of the first degree
4. Explain Series solutions of second order differential equations, Legendre and Bessel functions (Pn and Jn only) and their properties
5. Apply the Method of separation of variables for Laplace equation in Cartesian and polar coordinates.

**Block I: Differential Equations**
**Unit-1:** Degree, order and solution of a D.E. and Formation of a differential equation
**Unit-2:** Differential equations of the first order but not of the first degree: Separation of variables method, Solution of homogeneous equations
**Unit-3:** Linear Differential equations and Bernaulli's Equations
**Unit-4:** Exact Differential Equations

**Block II: Differential equations of the first order but not of the first degree**
**Unit-5:** Differential equations which are solvable for $p$
**Unit-6**: Differential equations which are solvable for $y$

**Unit-7:** Differential equations which are solvable for *x*
**Unit-8:** Clairaut's differential equations

**Block III: Higher Order Linear Differential Equation**
**Unit-9:** Rule to find the Complementary function and the Particular Integral.
**Unit-10:** Cauchy's homogenous linear equation and Legendre's linear equation
**Unit-11:** Homogeneous linear differential equations
**Unit-12:** Simultaneous linear differential equations with constant coefficients

Block IV: Series Solutions
**Unit-13:** Series solutions (Power series, Frobenius method)
**Unit-14:** Series solutions of second order differential equations
**Unit-15**: Legendre and Bessel functions (Pn and Jn only) and their properties.
**Unit-16:** Systems of linear first order ordinary differential equations

**Block V: Partial Differential Equations**
**Unit-17:** Order and degree of partial differential equations, Concept of linear and non-Linear partial differential equations
**Unit-18:** Linear partial differential equation of first order
**Unit-19:** Method of separation of variables for Laplace equation in Cartesian and polar coordinates.
**Unit-20:** Wave equation: Cauchy problem and d'Alembert formula.

**Recommended Books:**

- Barnes, Belinda & Fulford, Glenn R. (2015). Mathematical Modeling with Case Studies, Using Maple and MATLAB (3rd ed.). CRC Press, Taylor & Francis Group.
- Edwards, C. Henry, Penney, David E., & Calvis, David T. (2015). Differential Equation and Boundary Value Problems: Computing and Modeling (5th ed.). Pearson Education.
- Ross, Shepley L. (2004). Differential Equations (3rd ed.). John Wiley & Sons. India.


**Course Name: Physics Lab-II**
**Course Code: PHO-1251** **Credits: 2**

**Course Objectives:** To acquire basic knowledge about interference of light, wavelength of sodium light by Newton's Rings and diffraction at a straight edge or a single slit and also understand the Resolving limit of a telescope system.
**Course Outcomes:** After learning this course, students will be able to
1. Explain the perpendicular axes for moment of inertia.
2. Experimental conformation of diffraction at a straight edge or a single slit Experimental understanding the surface tension by Jaeger's method.
3. Study of Resolving limit of a telescope system.

**List of Experiments:**

1. Study of interference of light (biprism or wedge film).
2. To determine the wavelength of sodium light by Newton's Rings.

3. To determine the wavelength of monochromatic light by plane diffraction grating.
4. Study of diffraction at a straight edge or a single slit.
5. Use of diffraction grating and its resolving limit.
6. Resolving limit of a telescope system.
7. Polarization of light by the reflection.
8. Study of optical rotation for any system.

**Recommended Books**


- D. P. Khandelwal, “A laboratory manual for undergraduate classes” (Vani Publishing House, New Delhi).
- S. P. Singh, “Advanced Practical Physics” (Pragati Prakashan,Meerut).
- Worsnop and Flint-Advanced Practical Physics for student.

# Semester III

**COURSE NAME: Physical Chemistry**
**COURSE CODE: CHO-2111** **CREDIT: 3**

**Course Objectives:**

The objective of this course is to explain the different states of matter i.e. solid, liquid and gas. The smallest structural unit of all chemical substances in these states is molecule. How the molecules are arranged in a solid, liquid and gas, is the fundamental question before a chemist. It is the 'molecular model' of matter in these states which determine their physical behaviour. The theory which visualises that all substances, whether solids, liquids or gases are made of molecules in motion is called kinetic molecular theory of matter also discuss in this course. This course also illustrates the concept of chemical kinetics. This unit covers the following topics such as rate of reaction, order of reaction, rate law for different orders of reaction, Arrhenius theory and Catalyst and its effect on the rate of a reaction. The concept of equilibrium, conductivity, electrochemical cell and thermodynamics also discussed in this Course.

**Course Outcomes:**
Students will be able to:
1. Define State of Matter
2. Describe Chemical Kinetics
3. Identify Equilibrium
4. Explain Electrochemistry
5. Illustrate Thermodynamics

**Block 1: States of Matter**

**Unit 1:** Gaseous state: Postulates of Kinetic Theory of Gases and derivation of the kinetic gas equation. Deviation of real gases from ideal behaviour, compressibility factor, causes of deviation. Van der Waals equation of state for real gases. Boyle temperature (derivation not required). Critical phenomena, critical constants and their calculation from van der Waals equation. Andrew's isotherms of $CO_2$. Maxwell Boltzmann distribution laws of molecular velocities and molecular energies (graphic representation – derivation not required) and their importance. Most probable, average and root mean square velocities (no derivation). Collision cross section, collision number, collision frequency, collision diameter and mean free path of molecules.

**Unit 2:** Liquid state: Intermolecular forces, Dipole-dipole interaction, London forces, Hydrogen bonding, Structure of liquids, Characteristic properties of liquids, Vapour pressure, Surface tension, Viscosity, Refractive Index, Definition of RI, Determination of RI, RI and chemical constituent, Liquid Crystals: Definition, Structure of liquid crystals.

**Unit 3:** Solid State: Definition of space lattice and unit cell, forms of solids. Symmetry elements, unit cells, crystal systems, Bravais lattice types and identification of lattice planes.
Laws of Crystallography - Law of constancy of interfacial angles, Law of rational indices.
Miller indices. X–Ray diffraction by crystals, Bragg's law. Structures of NaCl, KCl and CsCl (qualitative treatment only). Defects in crystals.

**Block 2: Chemical Kinetics**

**Unit 4:** Chemical kinetics and its scope, Rate of a reaction, Units of rate, Factors affecting reaction velocity, Order of reaction and molecularity, Zero, First, Second and third order reactions, Integrated law for zero and first order reaction, Rate expression for First order reaction.

**Unit 5:** Rate expression for zero order reaction, Characteristic of zero order reactions, Example of zero order reaction, Rate law for First order reaction, First order reaction, Unit of first order rate constant, Half life time of a reaction, General methods for determination of order of a reaction, Hydrolysis of ester catalysed by hydrogen ion, Rate of radioactive disintegration, Average life, Concept of activation energy, Effect of temperature on reaction rate, Collision theory of reaction rate, Effect of catalyst, Arrhenius equation.

**Unit 6:** Catalyst: Promoters and Catalytic poisoning, negative catalyst, Theories of Catalysis, Activation energy and catalysis, Acid-base catalysis, Enzyme catalysis (Biochemical catalysis): Characteristics of enzyme catalysis, Examples of enzyme catalysis, Mechanism of enzyme catalysis, Kinetics of enzyme catalysis, Industrial application of catalysis.

**Block 3: Equilibrium**

**Unit 7:** Chemical Equilibrium**:** Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium. Distinction between $\Delta G$ and $\Delta G^{o}$, Le Chatelier's principle. Relationships between $K_p$, $K_c$ and $K_x$ for reactions involving ideal gases.

**Unit 8:** Ionic Equilibria: Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.

**Unit 9:** Phase Equilibrium: Phases, components and degrees of freedom of a system, criteria of phase equilibrium. Gibbs Phase Rule and its thermodynamic derivation. Derivation of Clausius – Clapeyron equation and its importance in phase equilibria. Phase diagrams of onecomponent systems (water and sulphur) and two component systems involving eutectics, congruent and incongruent melting points (lead-silver).

**Block 4: Electrochemistry**

**Unit 10:** Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Kohlrausch law of independent migration of ions. Transference number and its experimental determination using Hittorf and Moving boundary methods. Ionic mobility. Applications of conductance measurements: determination of degree of ionization of weak electrolyte, solubility and solubility

products of sparingly soluble salts, ionic product of water, hydrolysis constant of a salt. Conductometric titrations (only acidbase), Ostwald's dilution law.

**Unit 11:** Types of cells, Galvanic Cell, Electro chemical cell, Voltaic cell, Types of reversible electrodes, Gas- metal ion, Metal-metal ion, Metal insoluble salt, Anion and redox electrodes, Electrode reactions, Nernst equation, Derivation of cell E.M.F. and single electrode potential, Standard hydrogen electrode reference electrodes, Standard electrode potential, Single conventions, Electrochemical series and its significance.

**Unit 12:** Reversible and irreversible cells. Concept of EMF of a cell. Measurement of EMF of a cell. Nernst equation and its importance. Types of electrodes. Standard electrode potential. Electrochemical series. Thermodynamics of a reversible cell, calculation of thermodynamic properties: $\Delta G$, $\Delta H$ and $\Delta S$ from EMF data. Calculation of equilibrium constant from EMF data. Concentration cells with transference and without transference. Liquid junction potential and salt bridge. pH determination using hydrogen electrode and quinhydrone electrode. Potentiometric titrations -qualitative treatment (acid-base and oxidation-reduction only).

**Block 5: Thermodynamics**

**Unit 13:** Definition of thermodynamic terms: Temperature, System and surroundings, Homogeneous and heterogeneous system, Types of systems, Intensive and extensive properties , Processes and their type, Reversible and irreversible processes, State of a system, Thermodynamic equilibrium: Thermal, mechanical and chemical equilibrium, Nature of heat and work: Unit of heat, Sign convention of heat, Sign convention of work, Pressure - volume work, Work done in reversible isothermal expansion, Work done in reversible isothermal compression, Work done in irreversible isothermal expansion, State function: Exact and Inexact differentials, The Euler reciprocal relation.

**Unit 14:** First law of thermodynamics , Internal energy, Internal energy and first law of thermodynamics, Mathematical statement of the first law of thermodynamics, Enthalpy of a system, Relation between $\Delta H$ and $\Delta E$, Heat capacity, Heat capacity at constant volume, Heat capacity at constant pressure, Internal energy change with volume and pressure: Relation between $C_P$ and $C_V$, Joule-Thomson effect Joule-Thomson experiment, Explanation, JouleThomson coefficient, Inversion Temperature, Reversible work: isothermal expansion, isothermal compression and adiabatic, Isothermal reversible expansion, Work done in isothermal reversible compression, Maximum work, Work done in isothermal irreversible expansion, Adiabatic expansion, Calculation of dE, and dH.

**Unit 15:** Heat of reaction, Exothermic and endothermic reactions, Relation between enthalpy of reaction at constant volume and at constant pressure, Factors affecting heat of reaction, Enthalpy of reaction or heat of reaction, Variation of heat of reaction with temperature, Different types of heat of reaction (enthalpy of reaction), Heat of combustion, Uses of heat of combustion, Heat of solution, Heat of neutralisation, Some other definitions, Heat of fusion, Heat of vaporisation, Heat of sublimation, Heat of transition, Hess's law of constant heat summation, Application of Hess's law, Bond energies

**Reference/text books:**

1. Barrow, G.M. *Physical Chemistry* Tata McGraw-Hill (2007).
2. Castellan, G.W. *Physical Chemistry* 4th Ed. Narosa (2004).
3. Kotz, J.C., Treichel, P.M. & Townsend, J.R. *General Chemistry*, Cengage Learning India Pvt. Ltd.: New Delhi (2009).
4. Mahan, B.H. *University Chemistry*, 3rd Ed. Narosa (1998).
5. Petrucci, R.H. *General Chemistry*, 5th Ed., Macmillan Publishing Co.: New York (1985).

**Course Name: Basics of Still Photography**
**Course Code**: **JMO – 1103** **Credits: 3**

**Course Objectives:**
The objective of the course is to teach students the development of photography and various types of camera. The course also focuses to inculcate an understanding of camera handling and visual composition. It also focuses to explain various techniques of lighting used in photography.

**Course outcomes:** At the end of the course, student would be able to:

| S. No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | **Demonstrate** still camera and its accessories. | Apply |
| 2. | **Differentiate** genres of photography. | Analyze |
| 3. | **Classify** the various lights and lighting techniques. | Understand |
| 4. | **Demonstrate** the working style and technology new media. | Apply |
| 5. | **Explain** the principles of visual composition. | Understand |
| 6. | **Describe** prominent Indian photographers. | Understand |

**BLOCK I: DEVELOPMENT OF PHOTOGRAPHY**

**UNIT 1:** History and development of photography, Using Still Camera: holding the camera properly

**UNIT 2:** Steadying the camera, snapping shutter, Principles of camera obscura,

**UNIT 3:** Components of Camera: viewfinder, lenses, iris diaphragm, shutter, film chamber, light metre

**UNIT4:** Composition – different types of shots, camera angles and camera movements

**BLOCK II: CAMERAS AND ACCESSORIES**

**UNIT 5:** Types of Cameras: Simple; compact, view camera, range finder and reflex camera, underwater camera, digital camera, Digital Camera

**UNIT 6:** Camera for self-developing material (Polaroid),
**UNIT 7:** Camera accessories: Tripod, Tripod head, Remote Release Lens hood, Flash unit, filters, close up attachment etc.

**UNIT 8:** Types of photography: Adventure, black and white, Brand, Architectural, candid, Fashion, commercial product, event, food, golden hour, nature, landscape, sports, travel photography

**BLOCK III - LENSES AND THEIR USES**

**UNIT 9:** Types of Lenses: Single, Single Focal length and Zoom

**UNIT 10:** Controlling image; angle of view, Aperture and f-no. C.

**UNIT 11:** Depth of field, how depth of field works d. Depth of focus.

**UNIT 12:** Standard Lenses, Telephoto, Wide Angle, Portrait, Macro, Fisheye

**BLOCK IV: LIGHTS AND LIGHTING TECHNIQUES**

**UNIT 9:** Natural Light and Color Temperatures, Types of Studio Lights: Tungsten, Halogen, Mercury, LED, Mono lights

**UNIT 10**: Lighting Design: Key Light, Fill Light, Cutter Lights, Back Light, Spot Lights,

**UNIT 11:** Three point system, four point system

**UNIT 12:** Positioning of Light: High, Eye Level, Low, Natural Light and Color Temperatures

**BLOCK IV: PHOTO-JOURNALISM**

**UNIT 13:** Photojournalism, Importance of Photojournalism,
**UNIT 14:** Photo-Journalist and Tips for photojournalist,
**UNIT 15:** Photo editor, Qualities of photo editor
**UNIT 16:** Eminent Photographer: Raja Deen Dayal, Sunil Janah, Homai Vyarawalla, Henri Cartier Bresson, Raghu Rai, Prashant Panjiar, John Isaac,

**Text books and References**


1. The Magic of Digital Landscape Photography (Lark Photography) by Rob Sheppard, 2010, Sterling
2. Creative Still Life Photography by Bruce Pendleton, 1982, Littlehampton Book Services Ltd
3. Rick Sammon's Creative Visualization for Photographers: Composition, exposure, lighting, learning, experimenting by Rick Sammon 2015, Focal Press

4. Sunlight and Shadows: An Indian Wildlife Photographer's DiarybyM. Y. GhorpadePenguinIndia 2004
5. The History of Photography: 1839 to the Present Day by Beaumont Newhall, 1982, Museum of Modern Art.

**Course Name: Professional Communication**
**Course Code: ENO-1101** **Credit: 2**

**Course Objectives:** Cultivate and develop reading and writing habit to enhance their vocabulary. Understanding necessary communication skills for effective presentation and management.

**Course Outcomes**

By the end of the course, students will be able to build a professional tone. It will develop goodwill among customers and enhance business writing skills also would help them compete.

**Block I. Paragraph Writing**

**Unit- 1** Requisites of good paragraph writing
**Unit- 2** Scientific writing skills
**Unit- 3** Importance of listening and hearing
**Unit- 4** Effective listening skills

**Block II. Personal Skills**

**Unit- 5** Tips for before interview
**Unit- 6** Tips for during and after interview
**Unit- 7** Debates
**Unit- 8** Role play
**Unit- 9** Office etiquettes
**Unit-10** Corporative behaviour
**Unit-11** Group Discussion- Tips

**Block III. Letter Writing: Types and Format**

**Unit-12** Formal letters
**Unit-13** Informal letters
**Unit-14** Business letters
**Unit-15** Official letters
**Unit-16** Job applications

**Block IV. Communication Skills**

**Unit-17** Definition of Communication
**Unit-18** Types of Communication
**Unit-19** Level of Communication

**Unit-20** Flow of Communication

**Unit-21** Barriers to effective Communication

**Block V. Scientific writing skills**

**Unit-22** Techniques of scientific writing

**Unit-23** Plagiarism

**Unit-24** Types of reports

**Unit-25** Lay out of formal report**.**

**Books Reference:**

- Fluency in English part-1, Macmillan, Delhi,2005, Units 1-18
- Business English, Pearson, Delhi,2008, Units 1-3
- Language through Literature (forth coming). Dr. Gauri Mishra, Dr. Ranjana Kaul, Dr. Brat Biswas, Primus Books, Delhi 2005 Chapter 1-17
- Martin Hewing, Advanced English Grammar, CUP, New Delhi, 2010, Unit 1-60.

**Course Name: Chemistry Lab-II**

**Course Code: CHO-1251** **Credits: 1**

**Course Objective:** The objective of Chemistry Lab-II is to provide basic knowledge of different types of elements, functional groups etc. The qualitative estimation of elements, functional group and determination of their physical properties is provided in this study.

**Course Outcomes:** At the end of this study, students will be able to:

1. Determine various types of elements.
2. Identify the functional group present in the compound.
3. Examine the inorganic mixture analysis.
4. Define the separation and identification of ions from Groups zero, I, II, III, IV, V and VI.

**List of Experiments:**

1. Qualitative Organic Analysis:
(A) Detection of elements (X, N, S) (B) Detection of functional groups :

[Ph–OH, –COOH, >C=O, –CHO, R–O–R, –OH, Hydrocarbons, Halogens-containing compounds, $–CONH_2$ , Ar-NH 2 , $Ar-NO_2$ ]

2. Qualitative Inorganic Mixture Analysis:

Inorganic mixture analysis, separation and identification of ions from Groups zero, I, II, III, IV, V and VI, not containing more than 5 ions (2 cations & 2 anions) including interfering anion.

**Recommended Books:**

1.Practicle Organic Chemistry F.G. Mann and B.C. Saunders " Pearson" 2. Elementary Practical Organic Chemistry I. Pearson"

**Paper Code: AGL-1100**
**Paper Name: Environmental Studies** **Credits: 3**

**Course Outcomes:**

Upon successful completion of this course, the student will be able to:

| S. No. | Paper Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | **Recognize** key concepts ecology, environment and eco-sytem | Knowledge |
| 2. | **Describe** the applications of alternative energy sources | Understand |
| 3. | **Solve** the different types of environmental pollution problems | Apply |
| 4. | **Categorize** current environmental issues | Analyze |
| 5. | **Reframe** critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world. | Evaluate |

**Unit I: Multidisciplinary Nature of Environment & Ecosystem**
Environmental Education: Definition, Scope & Importance, Need for Public Awareness, Ecology & Environment, Type and components of Environment, Basics of Environmental Impact Assessment, Sustainable Development.
Eco system: Component of ecosystem, Type of ecosystem, food chain, food web, energy flow Ecological pyramids, Aquatic ecosystem (pond).

**Unit II: Alternative Energy Resources**
Biofuels: Alcohol, Hydrogen production technology, Biofuels from Jatropa.
Green Energy: Sources, efficiency and sustainability, Energy from Biomass and solid waste.
Renewable Energy Resources: solar, wind, hydro, geothermal, fuel cells.

**Unit III: Environmental Pollution**
Water Pollution: Types of pollutants, sources, effect of water pollution on human health.
Air Pollution: Air Pollutants, Sources, Effect of air pollutants on environment and human health, Dispersion of air pollutants.
Noise Pollution: Sources and effects.
Solid Waste Management: Sources and classification of solid wastes, Causes and effects of solid waste, Management of solid waste.

**Unit IV: Current Environmental Issue**
Population growth, Climate Change and Global warming: causes & effects, Acid Rain, Ozone Layer depletion, Photochemical smog, Case Study.

**Unit V: Social Issues and Environment**
Environmental legislations (Air, Water, Environmental protection, Forest and Wild life protection Act), Nongovernmental organizations and their role in environment improvement and education.

***Books Recommended/Suggested Reading:***


1. "Environmental Studies", Smriti Srivastava, S.K. Kataria & Sons, Delhi.
2. "Environmental Science", H. Kaur, Pragati Prakashan, Meerut.
3. "Environmental Studies", Benny Joseph, Tata McGraw Hills-2005.
4. "Environmental Chemistry", V.P. Kudesia, Pragati Prakashan, Meerut.
5. "Environmental Chemistry & Pollution Control", S.S. Dara, S. Chand & Co.


**Subject Code: ZCO-2111**
**Subject: Molecular Biology, Bio instrumentation & Biotechniques Credits: 3**

**Course outcomes:** The student at the completion of the course will be able to have:

- A detailed and conceptual understanding of molecular processes viz. DNA to trait.
- A clear understanding of the processes of central dogma viz. transcription, translation etc. underlying survival and propagation of life at molecular level.
- Understanding of how genes are ultimately expressed as proteins which are responsible for the structure and function of all organisms.
- Learn how four sequences (3 letter codons) generate the transcripts of life and determine the phenotypes of organisms.
- How genes are regulated differently at different time and place in prokaryotes and eukaryotes.

**Block -1: Process of Transcription And Process of Translation**

**Unit-1:** Fine structure of gene, RNA polymerases, Transcription factor sand machinery
**Unit-2:** Formation of initiation complex, Initiation, elongation and termination of transcription in prokaryotes and eukaryotes
**Unit-3:** The Genetic code, Ribosome, Factors involved in translation
**Unit-4:** Amino acylation of t RNA, t RNA-identity, amino acylation RNA synthetase, Initiation, elongation and termination of translation in prokaryotes and eukaryotes

**Block -2:Regulation of Gene Expression I And Regulation of Gene Expression II**

**Unit-5:** Regulation of gene expression in prokaryotes: *lac*and*trp*operons in *E. coli*, Regulation of gene expression in eukaryotes: Role of chromatin in gene expression
**Unit-6:** Regulation at transcription all evel, Post-transcriptional Modifications: Capping, Splicing, Polyadenylation, RNA editing.
**Unit-7:** Regulation of gene expression in eukaryotes, Regulation at translation all evel, Post-translational modifications: protein folding etc.
**Unit-8:** Intra cellular protein de gradation, Gene silencing, RNA interference (RNAi)

**Block -3: Principle and Types of Microscopes And Centrifugation and Chromatography**

**Unit-9:** Principle of Microscopy and Applications, Types of Microscopes: light microscopy, dark field microscopy, phase-contrast microscopy,
**Unit-10:** Fluorescence microscopy, confocal microscopy, electron microscopy
**Unit-11:** Principle of Centrifugation, Types of Centrifuges: high speed and ultracentrifuge, Types of rotors: Vertical, Swing-out, Fixed-angle etc.
**Unit-12:** Principle and Types of Chromatography: paper, ion-exchange, gel filtration, HPLC,

affinity

**Block -4: Spectro photometry and Biochemical Techniques And Molecular Techniques**
**Unit-13:** Biochemical techniques: Measurement of pH, Preparation of buffers and solutions, Principle of Colorimetry/Spectro photometry: Beer-Lambert law
**Unit-14:** Measurement, applications and safety measures of radio-tracer techniques
**Unit-15:** Detection of nucleic acid by gel electrophoresis, DNA sequencing DNA finger printing, RFLP
**Unit-16:** Polymerase Chain Reaction (PCR), Detection of proteins, PAGE, ELISA, Western blotting

**Suggested Readings:**


1. Lodishetal: Molecular Cell Biology: Freeman & Co, USA (2004).
2. Albert setal: Molecular Biology of the Cell: Garland (2002).
3. Cooper: Cell: A Molecular Approach: ASM Press (2000).
4. Karp: Celland Molecular Biology: Wiley (2002).
5. Watsonetal. Molecular Biology of the Gene. Pearson (2004).
6. Lewin. Genes VIII. Pearson (2004).
7. Pierce B. Genetics. Freeman (2004).
8. Sambrook*etal.* Molecular CloningVolsI,II,III.CSHL(2001).
9. Primrose. Molecular Biotechnology. Panima(2001).
10. Clark & Switzer. Experimental Biochemistry. Freeman (2000)


**Subject Code: BDO-2111** **Credits:4**
**Subject: Flowering Plants Identification & Aesthetic Characteristics**

**Course outcomes:** After the completion of the course the students will be able to:
1. To gain an understanding of the history and concepts underlying various approaches to plant taxonomy and classification.
2. To learn the major patterns of diversity among plants, and the characters and types of data used to classify plants.
3. To compare the different approaches to classification with regard to the analysis of data.
4. To become familiar with major taxa and their identifying characteristics, and to develop in depth knowledge of the current taxonomy of a major plant family.
5. To discover and use diverse taxonomic resources, reference materials, herbarium collections, publications.
6. For the entrepreneur career in plants, one can establish a nursery, Start a landscaping business, Set up a farm Or Run a plantation consultancy firm.

**Block-1 Taxonomic Resources & Nomenclature &Types of classification & Evidences**
**Unit-1** Components of taxonomy (identification, nomenclature, classification) ; Taxonomic resources: Herbarium- functions & important herbaria, Botanical gardens, Flora, Keys- single access and multi-access.
**Unit-2** Principles and rules of Botanical Nomenclature according to ICN (ranks and names; principle of priority, binomial system; type method, author citation, valid publication).
**Unit-3** Artificial, natural and phylogenetic. Bentham and Hooker (upto series), Engler and Prantl (upto series) angiosperm phylogeny group (APG IV) classification.

**Unit-4** Introduction to taxonomic evidences from palynology, cytology, phytochemistry & Molecular biology data (Protein and Nucleic acid homology).

**Block-2 Identification of Angiospermic families -I: (Families can be chosen University wise as per local available flora) & Identification of Angiospermic families -I: (Families can be chosen University wise as per local available flora)**

**Unit-5** A study of the following families with emphasis on the morphological peculiarities

**Unit-6** Economic importance of its members (based on Bentham & Hooker's system) Ranunculaceae, Malvaceae, Rutaceae, Fabaceae, Myrtaceae , Cucurbitaceae, Rubiaceae, Asteraceae, Apocynaceae, Acanthaceae, Asclepiadaceae, Solanaceae.

**Unit-7** A study of the following families with emphasis on the morphological peculiarities

**Unit-8** Economic importance of its members (based on Bentham & Hooker's system) Amaranthaceae, Euphorbiaceae, Papaveraceae, Apiaceae, Lamiaceae, Orchidaceae, Liliaceae, Musaceae, Poaceae.

**Block-3 Modern trends in Plant taxonomy: & TOOLS & SOFTWARES IN PLANT IDENTIFICATION-**

**Unit-9** Brief idea on Phenetics, Biometrics

**Unit-10** Cladistics (Monophyletic, polyphyletic and paraphyletic groups; Plesiomorphy and apomorphy).

**Unit-11** GIS ( Mapping of (i) Patterns(ii) Features (iii) Quantities 0P02.010H11YLIP - Free Phylogenetic Software, Digital Taxonomy (e-flora)

**Unit-12** Description Language for Taxonomy – DELTA Internet directory for botany.

**Block-4 Computer usage & Android Applications & Aesthetic Characteristics of Plants:**

**Unit-13** MS Office: PPT, Microsoft Excel, data entry, graphs, aggregate functions, formulas and functions, number systems, conversion devices, secondary storage media.

**Unit-14** GPS tagging, Plant Identification Apps.

**Unit-15** Aesthetic characteristics of plants, English, Italian, French, Persian, Mughal and Japanese gardens; Features of a garden (Garden wall, Fencing, Steps, Hedge, Edging, Lawn, Trees, shrubs and shrubberies, climbers and creepers, rockery, Flower beds, Shrubbery, Borders, Water garden).

**Unit-16** Some Famous gardens of India. Conservatory, green houses, Indoor garden, Roof garden, Topiary, Bonsai.

**Suggested Readings:**

**Course Books published in Hindi may be prescribed by the Universities.**

1. Plant Systematics. Arun K. Pandey & Shruti Kansana. 2020. Jaya Publishing House.
2. Bole, P. V. and Vaghani, Y. (1986) Field guide to the common trees of I ndia. Oxford University Press; Bombay.
3. Brandis, D. (1906) Indian Trees (London, 5th edition. 1971). International Book Distributors; Dehra Dun.
4. Dallwitz, M. J., Paine, T. A. and Zurcher, E. J. (2003). Principles of interactive keys. http://delta-intkey.com
5. https://www.naace.co.uk/school-improvement/ict-mark/
6. https://www.socitm.gov.uk, (2002) Learning in the 21st century Executive briefing A Socitm Insight publication, July 2002 Socitm.

7. K. B. Anjaria, (2015)"Electronic Herbarium and Digital Database Preparation of Common Trees of Anand District, Gujarat" MRP submitted to UGC, WRO, Pune 2015 (unpublished)
8. Lizeron Eremias and R. Subash.(2013) "E-Content Development: A Milestone In The Dynamic Progress Of E- Learning" International Journal of Teacher Educational Research (IJTER) Vol.2 No.1 January, 2013 ISSN: 2319- 4642
9. Pandey, B.P. 2007. Botany for Degree Students: Diversity of Seed Plants and their Systematics, Structure, Development and Reproduction in Flowering Plants. S. Chand & Company Ltd,New Delhi.
10. Stace, C. A. 1989. Plant Taxonomy and Biostatistics (2nd Ed.). Edward Arnold, London.

**Subject Code: ZCO-2151** **Credits:1**
**Subject: Bioinstrumentation & Molecular Biology Lab**

**Course outcomes:** The student at the completion of the course will be able to
- Understand the basic principles of microscopy, working of different types of microscopes
- Understand the basic techniques of centrifugation and chromatography for studying cells and separation of biomolecules
- Understand the principle of measuring the concentrations of macromolecules in solutions by colorimeter and spectrophotometer and use them in Biochemistry.
- Learn about some of the commonly used advance DNA testing methods.

**BLOCK-I:**
1. To study the working principle and Simple, Compound and Binocular microscopes.
2. To study the working principle of various lab equipments such as pH Meter, Electronic balance, use of glass and micropipettes, Laminar flow, Incubator, Waterbath, Centrifuge, Chromatography apparatus, etc.

**BLOCK-II:**
1. To prepare solutions and buffers.
2. To measure absorbance in Colorimeter or Spectrphotometer.
3. Demonstration of differential centrifugation to fractionate different components in a mixture.

**BLOCK-III:**
1. To prepare dilutions of Riboflavin and verify the principle of spectrophotometry.
2. To identify different amino acids in a mixture using paper chromatography.
3. Demonstration of DNA extraction from blood or tissue samples.
4. To estimate amount of DNA using spectrophotometer. spectrophotometer.

**BLOCK-IV:**

**Virtual Labs (Suggestivesites)**
www.labinapp.com
www.uwlax.edu
www.labster.com
www.onlinelabs.in
www.powershow.in
https://vlab.amrita.edu

**Suggested Readings:**
1. Sambrook et al .Molecular Cloning Vols I, II, III. CSHL (2001).

2. Primrose. Molecular Biotechnology. Panima (2001).
3. Clark & Switzer. Experimental Biochemistry. Freeman (2000)

**Course Name: Thermodynamics**
**Course Code: PHO-2111** **Credits: 4**

**Objectives:** The objective of this course is to understand the basic concepts of thermodynamics, second and third law of thermodynamics. Also, to understand the thermodynamic relationships, blackbody radiation and different laws.

**Course outcomes:**

- Understand the basic concepts of thermodynamics
- Explain second and third law of thermodynamics
- Explain thermodynamic relationships
- Describe blackbody radiation
- Discuss about the different laws

**Block I: An Introduction to Thermodynamics**

**Unit-1:** The laws of thermodynamics, The Zeroth law, various indicator diagrams, work done by and on the system.

**Unit-2:** First law of thermodynamics, internal energy as a state function and other applications.

**Unit-3:** Reversible and irreversible changes, Carnot cycle and its efficiency, Carnot theorem.

**Block II: Second and third Law of Thermodynamics**

**Unit-4:** The second law of thermodynamics. Different versions of the second law, practical cycles used in internal combustion engines

**Unit-5**: Entropy, principle of increase of entropy. The thermodynamic scale of temperature; its identity with the perfect gas scale.

**Unit-6:** Impossibility of attaining the absolute zero; third law of thermodynamics.

**Block III: Thermodynamic Relationships**

**Unit-7:** Thermodynamic variables; extensive and intensive, Maxwell's general relationships **Unit-8:** Application to Joule-Thomson cooling and adiabatic cooling in a general system, **Unit-9:** Van der Waals gas, Clausius-Clapeyron heat equation.

**Block IV: Black Body Radiation**

**Unit-10:** Thermodynamic potentials and equilibrium of thermodynamical systems, relation with thermodynamical variables.

**Unit-11:** Cooling due to adiabatic demagnetization, production, and measurement of very low temperatures.

**Unit-12:** Blackbody radiation, Pure temperature dependence, Stefan-Boltzmann law, pressure of radiation.

**Block V: Different Laws**

**Unit-13:** Spectral distribution of Black body radiation, Wien's displacement law

**Unit-14:** Rayleigh-Jean's law

**Unit-15:** Planck's Law, the ultraviolet catastrophe.

**Recommended Books**

- G.G. Agarwal and H.P. Sinha "Thermal Physics".
- S.K. Agarwal and B.K. Agarwal "Thermal Physics"

**Course Name: Algebra**
**Course Code: MAO-2111** **Credits: 4**

**Course Objectives:** The objective of the course is to introduce the fundamental theory of groups and their homomorphisms. Symmetric groups and group of symmetries are also studied in detail. Fermat's Little theorem as a consequence of the Lagrange's theorem on finite groups.

**Course Outcomes:**

After completing this course, the student will be able to:

1. Recall the basic concepts of group actions and their applications.
2. Explain the significance of the notions of cosets, normal subgroups and integral domain.
3. Compute the expression of permutation groups by using permutation multiplication.
4. Understand the homomorphism by using the relationship between groups
5. Outline the fundamental concepts in ring theory such as the concepts of ideals, quotient rings, integral domains, and fields.

**Block 1: Elementary Groups Theory**
**Unit 1:** Sets and Function
**Unit 2:** Groups
**Unit 3:** Subgroups
**Unit 4:** Classification of subgroups of cyclic groups.

**Block 2: Normal Group**
**Unit 5:** Normal subgroups. **Unit 6:** Factor groups.
**Unit 7:** Cauchy's theorem for finite abelian groups.
**Unit 8:** Finite Groups

**Block 3: Permutation Group**
**Unit 9:** Permutation Groups **Unit 10:** Finite Groups
**Unit 11:** Lagrange's theorem
**Unit 12:** Fermat's Little theorem;

**Block 4: Group Homomorphism and Isomorphism**
**Unit 13:** Group homomorphism
**Unit 14:** Group isomorphism's
**Unit 15:** Cayley's theorem

**Unit 16:** Free Group

**Block 5: Ring Theory**

**Unit 17:** Definition and examples of Rings. **Unit 18:** Rings of Matrices.
**Unit 19:** Subrings and ideals
**Unit 20:** Integral domains and fields.

**Recommended Books:**


- Gallian, Joseph. A. (2013). Contemporary Abstract Algebra (8th ed.).
- Cengage Learning India Private Limited, Delhi. Fourth impression, 2015.
- Rotman, Joseph J. (1995). An Introduction to The Theory of Groups (4th ed.). Springer Verlag, New York.


**Course Name: Physics Lab-III**
**Course Code: PHO-2151** **Credits: 1**

**Course Objectives:** To acquire basic knowledge about determination of temperature dependence of total radiation.
**Course Outcomes:** After learning this course, students will be able to

1. Explain Experimental determination of temperature dependence of total radiation.
2. Experimental conformation of Resistance thermometry
3. Experimental understanding the Charging and discharging in R.C. and R.C.L. circuits.
4. Study of A.C. Bridges.

**List of Experiments:**

1. Study of temperature dependence of total radiation.
2. Study of temperature dependence of spectral density of radiation.
3. Resistance thermometry.
4. Thermo-emf thermometry
5. Conduction of heat through poor conductors of different geometries.
6. To determine the coefficient of viscosity by capillary tube.
7. Charging and discharging in R.C. and R.C.L. circuits.
8. High resistance by leakage.
9. A.C. Bridges.
10. Half wave and full wave rectifiers.

**Recommended Book:**


- D.P. Khandelwal, “A Laboratory Manual for Undergraduate Classes (Vani Publishing House, New Delhi).
- S.P. Singh, “Advanced Practical Physics” (Pragati Prakashan, Meerut).
- Worsnop and Flint- Advanced Practical physics for student

# Semester IV

**COURSE NAME: Analytical Chemistry**
**COURSE CODE: CHO-2211** **CREDIT: 3**

**Course Objectives:**

The objective of this course is to acquire basic concepts, principles, and techniques of modern analytical chemistry that would empower students with an analytical mind set and the abilities to solve diverse analytical problems in an efficient and quantitative way that conveys the importance of accuracy and precision of the analytical results.

**Course Outcomes:**

After learning this course, students will be able to

6. Explain the Introduction to Analytical Chemistry.
7. Evaluate the Analytical Data
8. Define Equilibrium
9. Understand Gravimetric and Titrimetric Methods
10. Illustrate Spectroscopic Methods

**Block 1: Introduction to Analytical Chemistry**

**Unit 1:** Analytical Chemistry, Analytical perspective, common problems related to analytical chemistry, fundamental units of measures, significant figures.

**Unit 2:** Concentration: Molarity, normality, molality, weight, volume and weight to volume ratio, converting between concentration units, p-functions, stoichiometric calculations, basic equipment, preparing solution.

**Unit 3:** Analysis, determination, measurement, techniques, methods, procedure and protocol, classifying analytical techniques, selecting an analytical method: accuracy, precision, sensitivity, specificity and selectivity, scale of operation, equipment, time, cost and making the final choice, developing the procedure, importance of analytical methodology.

**Block 2: Evaluating the Analytical Data**

**Unit 4:** Characterizing measurements and results: measures of central tendency and measures of spread, characterizing equipment errors: errors that affect accuracy, precision, errors and uncertainty, propagation of uncertainty, distribution of measurement and results: population, sample, probability distribution for populations and sample, confidence intervals for population and sample.

**Unit 5:** Statistical analysis of data: significance test, constructing a significant test, one-tailed and two-tailed significant test and errors in significant test, statistical methods for normal distribution: comparing $\bar{x}$ to $\mu$, $s2$ to $\sigma2$, comparing two sample variance, comparing two sample means, detection limits.

**Unit 6:** Excel and R to analyze data: excel and R, Analytical standards: primary and secondary standards, other reagents and preparing a standard solutions, calibrating the signals, determining the sensitivity: single vs. multiple point standards, external standards, standard additions, internal standard, Linear regression and calibration

curves: Liner regression of straight line calibration curve, unweight linear regression with errors in y, weight linear regression with errors in y, weight linear regression with errors both in x and y, curvilinear and multivariate regression.

**Block 3: Equilibrium**

**Unit 7:** Chemical reaction, rate constant, types of equilibrium, Gibbs free energy and the equilibrium constant, Equilibrium constants for chemical reactions: precipitation reaction, acid-base reaction, complexation reaction and redox reaction, Le-Chatelier's Principle: temperature, pressure and concentration effect on equilibrium, Catalyst, completeness of reaction.

**Unit 8:** Ladder diagrams: Acid-base equilibrium, complexation equilibrium, and reduction/oxidation equilibrium, Solving equilibrium problems: solubility of simple salt, common ion effect, pH scale, pH of monoprotic weak acid and polyprotic acid or base, Effect of complexation on solubility.

**Unit 9:** Buffer solution: Buffer, types of buffer solution, indicators, phenolphthalein, methylorange, theories of acid-base indicators, hydrolysis of salts and solubility product calculations based on these concepts.

**Block 4: Gravimetric and Titrimetric Methods**

**Unit 10:** Overview of gravimetric method, types of gravimetric methods, conservation of mass, importance of gravimetric methods, Precipitation Gravimetry: Theory, qualitative and quantitative application, Thermogravimetry, Particulate Gravimetry.

**Unit 11:** Titrimetric methods: Introduction, equivalence point, end point, volume as a signal , titration curve and buret, Acid-Base Titration: acid-base titration curve, end point, titration in non-aqueous solvent, qualitative application and applications, Complexation Titration: EDTA, properties of EDTA, complexometric EDTA titration curve, end point and quantitative application.

**Unit 12:** Redox titration: Introduction, redox-titration curve, end point determination and quantitative applications, Precipitation Titrations: titration curve, end point evaluation, quantitative application and evaluation of precipitation titrimetric.

Block 5: Spectroscopic Methods

**Unit 13:** Introduction to spectroscopy, electromagnetic radiation, electromagnetic spectrum, basic components of spectroscopic instruments, Absorption spectra, Lambert-beer's law, absorbance, transmittance.

**Unit 14:** UV Spectroscopy: introduction, electronic transitions, Chromophores and auxochromes, shifts in intensity, solvent used in UIV spectroscopy, Woodward-Fieser rule for conjugated dienes and trienes, UV spectra of aromatic compounds, Applications of UV Spectroscopy.

**Unit 15:** Infrared (IR) Spectroscopy: Introduction, vibrational modes of Polyatomic Molecules, Group frequencies and analysis, applications of IR Spectroscopy.

**Reference/Text Book**


1. "A Text book of Soil Chemical Analysis" by Hessee P R
2. "Principles of Analytical Chemistry: A Textbook" by Miguel Valcarcel
3. "Analytical Chemistry: An Introduction" by Douglas A. Skoog, Donald M. West and F. James Holler.
4. "Analytical Chemistry: A Chemist and Laboratory Technician's Toolkit" by Bryan M. Ham and Aihui MaHam.
5. "Principles and Practice of Analytical Chemistry" by Fifield, Gary H., and David Kealey


**Course Name: Hindi-II**
**Course Code: HNO–2101** **Credits: 2**

## Course Objective:

सीओ 1: प्रत्येक काल के प्रख्यात हिंदी लेखकों की पहचान करना। सीओ 2: हिंदी साहित्य में आधुनिककाल के उद्भव का कारण समझना। सीओ 3: आधुनिक काल की साहित्यिक प्रवृत्तियों को समझना।
सीओ 4: हिंदी नाटक, लघुकथा और उपन्यास के विकास के इतिहास को समझना।

## Course Outcomes:

1- छात्रों में व्याकरण संबंधी सूत्रों के उच्चारण एवं सृजनात्मक क्षमता की वृद्धि करना।
2- छात्रों में चिंतन की प्रवृत्ति का विकास करना।
3- छात्रों को भाषा के व्यवहारिक विश्लेषण में निपुण बनाना।
4- छात्रों को व्यवहारिकता का ज्ञान कराना तथा अन्य विषयों का साहित्यिक अध्ययन कराना।

**Block - 1**

**इकाई .1 प्रेमचन्द का व्यक्तित्व एवं जीवन दृष्टि :–** उद्देश्य ; प्रस्तावना ; प्रेमचन्द का व्यक्तित्व, पारिवारिक और सामाजिक परिवेश, व्यक्तित्व का निर्माण, ई में तेलन का आरम्भ, उर्दू से हिन्दी में आगमन, प्रेस और निजी प्रकाशन ; प्रेमचन्द की जीवनदृष्टि, राष्ट्रीय चेतना, विचारधाराओं का प्रभाव, किसानों से लगाव, नारी दृष्टि, साम्प्रदायिक सोच, पतित चेतना।

**इकाई .2 प्रेमचन्द का व्यक्तित्व एवं जीवन दृष्टि :–**

उद्देश्य ; प्रस्तावना ; प्रेमचन्द का कथा साहित्य, उपन्यास, कहानी ; प्रेमचन्द के नाटक ; विविध साहित्य, जीवनी, बालसाहित्य, पत्र–साहित्य ; अनूदित साहित्य ; वैचारिक साहित्य, साहित्य विषयक निबन्ध और टिप्पणियाँ, साहित्येतर विषयक निबन्ध और टिप्पणियाँ, पत्रकारिता।

**इकाई 3 प्रेमचन्द की साहित्यिक मान्यताएँ** उद्देश्य ; प्रस्तावना ; प्रेमचन्द के साहित्य सम्बन्धी विचार, उपन्यास सम्बन्धी विचार, कहानी सम्बन्धी विचार ; यथार्थवाद और आदर्शवाद सम्बन्धी विचार।

**इकाई 4 प्रेमचन्द के उपन्यास और हिन्दी आलोचना** उद्देश्य ; प्रस्तावना ; प्रेमचन्द की समकालीन आलोचना ; परवर्ती आलोचना (1936–60) ;
सन् साठ के बाद की आलोचना ; सन् अस्सी के बाद की आलोचना।

**इकाई 5 सेवासदन : शिल्प–संरचना (औपन्यासिक शिल्प)** उद्देश्य ; प्रस्तावना ; वस्तु और रूप का संम्बन्ध ; शिल्प की तलाश का प्रश्न ; सेवासदन का वस्तु–संगठन और उसकी औपन्यासिकता ; पात्र–संरचना और भाषा की समस्या ; प्रभावान्विति का प्रश्न और शीर्षक की सार्थकता ; प्रेमचन्द की रचना–दृष्टि।

**इकाई 6 सेवासदन की नायिक (सुमन)** उद्देश्य ; प्रस्तावना ; सुमन : दारोगा कृष्णचन्द्र की कन्या के रूप में ; सुमन : पं. गजाधर की पत्नी के रूप में ; सुमन : वेश्या के रूप में ; सुमन : विधवाश्रम की सेविका के रूप में ; सुमन : परिवार की सदस्या के रूप में ; सुमन : सेवासदन की संचालिका के रूप में ; सुमन के चरित्रांकन में निहित प्रेमचंद का उद्देश्य।

**Block - 2**

**इकाई. 7 प्रेमाश्रम और कृषि समस्या :–** उद्देश्य ; प्रस्तावना ; प्रेमाश्रम के रचनाकाल में खेतिहर समाज की स्थिति और गति, अवध का किसान–आन्दोलन और प्रेमाश्रम ; समस्या का अवलोकन–बिंदु ; समस्या के विभिन्न पहलुओं की शिनाख्त, जमीदारी प्रथा का अपरिहार्य परिणाम : उत्पादकता का ह्रास और लगान में बढ़ोत्तरी, लगान के संदर्भ में ब्रिटिश साम्राज्यवाद और जमींदार वर्ग के संबंध पर कथाकार का दृष्टिकोण, किसानों के शोषण के अन्य रूप, जमींदार वर्ग के बदलते हुए चरित्र का रेखांकन ; समस्या का समाधान। **इकाई .8 प्रेमाश्रमयुगीन भारतीय समाज और प्रेमचंद का आदर्शवाद** उद्देश्य ; प्रस्तावना ; प्रेमचन्द की उपन्यास–दृष्टि : आदर्शोन्मुख यथार्थवाद ; प्रेमाश्रम में तत्कालीन समाज की तस्वीर, जमींदार, किसान, मध्यम वर्ग ; कथाकार का आदर्शवाद।

**इकाई . 9 प्रेमाश्रम का औपन्यासिक शिल्प इकाई की रूपरेक्षा** उद्देश्य ; प्रस्तावना ; प्रेमाश्रम की कथावस्तु एवं कथा संयोजन ; प्रेमाश्रम में सामाजिक–सांस्कृतिक चित्रण ; प्रेमाश्रम की पात्र–योजना, प्रमुख पुरुश पात्र, प्रमुख नारी पात्र ; भाषिक–योजना।

**इकाई 10 ज्ञानशंकर का चरित्र** उद्देश्य ; प्रस्तावना ; ज्ञानशंकर के चरित्र–विधान में प्रेमचंद की दृष्टि ; प्रमुख पारिवारिक सदस्यों के साथ ज्ञानशंकर का संबंध, ज्ञानशंकर और प्रेमशंकर, ज्ञानशंकर और प्रभाशंकर, ज्ञानशंकर और रायसाहब कमलानंद, ज्ञानशंकर और गायत्री तथा विद्या ; ज्ञानशंकर : एक जमींदार के रूप में ; ज्ञान शंकर की चारित्रिक विशेषताएँ ;ज्ञान शंकर की जीवन–दृष्टि ।

## Block - 3

**इकाई .11 परिशिष्ट : प्रेमाश्रय इकाई .12 रंगभूमि और औद्यागकीकरण की समस्या** उद्देश्य ; प्रस्तावना ; औद्योगिकीकरण तथा भारत में उसका महत्व ; उपन्यास की मुख्य विषय वस्तु, सूरदास का विरोध, मि. जॉनसेवक के तर्क, प्रेमचंद का दृष्टिकोण, मि. जॉनसेवक एवं सूरदास का संघर्ष ; अंग्रेजी राज की भूमिका।

**इकाई 13 रंगभूमि पर स्वाधीनता आंदोलन और गांधीवाद का प्रभाव** उद्देश्य ; प्रस्तावना ; स्वाधीनता आंदोलन का स्वरूप एवं पृष्ठभूमि, गांधीजी और असहयोग आंदोलन ; रंगभूमि में अंग्रेज ; अंग्रेजों के समर्थकों की स्थिति ; रंगभूमि में स्वाधीनता आंदोलन, डॉ. गांगुली और कौंसिल, वीरपाल सिंह और सशस्त्र संघर्ष, रानी जाह्नवी और धार्मिक दृष्टिकोण, विनय और सेवा समिति ; सूरदास और असहयोग।

**इकाई 14 रंगभूमि का औपचारिक शिल्प** उद्देश्य ; प्रस्तावना ; रंगभूमि में आदर्शोन्मुख यथार्थवाद ; प्रेमचंद की वर्णन कला ; रंगभूमि का ढाँचा ; रंगभूमि के पाठक ; भाषिक संरचना।

## Block - 4

**इकाई 15 गबन और राष्ट्रीय आंदोलन** उद्देश्य ; प्रस्तावना ; प्रेमचंद की रचना का उद्देश्य और 'गबन' ; गबन में राष्ट्रीय आंदोलन के चित्रण का ऐतिहासिक संदर्भ ; गबन और राष्ट्रीय आंदोलन में मध्यवर्ग की भूमिका ; गबन और राष्ट्रीय आंदोलन में निम्नवर्ग की दृष्टि ; गबन में चित्रित राष्ट्रीय आंदोलन और महिलाएँ ; राष्ट्रीय आंदोलन में पुलिस तथा नौकरशाही की भूमिका का चित्रण।

**इकाई 16 गबन और मध्यवर्गीय समाज** उद्देश्य ; प्रस्तावना ; गबन का रचनात्मक उद्देश्य ; मध्यवर्गीय परिवार की कथा ; गबन के पात्र, दयानाथ, रमानाथ, जालपा, अन्य स्त्री पात्र, अन्य वर्गों के पात्र।

**इकाई 17'गबन' का औपन्यासिक शिल्प** उद्देश्य ; प्रस्तावना ; उपन्यास का ढाँचा : कथानक ; गबन का कथानक : घटना प्रधान, चरित्र प्रधान या नाटकीय ; शिल्प की प्रविधियाँ, उपन्यास के वर्णन की शैली, पाठक की अवस्थिति, लेखक का पाठक के साथ सम्बन्ध, दृश्य का नाटकीय रूप में प्रस्तुतीकरण ; आदर्शोन्मुख यथार्थवाद ; गबन की भाषा ।

**Course Code: BSO-2101**
**Course Name: E-Marketing** **Credits: 3**

**Course objectives:** To provide insight thorough understanding of the principles and practices associated with using the internet to market goods and services.

**Course Learning Outcomes**
After completing the course, the student shall be able to:

| Course Outcome | Cognitive level |
|---|---|
| CO1: Describe the concept of marketing. | Understand |
| CO2: Describe the concept of E-Marketing. | Understand |
| CO3: Comprehend the importance of e-marketing management . | Understand |
| CO4: Understand the concept of internet marketing. | Understand |
| CO5: Know the basic concepts of direct marketing. | Understand |

**Block: I: Introduction**

**Unit - 1:** Concept, Nature and Importance of Marketing,
**Unit - 2:** Basics of Market Segmentation and Targeting.
**Unit - 3:** An overview of Marketing Decision.

**Block: III: E-Marketing**

**Unit - 4:** Concept and nature of e-marketing, E-marketing Vs Traditional marketing:
**Unit - 5:** Issues, Challenges and opportunities for e-marketing, Reason for growth of e-marketing,
**Unit - 6:** Tools and techniques of e-marketing, advantages and disadvantages, e-marketing situations.

**Block: III: E-Marketing Management**

**Unit - 7:** Segmentation, Targeting and positioning,
**Unit - 8:** E-marketing and customer relationship management- concept and scope, E-customers and their buying process,
**Unit - 9:** E-marketing and customer loyalty and satisfaction, Communities and social networks.

**Block: IV: Internet Marketing**

**Unit - 10:** Concept and role of Internet Marketing, Website design and Domain name branding, Search engine optimization- Function,
**Unit - 11:** Type of traffic, Keywords and steps in search engine optimization,
**Unit – I2:** Internet advertising- Types and Tracking ROI, Online PR, News and reputation Management.

**Block: V: Direct Marketing**

**Unit – I3:** Direct Marketing- Concept, Scope and growth, E-mail marketing,
**Unit – I4:** Social media marketing, concept and tools, Blogging- Benefits, Types,
**Unit – I5:** Video- Marketing for Business Purpose- Tools and Techniques, Pay per Click marketing: Issues and Challenges.

**Books Recommended/Suggested Reading:**

1. Strauss, Judy, and Raymond Frost- E-Marketing, Prentice Hall.
2. Hanson Ward A, Principle of Internet Marketing, South Western College Publication Division of Thomson Learning.
3. Chaffey D F Chadwick Ellis, Mayer R and K Johnson, Internet Marketing, Strategy Implementation and Practice, Prentice Hall.
4. Hanson W A and K Kalyanam, Internet Marketing & e-Commerce, South-Western College Publication.

**Course Code: ECO-0001** **Credits: 3**
**Course: Renewal Sources of Energy**

**Block -1 Energy Sources**
**Unit-1** Introduction to energy, Different forms of energy, Energy sources and their availability.
**Unit-2** Conventional and non-conventional sources energy, Conventional energy sources- Fossil fuel energy.
**Unit-3** Hydraulic energy, Non-Conventional Energy Sources-Wind energy, Tidal energy, Solar energy, Nuclear energy

**Block -2 Solar Energy**
**Unit-4** Introduction, Solar Constant, Solar Radiation at the Earth's Surface, Instruments for measuring solar radiation and sun shine, Pyranometer, Sun Shine Recorder, Solar Energy Utilization – Basic ideas about the pre-historic way of using solar energy.
**Unit-5** Solar Energy applications, Solar Collectors, Flat plate collectors (non-concentrating), Concentrating (focusing) type solar collector, Solar Cooker & its types
**Unit-6** Solar Water heater, Solar distillation, Solar Pumping, Electricity from Solar Energy, Solar Photo Voltaics, Applications of Solar Photo-Voltaic System in Rural Areas,

**Block -3 Bio Energy**
**Unit-7** Introduction, Advantages of Bio Gas technology, Bio Gas and its Compositions, History of Bio-gas, Process of Bio gas, generation – Wet Process, dry Process, Raw Materials available for Bio gas Fermentation.
**Unit-8** Selection of site for Installation of a Bio gas plant, Materials required for the Construction of bio gas plant, Constructional Details of Biogas Plant, Utilization and benefits of Biogas Technology
**Unit-9** Common Operational Problems, Economical, social environmental and health benefits of bio gas Utilization, KVIC Bio gas Plant, Pragathi Design Bio gas Plant, Janata Bio gas Plant, Deenbandhu Bio Gas Plant.

**Block -4 Tidal Power Plants**

**Unit-10** Introduction to Tidal Power Plants, Factors affecting the suitability of the site for tidal power plant.

**Unit-11** Classification of tidal Power Plants, Working of Different Tidal Power Plants, Advantages and disadvantages of Tidal Power Plants.

**Unit-12** Components of Tidal Power plants-Power house; Dam or Barrage; Gates and locks.

**Block -4 Wind Energy**

**Unit-13** Wind energy, Classification of wind mills, Advantages and disadvantages of Wind energy,

**Unit-14 Fuel Cells**

Introduction, Working of Fuel Cell, Advantages of Fuel Cells, Processor, Electrolyte, Inverter, Advantages of Fuel Cells.

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***Books Recommended/Suggested Reading:***

*1. Renewable Energy Sources and Emerging Technologies by D.P. Kothari, K. C. Singhal.*

*2. Non Conventional Energy Source by G. D. Rai.*

**Course Code: ECO-0001**

**Course: Renewal Sources of Energy** **Credits: 3**

**Block -1 Energy Sources**

**Unit-1** Introduction to energy, Different forms of energy, Energy sources and their availability.

**Unit-2** Conventional and non-conventional sources energy, Conventional energy sources- Fossil fuel energy.

**Unit-3** Hydraulic energy, Non-Conventional Energy Sources-Wind energy, Tidal energy, Solar energy, Nuclear energy

**Block -2 Solar Energy**

**Unit-4** Introduction, Solar Constant, Solar Radiation at the Earth's Surface, Instruments for measuring solar radiation and sun shine, Pyranometer, Sun Shine Recorder, Solar Energy Utilization – Basic ideas about the pre-historic way of using solar energy.

**Unit-5** Solar Energy applications, Solar Collectors, Flat plate collectors (non-concentrating), Concentrating (focusing) type solar collector, Solar Cooker & its types

**Unit-6** Solar Water heater, Solar distillation, Solar Pumping, Electricity from Solar Energy, Solar Photo Voltaics, Applications of Solar Photo-Voltaic System in Rural Areas,

**Block -3 Bio Energy**

**Unit-7** Introduction, Advantages of Bio Gas technology, Bio Gas and its Compositions, History of Bio-gas, Process of Bio gas, generation – Wet Process, dry Process, Raw Materials available for Bio gas Fermentation.

**Unit-8** Selection of site for Installation of a Bio gas plant, Materials required for the Construction of bio gas plant, Constructional Details of Biogas Plant, Utilization and benefits of Biogas Technology

**Unit-9** Common Operational Problems, Economical, social environmental and health benefits of bio gas Utilization, KVIC Bio gas Plant, Pragathi Design Bio gas Plant, Janata Bio gas Plant, Deenbandhu Bio Gas Plant.

**Block -4 Tidal Power Plants**

**Unit-10** Introduction to Tidal Power Plants, Factors affecting the suitability of the site for tidal power plant.

**Unit-11** Classification of tidal Power Plants, Working of Different Tidal Power Plants, Advantages and disadvantages of Tidal Power Plants.

**Unit-12** Components of Tidal Power plants-Power house; Dam or Barrage; Gates and locks.

**Block -4 Wind Energy**

**Unit-13** Wind energy, Classification of wind mills, Advantages and disadvantages of Wind energy,

**Unit-14 Fuel Cells**

Introduction, Working of Fuel Cell, Advantages of Fuel Cells, Processor, Electrolyte, Inverter, Advantages of Fuel Cells.

***Books Recommended/Suggested Reading:***

*1. Renewable Energy Sources and Emerging Technologies by D.P. Kothari, K. C. Singhal.*

*2. Non Conventional Energy Source by G. D. Rai.*

**Course Name: Chemistry Lab-III**

**Course Code: CHO-2251** **Credits:1**

**Course Objectives:** To acquire basic knowledge about Qualitative Organic Analysis and Detection of elements and Qualitative Inorganic Mixture Analysis.

**Course Outcomes:** After learning this course, students will be able to

1. Explain the Determination of iron in water sample.
2. Explain the Determination of molecular weight of a polymer.
3. Define the surface tension by Jaeger's method.
4. Understand determine DO &; BOD of a given water sample.

**List of Experiments:**

**Organic Chemistry**

Qualitative Analysis: Identification of an organic compound through the functional group analysis, determination of melting point/boiling point and preparation of suitable derivatives.

Purification of organic compounds: By crystallization (from water or alcohol) and distillation.

Recommended Books:

1.Practicle Organic Chemistry F.G. Mann and B.C. Saunders " Pearson" 2. Elementary Practical Organic Chemistry I. Vogle Pearson"

**Subject Code: ZCO-2211 Credits:3**

**Course Title: Gene Technology, Immunology and Computational Biology**

**Course outcomes: The student at the completion of the course will be able to:**

- Understand the principles of genetic engineering, how genes can be cloned in bacteria and the various technologies involved in it.
- Know the applications of biotechnology in various fields like agriculture, industry and human health.
- To have an in depth understanding about Immune System & its mechanisms.
- Get introduced to DNA testing and utility of genetic engineering in forensic sciences.
- Get introduced to computers and use of bioinformatics tools.
- Enable students to get employment in pathology/Hospital.
- Take up research in biological sciences.

**Block -I Principles of Gene Manipulation**

**Unit-1** Recombinant DNA Technology

**Unit-2** Selection and identification of recombinant cells

**Unit-3** Restriction Enzymes, DNA modifying enzymes, CloningVectors,

**Unit-4** Ligation Gene transfer techniques, Gene therapy

**Block -2 Applications of Genetic Engineering**

**Unit-5** Single cell proteins

**Unit-6** Biosensors, Biochips

**Unit-7** Crop and livestock improvement ,development of transgenics

**Unit-8** Development of DNA drugs and vaccines

**Block -3 Commercial production of Flowers, Vegetables, and fruits**

**Unit-9** Commercial **DNADiagnostics**

**Unit-10** Genetic ana lysis of human diseases, detection of known and unknown mutations Concept of pharmacogenomics and pharmacogenetics

**Unit-11** Historical perspective of Immunology, Innate and Adaptive Immunity, clonal selection, complement system Structure and functions of different classes of immunoglobulin, Hypersensitivity, Humoral immunity and cell mediated immunity, HL Acomplex: organization, class I and IIHL A molecules

**Unit-12** Calculations of mean, median, mode, variance, standard deviation Concepts of coefficient of variation, Skewness, Kurtosis Elementary idea of probability and application

**Block 4 BiostatisticsII**

**Unit-13** Data summarizing: frequency distribution, graphical presentation piediagram, histogram

Tests of significance: one and two sample tests, t-test and Chi-squaretest

**Unit-14** Basics (CPU,I/Ounits) and operating systems

**Unit-15** Concept of home pages and websites, World Wide Web, URLs, using search engines. I, Databases: nucleic acids, genomes, protein sequences and structures, Bibliography

**Unit-16** Sequence analysis (homology): pair wise and multiple sequence alignments-BLAST, CLUSTALW, Phylo genetic analysis

**Suggested Readings:**


1. Primrose&Twyman.PrinciplesofGenomeAnalysisandGenomics.Blackwell(2003).
2. Hartl&Jones.Genetics:principles&AnalsysisofGenes&Genomes.Jones&Bartlett(1998).
3. S6mbrook*etal.*MolecularCloningVolsI,II,III.CSHL(2001).
4. Primrose.MolecularBiotechnology.Panima(2001).
5. Clark&Switzer.ExperimentalBiochemistry.Freeman(2000)
6. Sudbery.HumanMolecularGenetics.Prentice-Hall(2002).
7. Wilson.ClinicalGenetics-AShortCourse,Wiley(2000).
8. Pasternak.AnIntroductiontoMolecularHumanGenetics.Fritzgerald(2000).
9. BiostatisticalAnalysis(FourthEdition)byJerroldH.Zarr,PearsonEducationInc.,Delhi.
10. StatisticalMethods(EighthEdition)byG.W.SnecdecorandW.G.Cochran,WilleyBlackwell


**Subject Code: BDO-2211 Credits:4**

**Subject: Economic Botany, Ethnomedicine and Phytochemistry**

**Course outcomes: After the completion of the course the students will be able to:**

1. Understand about the uses of plants –will know one plant-one employment
2. Understand phytochemical analysis related to medicinally important plants and economic products produced by the plants
3. know about the importance of Medicinal plants and its useful parts, economically important plants in our daily life and also about the traditional medicines and herbs, and its relevance in modern times.

**Block 1 Origin and domestication of cultivated plants**

**Unit 1** Centers of diversity of plants, origin of crop plants. Domestication and introduction of crop plants.

**Unit 2** Concepts of sustainable development; cultivation, production and uses of Cereals, legumes, Spices & beverages.

**Unit 3** Botany of oils, Fibers, timber yielding plants & dyes Study of the plants with Botanical names, Family, part used, and economic uses yielding Edible & essential oils

**Unit 4** Sugar, Starch; Fibers; Paper, Fumitories & Masticatories, Rubber, Dyes, Timber, biofuel crops.

**Block 2 Commercial production of Flowers, Vegetables, and fruits**

**Unit 5** Commercial greenhouse cultivation of rose, Gerbera, Gladiolus, Anthurium/lilium/lily, tomato, bell pepper, cucumber, strawberry & Exotic leafy vegetables using Hydroponics, IPR & Traditional Knowledge IPR and WTO (TRIPS, WIPO), Patent Act 1970 and its amendments, TIFAC, NRDC, Rights.

**Unit 6** Procedure of obtaining patents, Working of patents, Infringement, Copyrights, Trademarks, Geographical Indications, Traditional Knowledge Digital Library, Protection of Traditional Knowledge & Protection of Plant Varieties and Biotech inventions.

**Unit 7** Methodologies of ethnobotanical research: Field work, Literature, Herbaria and Musea and other aspects of ethnobotany. Importance of ethnobotany in Indian systems of medicine (Siddha, Ayurveda and Unani), Role of AYUSH, NMPB, CI-MAP and CARI.

**Unit 8** Tribal knowledge towards disease diagnosis, treatment, medicinal plants, plant conservation and cultivation.

**Block 3 Medicinal aspects**

**Unit 9** Study of common plants used by tribes (Aegle marmelos, Ficus religiosa, Cynodondactylon, Eclipta alba, Oxalis, Ocimum sanctum and Trichopuszeylanicus)

**Unit 10** Ethnobotanical aspect of conservation and management of plant resources, Preservation of primeval forests in the form of sacred groves of individual species and Botanical uses depicted in our epics.

**Unit 11** Plants in primary health care: common medicinal plants: Tinospora, Acorus, Ocimum, Turmeric and Aloe.

**Unit 12** Indian Pharmacopeia, Quality Evaluation of crude drugs & adulteration

**Block 4 Medicinal aspects**

**Unit 13** Preparation of drugs for commercial market - Organoleptic evaluation of drugs - Microscopic evaluation of drugs - Physical evaluation of drugs - Active and inert constituents of drugs - Classification of drug plants - individual drugs - drug adulteration. Sources of crude drugs – roots, rhizome, bulb, corm, leaves, stems, flowers, fruits and seeds.

**Unit 14** Organoleptic study of Adhatodavasica, Andrographis paniculata, Azadirachta indica,
Coriandrum sativum, Datura metel, Eclipta alba, Emblica officinalis, Ocimum sanctum, Phyllanthus amarus, Ricinus communis, Vinca rosea and Zingiber officinale.

**Unit 15** Herbal Preparations & Phytochemistry : Collection of wild herbs - Capsules - compresses - Elixirs - Glycerites - Hydrotherapy or Herbal bath - Herbal oils - Liquid extracts or Tincture - Poultices - Salves - Slippery elm slurry and gruel - Suppositories - Teas. Plant natural products , general detection, extraction and characterization procedures.
**Unit 16** Glycosides and Flavonoids and therapeutic applications. Anthocyanins and Coumarins and therapeutic applications, Lignans, Terpenes, Volatile oils and Saponins, Carotenoids and Alkaloids Carotenoids and pharmacological activities.

**Suggested Readings:**

1. Kochhar, S.L. (2011). Economic Botany in the Tropics, MacMillan Publishers India Ltd., New Delhi. 4th edition.
2. Sambamurthy, AVSS & Subrahmanyam, NS (2000). Economic Botany of Crop Plants. Asiatech Publishers. New Delhi.
3. Singh, D.K and K.V. Peter. 2014. Protected cultivation of horticultural crops. New India Publishing Agency, India.
4. Reddy P. Parvatha. 2016. Sustainable crop protection under protected cultivation. Springer, Singapore.
5. Amit Deogirikar. 2019. A Text Book on Protected Cultivation and Secondary Agriculture. Rajlaxmi Prakashan, Aurangabad, India.

6. Singh, B., B. Singh, N. Sabir and M Hasan. 2014. Advances in protected cultivation. New India Publishing Agency, India.
7. Sharma, OP. 1996. Hill's Economic Botany (Late Dr. AF Hill, adopted by OP Sharma). Tata McGraw Hill Co. Ltd., New Delhi.
8. Joe J. Hanan. 1997. Greenhouses: Advanced Technology for protected horticulture. CRC Press. 9. Krishnamurthy, K.V. (2004). An Advanced Text rbook of Biodiversity - Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi
10. N.K. Acharya: Textbook on intellectual property rights, Asia Law House (2001).

**Subject Code: BDO-2251**
**Subject: Genetic Engineering and Counselling Lab Credits:1**

**Course outcomes:** The student at the completion of the course will be able to:

- Understand the principles of genetic engineering with hands-on experiments in mutation detection, testing of infectious diseases like Covid 19.
- Get introduced to DNA testing and utility of genetic engineering in forensic sciences.
- Apply knowledge and awareness of the basic principles and concepts of biology, computer science and mathematics existing software effectively to extract information from large databases and to use this information in computer modeling.
- Use bioinformatics tools to find out evolutionary/phylogenetic relationship of organisms using gene sequences.
- Get employment in Hospitals/Diagnostic and forensic labs/Counsel families with genetic disorders.
- Enable students to take up research in biological sciences.

**BLOCK-1**
1. Measure the pre and post clitellar lengths of earthworms and calculate mean, median, mode, standard deviation etc.
2. Measure the height and weight of all students in the class and apply statistical measures.

**BLOCK-2**
1. Determination of ABO Blood group
2. To perform bacterial culture and calculate generation time of bacteria.
3. To study Restriction enzyme digestion using teaching kits.
4. To detect genetic mutations by Polymerase Chain Reaction (PCR) using teaching kits.
5. Demonstration of agarose gel electrophoresis for detection of DNA.
6. Demonstration of Polyacrylamide Gel Electrophoresis (PAGE) for detection of proteins.
7. To calculate molecular weight of unknown DNA and protein fragments from gel pictures.

**BLOCK-3**
1. To learn the basics of computer applications
2. To learn sequence analysis using BLAST
3. To learn Multiple sequence alignment using CLUSTALW
4. To learn about Phylogenetic analysis using the programme PHYLIP.
5. To learn how to perform Primer designing for PCR using available softwares etc.

**BLOCK-4**

Virtual Labs (Suggestive sites)

1. Gel Documentation System https://youtu.be/WPpt3-FanNE
2. Colorimeter- https://youtu.be/v4aK6G0bGuU
3. PCR Part 1- https://youtu.be/CpGX1UFSl4A
4. PCR Part 2- https://youtu.be/6IcHAYPTAEw
5. DNA isolation Part 1- https://youtu.be/QE7Ul0JnY9A
6. DNA isolation part 2- https://youtu.be/ efr_HFeHxM
7. DNA curve- https://youtu.be/ubL8QxTeuG4
8. Spectrophotometer- https://youtu.be/ubL8QxTeuG4
9. Agarose Part 1- https://youtu.be/7gvHPFww--g
10. Agarose part 2- https://youtu.be/j_bOZCHNsSg
11. Use softwares like Primer3, NEB cutter
12. NCBI, BLAST, CLUSTAL W, PHYLIP

Suggested Readings:

1. Primrose &Twyman. Principles of Genome Analysis and Genomics. Blackwell (2003).
2. Hartl& Jones. Genetics: principles &Analsysis of Genes & Genomes. Jones & Bartlett (1998).
3. Sambrooket al .Molecular Cloning Vols I, II, III. CSHL (2001). 4. Primrose. Molecular Biotechnology. Panima (2001).

**Course Name: Circuit Fundamentals and Basic Electronics**

**Course Code: PHO-2211** **Credits: 3**

**Course Objectives:** To acquire the knowledge of Growth and decay of currents through inductive resistances, Semiconductors, Transistor biasing circuits and oscillator.

**Course outcomes:**

- Describe resistance and circuits
- Understand semiconductors
- Explain transistors and amplifiers
- Explain about oscillators

**Block I: Resistance and Circuits**

**Unit-1:** Growth and decay of currents through inductive resistances, charging and discharging in R.C. and R.L.C. circuits.

**Unit-2:** Time constant, Measurement of high resistance. A.C. Bridges

**Unit-3:** Wien Bridge. Thevenin, Norton and Superposition theorems and their applications.

**Block II: Semiconductors**

**Unit-4:** Semiconductors, intrinsic and extrinsic semiconductors, n-type and p-type semiconductors.

**Unit-5**: Unbiased diode forward bias and reverse bias diodes, diode as a rectifier, diode characteristics, zener diode.

**Unit-6:** Avalanche and zener breakdown, power supplies, rectifier, bridge rectifier, capacitor input filter, voltage regulation, zener regulator.

**Block III: Transistors**

**Unit-7:** Bipolar transistors, three doped regions, forward and reverse bias, DC alpha, DC beta transistor curves.

**Unit-8:** Transistor biasing circuits, base bias, emitter bias and voltage divider bias, DC load line. Basic AC equivalent circuits

**Unit-9:** Low frequency model, small signal amplifiers, common emitter amplifier, common collector amplifiers.

Block IV: Amplifier

**Unit-10:** common base amplifiers, current and voltage gain.

**Unit-11:** R.C. coupled amplifier, gain, frequency response, equivalent circuit at low, medium and high frequencies, feedback principles

**Unit-12:** Input and output impedance, transistor as an oscillator.

**Block V: Oscillator**

**Unit-13:** General discussion and theory of Hartley oscillator only

**Unit-14:** Elements of transmission and reception, basic principles of amplitude modulation and demodulation

**Unit-15:** Principle and design of linear multimeters and their application, cathode ray oscillograph and its simple applications

**Recommended books:**

- B.G. Streetman; "Solid State Electronic Devices", IInTdi Edition (Prentice Hall of India, New Delhi, 1986).
- W.D. Stanley: "Electronic Devices, Circuits and Applications" (Prentice-Hall, New TTC'A 1flOO\ JL4y, JJI. 1OO).
- J.D. Ryder, "Electronics Fundamentals and Applications", lI'' Edition (Prentice-Hall of India, New Delhi, 1986)

**Course Name: Real Analysis**
**Course Code: MAO-2211** **Credits: 4**

**Course Objectives:** The course is designed to provide students with a deep and rigorous understanding of real numbers and of defining terms to prove the results about convergence and divergence of sequences and series of real numbers. It aims to develop the ability to analyze and reason about limits, continuity, and differentiability, and apply these concepts to solve problems.

**Course Outcomes:**

On successful completion of this course, students should be able to:

1. Analyze and apply fundamental properties of real numbers.
2. Evaluate and interpret sequences of real numbers.
3. Solve problems involving series of real numbers.
4. Apply principles of limits and continuity to functions.
5. Demonstrate understanding and application of differentiation concepts in real analysis.

**Block I: Fundamental Properties of Real Numbers**
**Unit 1:** Sets and Numbers
**Unit 2:** Field and Order Structure of Real Numbers
**Unit 3:** Topology of Real Numbers

**Block II: Sequences of Real Numbers**
**Unit 4:** Limit Points of a Sequence
**Unit 5:** Limit Inferior and Superior
**Unit 6:** Convergent and Non-Convergent Sequences

**Block III: Series of Real Numbers**
**Unit 7:** Positive Term Series
**Unit 8:** Tests for Convergence
**Unit 9:** Series with Arbitrary Terms

**Block IV: Limit and Continuity**
**Unit 10:** Limit of a Function
**Unit 11:** Continuity
**Unit 12:** Properties of Continuous Functions

**Block V: Differentiability**

**Unit 13:** Derivative
**Unit 14:** Relation between Derivability and Continuity
**Unit 15:** Increasing and Decreasing Functions
**Unit 16:** Mean Value Theorems

**Recommended Books:**


- R. G. Bartle and D. R. Sherbert: Introduction to Real Analysis, John Wiley and Sons, Singapore, 3rd Ed, 2003.
- S. C. Malik and S. Arora: Mathematical Analysis, New Academic Science Ltd, 5th Ed, 2017.
- W. Rudin: Principles of Mathematical Analysis, Third Edition, McGraw Hill, New York, 3rd Ed, 1976.
- T.M. Apostol: Mathematical Analysis, 2nd Ed., Narosa Distributor, New Delhi, 2002.

**Course Name: Physics Lab-IV**
**Course Code: PHO-2251** **Credits: 1**

**Course Objectives:** To acquire basic knowledge about Characteristics of a transistor in CE, CB and CC configurations and Frequency response of R.C. coupled amplifier and also verify different theorem .

**Course Outcomes:** After learning this course, students will be able to **1.** Explain the perpendicular axes for moment of inertia.

2. Experimental conformation of different theorem
3. Experimental understanding the Characteristics of a transistor.
4. Study of Characteristics of a tunnel diode.

**List of Experiments:**

1. Characteristics of a transistor in CE, CB and CC configurations
2. Frequency response of R.C. coupled amplifier.
3. To verify the Norton's theorem.
4. To verify the Superposition's theorem.
5. To verify the Thevenin's theorem.
6. To determine the frequency of tuning fork.
7. To determine the velocity of sound in air by Kundt's tube.
8. Specific resistance and energy gap of a semiconductor
9. Characteristics of a transistor 10. Characteristics of a tunnel diode.

**Recommended Books**


- D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
- S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut). Worsnop and Flint- Advanced Practical physics for students.

# Semester V

**Course Name: Quantum Chemistry Spectroscopy and Photochemistry**
**Course Code: CHO-3111** **Credits: 4**

**Course Objectives:**
The objective of this course is to explain the general concept of quantum mechanics, wave functions, postulates. An introduction to spectroscopy and photochemistry is also discussed in this chapter.

**Course Outcomes:** Students will be able to:

1. Define general introduction of quantum chemistry
2. Describe elementary quantum mechanics
3. Illustrate general introduction of spectroscopy
4. Identify different types of spectroscopies
5. Explain photochemistry and colligative properties

**Block 1: Introduction to Quantum Mechanics**

**Unit 1:** Black-body radiation, Planck's radiation law, photoelectric effect, heat capacity of solids, Bohr's model of hydrogen atom (without derivation) their solution of overall solution and its defects.

**Unit 2:** Compton effect, de-Broglie's hypothesis, the Heisenberg's uncertainty principle, Hamiltonian Operator. Schrödinger wave equation and its importance, physical interpretation of the wave function.

**Unit 3:** Postulates of quantum mechanics, particle in a one dimensional box. Schrödinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance, hydrogen like wave functions, radial wave functions, angular wave functions.

**Block II: Elementary Quantum Mechanics**

**Unit 4:** Molecular orbital theory, basic ideas–criteria for forming M.O. from A.O., construction of M.O's by LCAO–$H_2^+$ ion.

**Unit 5:** Calculation of energy levels from wave functions, physical picture of bonding and anti-bonding wave functions, concept of, σ*,σ*orbitals and their characteristics, Hybrid orbitals–sp, $sp^2$, $sp^3$ calculation of coefficients of A.O's used in sp and $sp^2$ hybrid orbitals and interpretation of geometry.

**Unit 6:** Introduction to valence bond model of H2, comparison of M.O. and V.B. models.

**Block III: Spectroscopy: An Introduction**

**Unit 7:** Introduction: electromagnetic radiation, regions of the spectrum, basic features of different spectrophotometers.

**Unit 8:** Statement of the born-oppenheimer approximation, degrees of freedom, Energy levels of a rigid rotor (semi-classical principles), selection rules, spectral intensity.

**Unit 9:** Distribution using population distribution (Maxwell-Boltzmann distribution) determination of bond length, qualitative description of non-rigid rotor, isotope effect.

**Block IV: Infrared, Raman and Electronic Spectroscopy**

**Unit 10:** Infrared Spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion

and isotope on the spectrum, idea of vibrational frequencies of different functional groups.

**Unit 11:** Raman Spectrum: Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules.

**Unit 12:** Electronic Spectrum: Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Franck-Condon principle. Qualitative description of σ, π and η M.O. their energy levels and the respective transition.

**Block V: Photochemistry and Soliutions**

**Unit 13:** Interaction of radiation with matter, difference between thermal and photochemical processes, Laws of photochemistry: Grothus – Drapper law, Stark–Einstein law, Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non- radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions–energy transfer processes (simple examples), Kinetics of Photochemical reaction.

**Unit 14:** Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solution, colligative properties, Raoult's law, relative lowering of vapor pressure, molecular weight determination, Osmosis, law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure, Elevation of boiling point and depression of freezing, Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point.

**Unit 15:** Experimental methods for determining various colligative properties. Abnormal molar mass, Van't Hoff factor, Colligative properties of degree of dissociation and association of solutes. Optical activity, polarization–(Clausius–Mossotti equation), orientation of dipoles in an electric field, dipole moment, induced dipole moment, measurement of dipole moment- temperature method and refractivity method, dipole moment and structure of molecules, magnetic properties paramagnetism, diamagnetism and ferromagnetic, Magnetic susceptibility, its measurements and its importance.

**References:**


1. Banwell, C. N. & McCash, E. M. Fundamentals of Molecular Spectroscopy 4th Ed. Tata McGraw-Hill: New Delhi (2006).
2. Chandra, A. K. Introductory Quantum Chemistry Tata McGraw-Hill (2001).
3. House, J. E. Fundamentals of Quantum Chemistry 2 nd Ed. Elsevier: USA (2004).
4. Lowe, J. P. & Peterson, K. Quantum Chemistry, Academic Press (2005).

Kakkar, R. Atomic & Molecular Spectroscopy: Concepts & Applications, Cambridge University Press (2015).

**Course Code: H000201T**

**Course Name: Health and Hygiene** **Credits:3**

**Block 1:**

**Unit 1**. Basic First Aid

- Aims of first aid & First aid and the law.
- Dealing with an emergency, Resuscitation (basic CPR).
- Recovery position, Initial top to toe assessment.
- Hand washing and Hygiene
- Types and Content of a First aid Kit

**Unit 2** First AID Technique

- Dressings and Bandages.
- Fast evacuation techniques (single rescuer).
- Transport techniques.

**Unit 3**. First aid related with respiratory system

- Basics of Respiration.
- No breathing or difficult breathing, Drowning, Choking, Strangulation and hanging,
- Swelling within the throat, Suffocation by smoke or gases and Asthma.

**Unit 4** First aid related with Heart, Blood and Circulation

- Basics of The heart and the blood circulation.
- Chest discomfort, bleeding.

**Unit 5**. First aid related with Wounds and Injuries

- Type of wounds, Small cuts and abrasions
- Head, Chest, Abdominal injuries
- Amputation, Crush injuries, Shock

**Unit 6** First aid related with Bones, Joints Muscle related injuries

- Basics of The skeleton, Joints and Muscles.
- Fractures (injuries to bones).

**Block 2:**

**Unit 7**. First aid related with Nervous system and Unconsciousness

- Basics of the nervous system.
- Unconsciousness, Stroke, Fits – convulsions – seizures, Epilepsy.

**Unit 8** First aid related with Gastrointestinal Tract

- Basics of The gastrointestinal system.
- Diarrhea, Food poisoning.

**Unit 9** First aid related with Skin, Burns

- Basics of The skin.
- Burn wounds, Dry burns and scalds (burns from fire, heat and steam).
- Electrical and Chemical burns, Sun burns, heat exhaustion and heatstroke.
- Frost bites (cold burns), Prevention of burns, Fever and Hypothermia.

**Unit 10**. First aid related with Poisoning

- Poisoning by swallowing, Gases, Injection, Skin
  First aid related with Bites and Stings
- Animal bites, Snake bites, Insect stings and bites

**Unit 11** First aid related with Sense organs

- Basic of Sense organ.
- Foreign objects in the eye, ear, nose or skin.
- Swallowed foreign objects.

**Unit 12** Specific emergency satiation and disaster management

- Emergencies at educational institutes and work
- Road and traffic accidents.
- Emergencies in rural areas.
- Disasters and multiple casualty accidents.
- Triage.
  Emergency Child birth

**Block 3:**

**Unit 13** Basic Sex Education

- Overview, ground rules, and a pre-test
- Basics of Urinary system and Reproductive system.
- Male puberty — physical and emotional changes
- Female puberty — physical and emotional changes
- Male-female similarities and differences
- Sexual intercourse, pregnancy, and childbirth
- Facts, attitudes, and myths about LGBTQ+ issues and identities
- Birth control and abortion
- Sex without love — harassment, sexual abuse, and rape
- Prevention of sexually transmitted diseases.

**Block IV:**

**Unit 14:** Mental Health and Psychological First Aid

- What is Mental Health First Aid?
- Mental Health Problems in the India
- The Mental Health First Aid Action Plan
- Understanding Depression and Anxiety Disorders
- Crisis First Aid for Suicidal Behavior & Depressive symptoms
- What is Non-Suicidal Self-Injury?
- Non-crisis First Aid for Depression and Anxiety
- Crisis First Aid for Panic Attacks, Traumatic events
- Understanding Disorders in Which Psychosis may Occur
- Crisis First Aid for Acute Psychosis
- Understanding Substance Use Disorder
- Crisis First Aid for Overdose, Withdrawal
- Using Mental Health First Aid

***Books Recommended/ Suggested Readings:***


1. *Indian First Aid Mannual-https://www.indianredcross.org/publications/FA-manual.pdf*
2. *Red Cross First Aid/CPR/AED Instructor Manual.*
3. *https://mhfa.com.au/courses/public/types/youthedition4.*
4. *Finkelhor, D. (2009). The prevention of childhood sexual abuse. Durham, NH: Crimes Against Children Research Center. www.unh.edu/ccrc/pdf/CV192. pdf*
5. *Kantor L. & Levitz N. (2017). Parents' views on sex education in schools: How much do Democrats and Republicans agree? PLoS ONE, 12 (7): e0180250.*
6. *Orenstein, P. (2016). Girls and sex: Navigating the complicated new landscape. New York, NY: Harper.*

7. *Schwiegershausen, E. (2015, May 28). The Cut. www.thecut.com/2015/05/most-women-are-catcalled-before-they-turn-17.html*
8. *Wiggins, G. & McTighe, J. (2008). Understanding by design. Alexandra, VA: ASCD.*
9. *https://marshallmemo.com/marshall-publications.php#8*

**Course Code: MAV-005**
**Course: Basic Statistics** **Credits:3**

| COs No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | **Recall** measures of central tendency. | Remember |
| 2. | **Define** various measures of dispersion. | Remember |
| 3. | **Explain** the concept of probability, normal distribution and its properties. | Understand |
| 4. | **Summarize** the concept of correlation and regression. | Understand |

**Block 1**
Unit- 1 Introduction, definition of Statistics and its use
Unit-2 limitations of Frequency distribution
Unit-3 Measures of Central Tendency, Arithmetic mean, Median, Mode.

**Block 2**
Unit- 4 Measures of Dispersion
Unit- 5 Standard Deviation,
Unit- 6 Variance
Unit- 7 Coefficient of Variation, Quartile deviation and its coefficient.
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**Block 3**
Unit- 8 Probability definition and concept of probability
Unit- 9 Normal Distribution
Unit-10 Properties of Normal Distribution

**Block 4**
Unit- 11 Correlation: Computation of Correlation Coefficient and its testing,
Unit-12 Linear regression and regression coefficients.

***Books Recommended/Suggested Reading:***
1. *Gupta S. C. and Kapoor V. K.; Fundamentals of Mathematical Statistics, S. Chand and Sons.*
2. *Gupta S. C. and Kapoor V. K.; Applied Statistics, S. Chand and Sons.*
3. *Hogg R. V., Mckean J. and Craig A. T.; Introduction to Mathematical Statistics, Pearson.*
4. *Das N. G.; Statistical Methods, Tata McGraw Hill.*
5. *Vittal P. R.; Mathematical Statistics and Probability, Margham Publishers.*

**Subject Code: ZCO-3111**

**Subject: Diversity of Non-Chordates and Economic Zoology** **Credits:4**

**Course outcomes:**

The student at the completion of the course will be able to:

The student at the completion of the course will be able to:

- demonstrate comprehensive identification abilities of non-chordate diversity
- explain structural and functional diversity of non-chordate
- explain evolutionary relationship amongst non-chordate groups
- Get employment in different applied sectors
- Students can start their own business i.e. self employments.
- Enable students to take up research in Biological Science

**Block-1Protozoa to Coelenterate & Ctenophora to Nemathelminthes**

**Unit-1:**Protozoa – *Paramecium* (Morphology and Reproduction), Porifera – *Sycon* (Canal System)

**Unit-2:**Coelenterata – *Obelia* (Morphology and Reproduction), Ctenophora - Salient features

**Unit-3:** Platyhelminthes - *Taenia* (Tape worm) (Morphology and Reproduction)

**Unit-4:**Nemathelminthes –*Ascaris lumbricoides* (Morphology and Reproduction)

**Block-2Annelida and Arthropoda**

**Unit-5:**Annelida –*Hirudinaria*(Leech) (Morphology and Reproduction)

**Unit-6:** Arthropoda – *Palaemon* (Prawn) (Morphology

**Unit-7:** Appendages

**Unit-8:** Nervous System and Reproduction)

**Block-3Mollusca to Hemichordata, Vectors and pests**

**Unit-9:**Mollusca – *Pila*(Morphology, Shell, Respiration, Nervous System and Reproduction)

**Unit-10:** Echinodermata –*Pentaceros*(Morphology and Water Vascular System)

**Unit-11:** Life cycle and their control of following pests: Gundhibug,Sugarcane leafhopper, Rodents.

**Unit-12:** Termites and Mosquitoes and their control

**Block-4Economic Zoology-1 and Economic Zoology- 2**

**Unit-13:** Animal breeding and culture: Pisciculture

**Unit-14:** Sericulture

**Unit-15:** Apiculture, Lac-culture

**Unit-16:** Vermiculture

**Suggested Readings:**


1. Barnes et al (2009). The Invertebrates: A synthesis. Wiley Backwell 17
2. Hunter: Life of Invertebrates (1979, Collier Macmillan)
3. Marshall: Parker &Haswell Text Book of Zoology, Vol. I (7th ed 1972, Macmillan)
4. Moore: An Introduction to the Invertebrates (2001, Cambridge University Press)
5. Brusca and Brusca (2016) Invertebrates. Sinauer
6. Jan Pechenik (2014) Biology of the invertebrates. McGraw Hill
7. Neilsen (2012). Animal Evolution: Interrelationships amongst living Phyla. Oxford 8.Parasitology- Chatterjee
9. Parasitology- Chakraborty
10. Thomos C. Chung. General Parasitology. Hardcourt Brace and Co. Ltd. Asia, New Delhi.

**Subject Code:** BDO-3111
**Subject:** Plant Physiology, Metabolism & Biochemistry **Credits:4**

**Course outcomes**: After the completion of the course the students will be able to:
1. Understand the role of Physiological and metabolic processes for plant growth and development.
2. Learn the symptoms of Mineral Deficiency in crops and their management.
3. Assimilate Knowledge about Biochemical constitution of plant diversity.
4.Know the role of plants in development of natural products, nutraceuticals, dietary supplements, antioxidants

**BLOCK-1 Plant water relation, Mineral Nutrition, Transpiration and translocation in phloem & Carbon Oxidation**

**Unit-1** Importance of water, water potential and its components; Transpiration and its significance; Factors affecting transpiration; Root pressure and guttation.

**Unit-2** Criteria of essentiality of elements; Role of essential elements; Symptoms of mineral deficiency in major crops, Transport of ions across cell membrane, active and passive transport, Composition of phloem sap, girdling experiment; Pressure flow model.

**Unit-3** Krebs cycle, Glycolysis, fate of pyruvate- aerobic and anaerobic respiration and fermentation, regulation of glycolysis, oxidative pentose phosphate pathway, oxidative decarboxylation of pyruvate, regulation of Krebs cycle, mitochondrial electron transport, oxidative phosphorylation, ATP-Synthetase,

**Unit-4** Chemiosmotic mechanism, P/O ratio, cyanide-resistant respiration, factors affecting respiration.

**BLOCK-2 Nitrogen Metabolism &Lipid Metabolism & Photosynthesis**

**Unit-5** Nitrate assimilation, biological nitrogen fixation (examples of legumes and non-legumes), Physiology and biochemistry of nitrogen fixation

**Unit-6** Ammonia assimilation (GS-GOGAT), reductive amination and transamination, amino acid synthesis.

**Unit-7** Lipid Metabolism: Synthesis and breakdown of triglycerides, -oxidation, glyoxylate cycle, gluconeogenesis and its role in mobilization of lipids during seed germination, -oxidation. ;

**Unit-8** Photosynthesis: Pigments, Action spectra and Enhancement effect, Electron transport system and Photophosphorylation, C3 & C4 photosynthesis, CAM- Reaction and Significance

**BLOCK-3 Plant Development, Movements, Dormancy & Responses & Biomolecules**

**Unit-9** Developmental roles of Phytohormones (auxins, gibberellins, cytokinins, ABA, ethylene.) autonomic & paratonic movements, Control and Coordination in plants, Photoperiodism (SDP, LDP, Day neutral plants); Phytochrome (discovery and structure)

**Unit-10** red and far red-light responses on photomorphogenesis, Seed physiology & Dormancy, Vernalization & Senescence

**Unit-11** Carbohydrates: Nomenclature and classification; Role of monosaccharides (glucose, fructose, sugar alcohols – mannitol and sorbitol); Disaccharides (sucrose, maltose, lactose), Oligosaccharides and polysaccharides (structural-cellulose, hemicelluloses, pectin, chitin, mucilage; storage – starch, inulin).

**Unit-12** Lipids: Storage lipids: Fatty acids structure and functions, Structural lipids: Phosphoglycerides; Lipid functions: cell signals, cofactors, prostaglandins, Introduction of lipid micelles, monolayers, bilayers

**BLOCK-4 Proteins: & Enzymes:**

**Unit-13** Structure of amino acids; Peptide bonds; Levels of protein structure-primary, secondary, Ramchandran plot,tertiary and quaternary; Isoelectric point; Protein denaturation and biological roles of proteins

**Unit-14** Nucleic acids: Structure of nitrogenous bases; Structure and function of nucleic acids,Nucleic acid denaturation &Re-naturation , MiRNA

**Unit-15** Structure of enzyme: holoenzyme, apoenzyme, cofactors, coenzymes and prosthetic group; mechanism of action (activation energy, lock and key hypothesis, induced- fit theory), enzyme inhibition and factors affecting enzyme activity, Allosteric enzymes &Abzymes.

**Unit-16** Phytonutrients, Nutraceuticals, dietary supplements and antioxidants.

**Suggested Readings: Course Books published in Hindi may be prescribed by the Universities.**


1. Hopkins, W.G. &Hiiner, N.P. Introduction to Plant Physiology (3rd ed.) 2004, John Wiley & Sons.
2. A Handbook On Mineral Nutrition And Diagnostic Techniques For Nutritional Disorders Of Crops (pb)ISBN : 9788177543377Edition : 01Year : 2011Author : Pathmanabhan G , Vanangamudi M , Chandrasekaran CN , Sathyamoorthi K , Babu CR , Babu RC , Boopathi PNPublisher : Agrobios (India)
3. Jain, V.K. Fundamental of Plant Physiology (7th ed.) 2004. S. Chand and Company.
4. Salisbury, F.B. & Ross, C.W. Plant Physiology (4th ed.), 19992, Wadsoworth Publishing Company.
5. Panday, S.N. & Sinha, B.K. Plant Physiology (4th ed.), 2006, Vikas Publishing House Pvt. Ltd.
6. Mukherjee, S. & Ghosh, A. Plant Physiology (2nd ed.), 2005, New Central Book Agency.
7. Chaudhuri, D., Kar, D.K., and Halder, S.A. Handbook of Plant Biosynthetic Pthways 2008, New Central Book. Agencies.
8. Voet, D. and Voet, J.G., Bio-Chemistry (3rd ed.), 2005, John Wiley & Sons.
9. Mathews, C.K., Van Holder, K.E. & Ahren, K.G. Bio-Chemistry (3rd ed.), 2000, Pearson Education.
10. Lehninger Principles of Biochemistry. Sixth Edition. 2013. David L. Nelson, Michael M. Cox. Freeman, Macmillan.


**Subject Code: ZCO-3151**

**Subject: Diversity of Chordates and Comparative Anatomy** **Credits: 2**

**Course outcomes:**

The student at the completion of the course will be able to:

- Demonstrate comprehensive identification abilities of chordate diversity
- Explain structural and functional diversity of chordates

Explain evolutionary relationship amongst chordates Take up research in biological sciences.

**Block-1 Origin of Chordates & Hemichordata & Cephalochordata and Urochordata**

**Unit-1:** Origin of Chordates. Classification of Phylum Chordata upto the class.
**Unit-2:**Hemichordata: General characteristics, classification and detailed study of *Balanoglossus*(Habit and Habitat,
Morphology, Anatomy, Physiology and Development).
**Unit-3:**Cephalochordata : General characteristics, classification and detailed study of *Branchiostoma*(*Amphioxus*) (Habit and Habitat, Morphology, Anatomy, Physiology).
**Unit-4:** (ii)Urochordata : General characteristics, classification and detailed study of *Herdmania* (Habit and Habitat, Morphology, Anatomy, Physiology and Post Embryonic Development).

**Block-2 Classification and General Characteristics of Vertebrates &Comparative Anatomy and Physiology of Vertebrates**
**Integumentary System**
**Unit-5:**General characters and Classification of different classes of vertebrates (Pisces, Amphibia, Reptilia, Aves, Mammalia) up to the order with examples.
**Unit-6:** Poisonous and Non Poisonous Snakes and biting mechanism., Neoteny and Paedogenesis
**Unit-7:** Migration in birds , Dentition in Mammals
**Unit-8:** Structure, functions and derivatives of integument, **Skeletal System** Overview of axial and appendicular skeleton, Jaw suspensorium, Visceral arches.

**Block-3 Digestive System & Respiratory System**
**Unit-9:** Alimentary canal and associated glands
**Unit-10:** dentition
**Unit-11:** Skin, gills
**Unit-12:** lungs and air sacs; Accessory respiratory organs

**Block-4Circulatory System** &**Urinogenital System & Nervous System** &**Sense Organs**
**Unit-13:** General plan of circulation, evolution of heart and aortic arches
**Unit-14:** Succession of kidney, Evolution of urinogenital ducts, Types of mammalian uteri
**Unit-15:** Comparative account of brain Autonomic nervous system, Spinal cord, Cranial nerves in mammals
**Unit-16:** Classification of receptors Brief account of visual and auditory receptors in man

**Suggested Readings:**

1. Harvey et al: The Vertebrate Life (2006)
2. Colbert et al: Colbert's Evolution of the Vertebrates: A history of the backboned animals through time (5th ed 2002,Wiley - Liss)
3. Hildebrand: Analysis of Vertebrate Structure (4th ed 1995, John Wiley)
4. Kenneth V. Kardong (2015) Vertebrates: Comparative Anatomy, Function, Evolution McGraw Hill
5. McFarland et al: Vertebrate Life(1979, Macmillan Publishing)
6. Parker and Haswell: TextBook of Zoology, Vol. II (1978, ELBS)
7. Romer and Parsons: The Vertebrate Body (6th ed 1986, CBS Publishing Japan)
8. Young: The Life of vertebrates (3rd ed 2006, ELBS/Oxford)
9. Weichert C.K and William Presch (1970). Elements of Chordate Anatomy, Tata McGraw Hills

**Course Name: Electromagnetism**
**Course Code: PHO-3111** **Credits: 4**

**Course Objectives:** To acquire the knowledge of Dielectrics, Magnetic Properties of Matter, Electromagnetic Waves and Reflection by in osphere.

**Course outcomes:**

- Understand electrostatics.
- Understand magnetostatics.
- Explain EM waves
- Explain reflection of EM waves

**Block I: Electrostatics**

**Unit-1:** Dielectrics: Dielectric constant, polarization,
**Unit-2:** Electronic polarization, Atomic or ionic Polarization
**Unit-**3: Polarization charges, Electrostatic equation with dielectrics, **Unit-**4: Field, force and energy in Dielectrics.

**Block II: Magneto statics**

**Unit-5:** Magnetic Properties of Matter: Intensity of magnetization and magnetic susceptibility
**Unit-6:** Properties of Dia, Para and Ferromagnetic materials, Curie temperature,
**Unit-7:** Hysteresis and its experimental determination.

**Block III: EM Waves**

**Unit-8:** Electromagnetic Waves: The wave', equation satisfied .by E and B, plane electromagnetic waves in vacuum,
**Unit-9:** Maxwell equations and their derivations, Displacement current,
**Unit-10:** Vector and Scalar potentials, Boundary conditions at interface between two different media,
**Unit-11:** Poynting vector and Poynting theorem

**Block IV: Reflection of EM waves**

**Unit-12:** Reflection at, a plane boundary of dielectrics,
**Unit-13:** Polarization by reflection and total internal reflection,
**Unit-14:** Faraday effect; waves in a conducting medium,
**Unit-15:** Reflection and refraction by the ionosphere

**Recommended books**


- Berkeley Physics Course; Electricity and Magnetism, Ed. E.M. Purcell (Mc Graw Hill).
- Halliday and Resnik; "Physics", Vol 2.
- D J Griffith; "Introduction to Electrodynamics" (Prentice-Hall of India).
- Reitz and Milford; "Electricity and Magnetism (Addison-Wesley).
- A S Mahajan and A A Rangwala; "Electricity and Magnetism" (Tata McGraw-Hill)

**Course Name: Numerical Methods**
**Course Code: MAO-3111** **Credits: 4**

**Course Objectives:** The goal of this paper is to acquaint students for the study of certain algorithms that uses numerical approximation for the problems of mathematical analysis. Also, the use of Computer Algebra Systems (CAS) by which the intractable problems can be solved both numerically and analytically.

**Course Outcomes:** On successful completion of this course, students shall be able to:
1. Analyze and solve several errors and approximation in numerical methods.
2. Discuss different methods of interpolation.
3. Determine numerical differentiation & integration.
4. Apply several methods to solve curve fitting and interpolation questions and its related techniques.
5. Apply several methods to solve the equations in one variable or simultaneous equation.

**Block I: Errors and Significant Digits**
**Unit-1**: Floating point representation and computer arithmetic,
**Unit-2**: Significant digits, Errors: Roundoff error, Local truncation error
**Unit-3**: Global truncation error, Order of a method,
**Unit-4**: Convergence and terminal conditions

**Block II: Methods: Approximated Roots**
**Unit-5**: Efficient computations Bisection method,
**Unit-6**: Secant method
**Unit-7**: Regula Falsi method and Newton Raphson method
**Unit-8**: Newton's method for solving nonlinear systems

**Block III: Gauss Elimination**
**Unit-9**: Gauss elimination method (with row pivoting)
**Unit-10**: Gauss Jordan method, Gauss Thomas method for tridiagonal systems
**Unit-11**: Iterative methods: Jacobi and Gauss-Seidel iterative methods

**Block IV:** Interpolation and Extrapolation Methods
**Unit-12**: Lagrange's form and Newton's form Finite difference operators
**Unit-13**: Linear interpolation, Cubic spline interpolation (only method)
**Unit-14**: Euler's method Modified Euler's methods
**Unit-15**: Heun method and Mid-point method, Runge-Kutta second methods:

**Block V: Numerical differentiation and Integration**
**Unit-16**: First derivatives and second order derivatives,
**Unit-17**: Richardson extrapolation Unit-18: Trapezoid rule, Simpson's rule (only method), Newton Cotes open formulas.
**Recommended Books:**

- Laurence V. Fausett, Applied Numerical Analysis, Using MATLAB, Pearson, 2/e (2012)
- M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publisher, 6/e (2012).
- Steven C Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, Tata McGraw Hill, 2/e(2010).


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**Course Name: Physics Lab-V**

**Course Code: PHO- 3151** **Credits: 2**

**Course Objectives:** To acquire basic knowledge about Use of a vibration magnetometer to study a field and Measurement of low resistance by Carey-Foster bridge or otherwise and also Study of decay of currents in LR and RC circuits.

**Course Outcomes:** After learning this course, students will be able to

1. Explain the vibration magnetometer to study a field by experiment.
2. Experimental understanding of Lissajuous figures using a CR0Experimental understanding the Hall-probe method for measurement of magnetic field.
3. Study of field due to a current.

**List of Experiments:**

1. Use of a vibration magnetometer to study a field.
2. Study of field due to a current.
3. Measurement of low resistance by Carey-Foster bridge or otherwise.
4. Measurement of inductance using impedance at different frequencies.
5. Measurement of capacitance using impedance at different frequencies.
6. Study of decay of currents in LR and RC circuits.
7. Response curve for LCR circuit and resonance frequency and quality factor.
8. Characteristic of a choke.
9. Hall-probe method for measurement of magnetic field
10. Study of Lissajuous figures using a CR0.

**Recommended Books**


- D.P. Khandelwal, “A Laboratory Manual for Undergraduate Classes (Vani Publishing House, New Delhi).
- S.P. Singh, “Advanced Practical Physics” (Pragati Prakashan, Meerut).

# Semester VI

**Course Name: Organometallics, Bioinorganic Chemistry**
**Course Code: CHO-3211** **Credits: 4**

**Course Objectives:**

The objective of this course is to explain the general concept of organometallic compounds and its derivatives and basic knowledge of bioinorganic chemistry.

**Course Outcomes:** Students will be able to:

1. Define theories of coordination chemistry
2. Describe magnetic properties of transition metal complexes
3. Illustrate organometallic chemistry
4. Identify hard and soft acids and bases
5. Explain bioinorganic chemistry

**Block I: Theories of coordination Chemistry**

**Unit 1:** Metal-ligand bonding in Transition Metal Complexes Limitations of valance bond theory, an elementary idea of crystal field theory.

**Unit 2:** Crystal field splitting in octahedral, tetrahedral and square planner complexes, factors affecting the crystal- field parameters. Thermodynamic and Kinetic Aspects of Metal Complexes.

**Unit 3:** A brief outline of thermodynamics stability of metal complexes and factors affecting the stability, stability constants of complexes and their determination, substitution reactions of square planar complexes.

**Block II: Magnetic Properties of Transition Metal Complexes**

**Unit 4:** Magnetic Properties of Transition Metal Complexes, Types of magnetic behavior, methods of determining magnetic susceptibility, spin-only formula, L-S coupling.

**Unit 5:** Correlation of $u_s$ and $u_{eff}$ values, orbital contribution to magnetic moments, application of magnetic moment data for 3d metal complexes.

**Unit 6:** Electronic spectra of Transition Metal Complexes, Types of electronic transitions, selection rules ford-d transitions, spectroscopic ground states, spectrochemical series, Orgelenergy level diagram for $d^1$ and $d^9$ states, discussion of the electronic spectrum of $[Ti(H2O)6]^{3+}$complexion.

**Block III: Organometallic Chemistry**

**Unit 7:** Organometallic Chemistry: Definition, nomenclature and classification of organometallic compounds.

**Unit 8:** Preparation, properties, bonding and applications of alkyls and aryls of Li, Al, Hg, Sn, metal carbonyls: 18 electron rule, preparation, structure and nature of bonding in the mononuclear carbonyls.

**Unit 9:** Silicones and Phosphazenes: Silicones and phosphazenes as examples of inorganic polymers, nature of bonding in tri phosphazenes.

**Block IV: Hard and Soft Acids and Bases**

**Unit 10:** Hard and Soft Acids and Bases (HSAB): Classification of acids and bases as hard and soft.

**Unit 11:** Pearson's HSAB concept, acid-base strength and hardness and softness, Symbiosis,

**Unit 12:** Theoretical basis of hardness and softness, electro negativity and hardness and softness.

**Block V: Bioinorganic Chemistry**

**Unit 13:** Bioinorganic Chemistry: Essential and trace elements in biological processes.

**Unit 14:** Metallo porphyrins with special reference to hemoglobin and myoglobin.
**Unit 15:** Biological role of alkali and alkaline earth metal ions with special reference to $Ca^{2+}$.

**References:**


1. Basic Inorganic Chemistry, F. A Cotton, G. Wilkinson, and Paul L. Gaus, 3 rd Edition (1995), John Wiley & Sons, New York.
2. Concise Inorganic Chemistry, J. D. Lee, 5 th Edition (1996), Chapman & Hall, London.
3. Inorganic Chemistry, J.E. Huheey, E.A. Keiter and R.L. Keiter.
4. Berg, J.M., Tymoczko, J. L. & Stryer, L. Biochemistry 7 th Edition, W. H. Freeman.
5. G. Odian: Principles of Polymerizations, 4 th Edition, Wiley, 2004.


**Course Code: B070404T**
**Course Name: Web Designing** **Credits: 3**

| S. No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | Explain the history of the internet and related internet concepts that are vital in understanding web development. | Understand |
| 2. | Discuss the insights of internet programming and implement complete application over the web. | Understand |
| 3. | Utilize the concepts of JavaScript and Java | Apply |
| 4. | Demonstrate the important HTML tags for designing static pages and separate design from content using Cascading Style sheet. | Apply |
| 5. | Reframe web application development software | Evaluate |

**Block-1: Introduction**

**Unit-1** What is Markup Language Basic Structure of HTML
Unit-2 Difference Between HTML and XHTML
Unit-3 Head Section and Elements of Head Section Meta Tags CSS Tags Script Tag Table Tag Div Tag Header Tags Paragraph, pan, Pre Tags

**Block-2: Designing Pages with HTML**

Unit-4 Anchor Links and Named Anchors Image Tag Object Tag frame Tag Forms Form Tag attributes of Form POST
Unit-5 GET Method Field set and Legend Text input,
Unit-6 Text area Checkbox and Radio Button Dropdown.

**Block-3 CSS**

Unit-7 Dynamic HTML, Document Object Model,
Unit-8 Features of DHTML, CSSP (Cascading Style Sheet Positioning) and JSSS (JavaScript assisted Style Sheet

**Block 4 Java Script**

Unit-9 Objects, Methods, Events and Functions, Tags, Operators, Data Types.

Unit-10 Literals and Type Casting in JavaScript, Programming Construct Array and Dialog Boxes.

**Block 5: Front Page**

Unit-11 Front Page Basics, Web Terminologies, Phases of Planning and Building Unit-12 Web Sites, the FTP, HTTP and WPP.

**Books Recommended/Suggested Reading:**


1. *Steven Holzner: Dreamtech Press*
2. *Evan Bayross: HTML, Java Script, DHTML, PERL, CGI.*
3. *Ivon Bayros: Introduction to HTML, DHTML, Java Script.*


**Subject Code: ZCO-3211**

**Subject: Evolutionary and Developmental Biology** **Credits: 4**

**Course outcomes:**

**The student at the completion of the course will be able to:**

- Understand that by biological evolution we mean that many of the organisms that inhabit the earth today are different from those that inhabited it in the past.
- Understand that natural selection is one of several processes that can bring about evolution, although it can also promote stability rather than change.
- Understand how the single cell formed at fertilisation forms an embryo and then a full adult organism.
- Integrate genetics, molecular biology, biochemistry, cell biology, anatomy and physiology during embryonic development.
- Understand a variety of interacting processes, which generate an organism's heterogeneous shapes, size, and structural features.
- Understand how a cell behaves in response to an autonomous determinant or an external signal, and the scientific reasoning exhibited in experimental life science.

**Block 1 Theories of Evolution**

**Unit 1** Origin of Life, Historical review of evolutionary concept: Lamarckism, Darwinism (Natural, Sexual and Artifical selection).

**Unit 2** Modern synthetic theory of evolution, Patterns of evolution (Divergence, Convergence, Parallel, Coevolution).

**Unit 3** Microevolution and Macroevolution: allele frequencies, genotype frequencies.

**Unit 4** Hardy Weinberg equilibrium and conditions for its maintenance, Forces of evolution: mutation, selection, genetic drift.

**Block 2 Direct Evidences of Evolution**

**Unit 5** Types of fossils, Incompleteness of fossil record, Dating of fossils, Phylogeny of horse

**Unit 6** Biological species concept (Advantages and Limitations)

**Unit 7** Modes of speciation (Allopatric, Sympatric)

**Unit 8** Mass extinction (Causes, Names of five major extinctions

**Block 3 Gamete Fertilization and Early Development**

**Unit 9** Gametogenesis, Fertilization, Cleavage pattern, Gastrulation, fate maps

**Unit 10** Developmental mechanics of cell specification, Morphogenesis and cell adhesion

**Unit 11** Genes and development, Molecular basis of development,

**Unit 12** Differential gene expression

**Block 4 Early Vertebrate Development**

**Unit 13** Early development of vertebrates (fish, birds & mammals),

**Unit 14** Metamorphosis, regeneration and stem cells, Environmental regulation of development

**Unit 15** The dynamics of organ development, Development of eye, kidney, limb

**Unit 16** Metamorphosis: the hormonal reactivation of development in amphibians, insects, Regeneration: salamander limbs, mammalian liver, Hydras, Aging: the biology of senescence

Suggested Readings:

1. Ridley, M. (2004). Evolution. III Edition. Blackwell Publishing
2. Barton, N. H., Briggs, D. E. G., Eisen, J. A., Goldstein, D. B. and Patel, N. H. (2007). Evolution. Cold Spring, Harbour Laboratory Press.
3. Hall, B. K. and Hallgrimsson, B. (2008). Evolution. IV Edition. Jones and Bartlett Publishers
4. Campbell, N. A. and Reece J. B. (2011). Biology. IX Edition, Pearson, Benjamin, Cummings.
5. Douglas, J. Futuyma (1997). Evolutionary Biology. Sinauer Associates.
6. Developmental Biology: T. Subramaniam, (Reprint), Narosa Publishing House Pvt. Ltd., New Delhi (2013).
7. Essential Developmental Biology: Jonathan M. W. Slack, (3rd ed.), Wiley-Blackwell. (2012).
8. Developmental Biology: From a Cell to an Organism (Genetics & Evolution) eBook: Russ Hodge, Infobase Publishing. (2009).
9. Current Topics in Developmental Biology: Roger A. Pedersen, Gerald P. Schatten, Elsevier. (1998).
10. Developmental biology: Werner A. Müller, Springer Science & Business Media. (2012).

**Subject Code: BDO-3211** **Credits:4**
**Subject: Cytogenetics, Plant Breeding & Nanotechnology**

**Course outcomes:** After the completion of the course the students will be able:
1.Acquire knowledge on cell ultrastructure.
2. Understand the structure and chemical composition of chromatin and concept of cell division.
3. Interpret the Mendel's principles, acquire knowledge on cytoplasmic inheritance and sex-linked inheritance.
4. Understand the concept of 'one gene one enzyme hypothesis' along with the molecular mechanism of mutation.

**Block 1 Cell Biology**

**Unit 1** Structure and function of cell wall, plasma membrane, ribosomes, Endoplasmic reticulum, golgi apparatus, mitochondria, chloroplast, lysosomes, peroxisomes and cell inclusions - Organization of nucleus: nuclear envelope, nucleoplasm and nucleolus. Chromosomal nomenclature- chromatids, centromere, telomere, satellite, secondary constriction. Organization of chromosomes- Nucleic acid and histones- types and classification. Lampbrush chromosomes and polytene chromosomes- Karyotype and idiogram.
**Unit 2** Cell cycle: G0, G1, S and G2 phases – mitosis: open and closed mitosis – amitosis - meiosis. Variation in Chromosome number (Numerical aberrations)- anueploidy and Euploidy-haploidy, polyploidy- significance (Structural aberrations) - deletion, duplication, inversion and translocation.
**Unit 3** Chromosome theory of inheritance, crossing over and linkage; Incomplete dominance and codominance.
**Unit 4** Interaction of Genes; Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Polygenic inheritance; Extra-nuclear Inheritance, Linkage, crossing over, Concept of sex determination and Sex chromosomes; Patterns of Sex determination in plants.

**Block 2 Plant breeding**

**Unit 5** Plant introduction. Agencies of plant introduction in India, Procedure of introduction - Acclimatization – Achievements, Selection - mass selection, pure line selection and clonal selection.

**Unit 6** Genetic basis of selection methods, Hybridization: Procedure of hybridization, inter generic, inter specific, inter varietal hybridization with examples. Composite and synthetic varieties, Male sterility, Heterosis and its exploitation in plant breeding, Mutation, Molecular Breeding (use of DNA markers in plant breeding), achievements in India, Breeding for pest, pathogenic diseases and stress resistance.

**Unit 7**Definition, statistical methods, basic principles, variables- measurements, functions, limitations and uses of statistics. Biometry: Data, Sample, Population, random sampling,

**Unit 8** Frequency distribution- definition only, Central tendency– Arithmetic Mean, Mode and Median; Measurement of dispersion–Coefficient of variation, Standard Deviation,

Standard error of Mean; Test of significance: chi- square test for goodness of fit. Computer application in biostatistics - MS Excel and SPSS

**Block 3 Plant tissue culture**

**Unit 9** Principles, components and techniques of in vitro plant cultures, Callus cultures, Cell culture, cell suspension cultures, Embryogenesis and organogenesis.

**Unit 10** Protoplast isolation and culturing of protoplast- principle and application, regeneration of protoplasts, protoplast fusion and somatic hybridization- selection of hybrid cells, Somaclonal variation, Plant secondary metabolites production.

**Unit 11** Nanotechnology Fundamentals of nanoscale self-assembly process involved in important functional biomolecules such as Nucleic acid (DNA and RNA), Proteins, Enzymes. Cell structure and organelles, nanoscale assembly of cellular components (cell membrane and liposomes). Nanoscale assembly of microorganisms (virus).

**Unit 12** Nano-particles synthesis, Biological synthesis of Nanoparticles, Advantages and applications of biologically synthesized nanomaterials. Introduction to biological nanomaterials. Biomineralization, Magnetosomes, nano-pesticides, nano-fertilizers, nano-sensors.

**Block 4 Artificial Intelligence in Plant Sciences**

**Unit 13** Artificial Intelligence in Plant Sciences Big Data Analytics, Blockchain Technology, 3-D Printing, Machine learning, Algorithms of Machine Learning, Expert systems and Fuzzy logic.

**Unit 14** Artificial Neural Networks and Genetic algorithms, Predictive Analytics, Agents and Robotics, IoT Sensors, Object Image capture & analysis ; Applications of Artificial Neural Networks in Plant Science.

**Unit 15** Educational software- INFLIBNET, NICNET, BRNET, internet as a knowledge repository- google scholar, science direct. resource management, weather forecasting.

**Unit 16** IoT Database management, IoT platforms, IoT Graphical user interface • IoT application development for Android Mobile phones, ICT Applications for different crops and horticulture.

**Suggested Readings:**


1. G.M. Cooper. (2015). The cell: A Molecular Approach. 7th Edition. Sinauer Associates.
2. 2. Alberts, B., Johnson, A.D., Lewis, J., Morgan, D., Raff, M., Roberts, K., Walter, P. (2014). Molecular Biology of Cell. 6th Edition. WW. Norton & Co.
3. 3. Campbell, M.K. (2012) Biochemistry, 7th ed., Published by Cengage Learning.
4. 4. Campbell, P.N. and Smith, A.D. (2011). Biochemistry Illustrated, 4th ed., Published by Churchill Livingstone

5. 5. Tymoczko, J.L., Berg, J.M. and Stryer, L. (2012). Biochemistry: A short course, 2nd ed., W.H.Freeman.
6. 6. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2011) Biochemistry, W.H.Freeman and Company BOTANY-UG-2020 Page 49
7. Nelson, D.L. and Cox, M.M. (2008). Lehninger Principles of Biochemistry, 5th Ed., W.H. Freeman and Company.
8. Karp, G. (2010). Cell Biology, John Wiley & Sons, U.S.A. 6th edition.
9. Hardin, J., Becker, G., Skliensmith, L.J. (2012). Becker's World of the Cell. 8th edition.Pearson Education Inc. U.S.A.)
10. Gardner, E.J., Simmons, M.J., Snustad, D.P. (1991). Principles of Genetics, John Wiley & sons, India. 8th e

**Subject Code: BDO-3251** **Credits:2**
**Subject: Cytogenetics, Conservation & Environment**

**BLOCK 1** Cell biology 1. Study of plant cell structure with the help of epidermal peal mount of Onion/Rhoeo/Crinum 2. Measurement of cell size by the technique of micrometry. 3. Counting cells per unit volume with the help of haemocytometer (Yeast/pollen grains) 4. Determination of mitotic index and frequency of different mitotic stages in pre-fixed root tips of Allium cepa.
**BLOCK 2** Monohybrid cross (Dominance and incomplete dominance) 2. Dihybrid cross (Dominance and incomplete dominance) 3. Gene interactions (All types of gene interactions mentioned in the syllabus) a. Recessive epistasis 9: 3: 1. b. Dominant epistasis 12: 3: I c. Complementary genes 9: 7 d. Duplicate genes with cumulative effect 9: 6: 1 e. Inhibitory genes 13: 3 4. Observe the genetic variations among inter and intra specific plants. 5. Demonstration of Breeding techniques-Hybridization, case studies of mutation, polyploidy, emasculation experiment.
**BLOCK 3** Biostatistics: 1.Univariate analysis of statistical data: Statistical tables, mean, mode, median, standard deviation and standard error (using seedling population / leaflet size). 2.Calculation of correlation coefficient values and finding out the probability. 3.Determination of goodness of fit in Mendellian and modified mono-and dihybrid ratios (3:1, 1:1, 9:3:3:1, 1:1:1:1, 9:7, 13:3, 15:1) by Chi-square analysis and comment on the nature of inheritance. 3. Computer application in biostatistics - MS Excel and SPSS.
**BLOCK 4** Plant tissue culture 1.Familiarization of instruments and special equipments used in the plant tissue culture experiments 2.Preparation of plant tissue culture medium, and sterilization, Preparation of stock solutions of nutrients for MS Media. 3.Surface sterilization of plant materials for inoculation (implantation in the medium) 4.Micropropagation of potato/tomato/ - Demonstration 5.Protoplast isolation and culturing – Demonstration
**BLOCK 5** Ecology & Environment 1. Ecological Adaptations: Hydrophytes, Xerophytes, Halophytes, Epiphytes and Parasites 2. Study of morphological adaptations of hydrophytes and xerophytes (four each). 3. Study of biotic interactions of: Stem parasite (Cuscuta), Root parasite (Orobanche) Epiphytes, Predation (Insectivorous plants). 4. Observation and study of different ecosystems mentioned in the syllabus. 5. Field visit to familiarize students with ecology of different sites.
**BLOCK 6** Soil Formation, Properties & Conservation 1. Determination of pH of various soil and water samples (pH meter, universal indicator/Lovibond comparator and pH paper) 2. Analysis for carbonates, chlorides, nitrates, sulphates, organic matter and

base deficiency from two soil samples by rapid field tests. 3. Determination of organic matter of different soil samples by Walkley & Black rapid titration method. 4. Soil Profile study 5. Soil types of India-Map

**BLOCK 7** Biodiversity and Phytogeography: 1. Study of community structure by quadrat method and determination of (i) Minimal size of the quadrat, (ii) Frequency, density and abundance of components (to be done during excursion/field visit). 2. Marking of vegetation types of India, World & Uttar Pradesh on maps 7 BOTANY-UG-2020 Page 56 3. Phytogeographical areas of India.

**BLOCK 8** Pollution &Waste management 1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter 2. Estimation of chloride and dissolved oxygen content in water sample 3. Comparative anatomical studies of leaves form polluted and less polluted areas. 4. Measurement of dissolved O2 by azide modification of Winkler's method. 5. Determination of dissolved oxygen of water samples from polluted and unpolluted sources. 6. Microbiological assessment of drinking water using MPN technique- water from well, river, water supply department and packaged drinking water 7. Making kitchen waste from compost/vermicompost by Enzymes/Bio decomposer/ Whey with dung. Climate Change, Carbon Credits & Role of GIS 1. Conducting Waste Audit of your Institution -Demo 2. Green auditing of the College/University -Demo

**Suggested Readings:**

1. Practical Botany (Part III) Author: Sunil D Purohit, Anamika Singhvi & Kiran Tak 2013 Apex Publishing House,Raj.
2. Practical Botany (Part II) Author: N. C. Aery, Sunil D Purohit & Gotam K Kukda 2013 Apex Publishing House,Raj.
3. A Handbook Of Soil, Fertilizer And Manure (2nd Ed.) (pb) ISBN : 9788177544152Edition : 02Year : 2017Author : Gupta PKPublisher : Agrobios (India)
4. Green Technology: An Approach For Sustainable Environment ISBN : 9788177543438Edition : 01Year : 2021Author : Dr. Purohit SSPublisher : Agrobios (India)
5. Laboratory Manual Of Chemical And Bacterial Analysis Of Water And SewageISBN : 9788177540802Edition : 01Year : 2011Author : Theroux FR , Eldridge EF , Mallmann WLPublisher : Agrobios (India)
6. Methods In Environmental Analysis: Water Soil And Air (2nd Ed.) ISBN : 9788177543087Edition :02Year : 2021Author : Gupta PKPublisher : Agrobios (India)
7. Water Treatment And Purification Technology ISBN : 9788177540024Edition : 01Year : 2009Author : Ryan WJPublisher : Agrobios (India

**Course Name**: **Elements of Quantum Mechanics and Atomic & Molecular Spectra**
**Course Code: PHO-3211** **Credits: 4**

**Objectives:** To acquire the knowledge about Matter Waves, Schrodinger wave equation, Atomic spectra and Molecular spectra.

**Course outcomes:**

- Understand about the origin of quantum mechanics.
- Understand Schrodinger wave equation
- Explain atomic spectra

- Explain molecular spectra

**Block I: Origin of Quantum Mechanics**

**Unit-1:** Matter Waves: Inadequacies of classical mechanics, Photoelectric phenomenon, Compton effect, wave particle duality,

**Unit**-2: de- Broglie matter waves and their experimental verification,

**Unit**-3: Heisenberg's Uncertainty principle, Complementary principle,

**Unit**-4: Principle of superposition, Motion of wave packets.

**Block II: Schrodiner Wave Equation**

**Unit-5:** Schrodinger wave equation and its Applications: Schrodinger wave equation, Interpretation of wave function,

**Unit**-6: Expectation values of dynamical variables, Ehrenfest theorem, Orthonormal properties of wave functions,

**Unit**-7: One dimensional motion in step potential, Rectangular barrier,

**Unit**-8: Square well potential, Particle in a box, normalization Simple Harmonic Oscillator.

**Block III: Atomic Spectra**

**Unit-8:** Atomic spectra: Spectra of hydrogen, deuteron and alkali atoms, spectral terms, doublet

**Unit**-9: Fine structure, screening constants for alkali spectra for s, p. d, and f states, selection rules.

**Unit-10:** Singlet and triplet fine structure in alkaline earth spectra, L-S and J-J couplings. Weak spectra: continuous X-ray spectrum and its dependence on voltage,

**Unit-11:** Duane and Haunt's law. Characteristics X-rays, Moseley's law, doublet structure and screening parameters in X-ray spectra, X-ray absorption spectra.

**Block IV: Molecular Spectra**

**Unit-12:** Molecular spectra: Discrete set of electronic energies of molecules,

**Unit-13**: Quantization of vibrational and rotational energies, determination of inter nuclear distance,

**Unit-14:** Pure rotation and rotation- vibration spectra,

**Unit-15:** Dissociation limit for the ground and other electronic states, transition rules for pure vibration and electronic vibration spectra

**Recommended books:**


- H. S. Mani and G K Mehta; "Introduction to Modern Physics" (Affiliated East-West Press 1989). • A Beiser, "Perspectives of Modern Physics".
- H. E. White; "Introduction to Atomic Physics". Barrow; "Introduction to Molecular Physics".
- R. P. Feymann, R B Leighton and M Sands; "The Feynmann Lectures on Physics, Vol. III (B I Publications. Bombay. Delhi, Calcutta, Madras).

**Course Name: Complex Analysis**

**Subject Code: MAO-3211** **Credits: 4**

**Course Objectives:** This course aims to provide students with a comprehensive understanding of complex numbers and functions of a complex variable. Students will develop the ability to analyze and apply complex integration, sequence and series, and their significance in mathematical contexts, promoting problem-solving and analytical skills.

**Course Outcomes:**

1. Apply complex number concepts, including polar and exponential forms, to solve problems.
2. Analyze complex functions for limits, continuity and differentiability.
3. Apply the Cauchy-Riemann equations and understand analytic functions.
4. Evaluate contour integrals and theorems, such as Cauchy's and Morera's theorems.
5. Solve problems involving complex sequences, series and singular points, applying the residue theorem in mathematical analysis.

**Block I: Analytical Functions**

**Unit 1:** Functions of complex variable

**Unit 2:** Concepts of limits, continuity and differentiability of complex functions

**Unit 3:** Analytic functions, Cauchy-Riemann equations (Cartesian and Polar form), Harmonic Function,

**Unit 4:** Orthogonal system, Power Series as an analytic function.

**Block II: Transformations**

**Unit 5:** Elementary functions, Mapping by Elementary functions

**Unit 6:** Linear and Bilinear transformations

**Unit 7:** Fixed points, Cross ratio

**Unit 8:** Inverse points and critical points, Conformol Transformation.

**Block III: Complex Integration**

**Unit 9:** Complex Integration, Line integral,

**Unit 10:** Cauchy's fundamental theorem, Cauchy's integral formula,

**Unit 11:** Morera's theorem, Liouville theorem,

**Unit 12:** Maximum Modulus theorem.

**Block IV: Series of Complex Numbers**

**Unit 13:** Convergence of a series complex term, Power series

**Unit 14:** Region of convergence, Radius of convergence of power series

**Unit 15:** Taylor's and Laurent Theorem.

**Block V: Important Theorems**

**Unit 16:** Singularities and zeros of an analytic function

**Unit 17:** Rouche's theorem, Fundamental theorem of algebra

**Unit 18:** Analytic continuation

**Unit 19:** Residue theorem and its applications to the evaluation of definite integrals

**Unit 20:** Argument principle

**Recommended Books:**


1. Brown and Churchill, Complex variable and Applications, McGraw Hill.
2. A. R. Vashistha, Complex Analysis, Krishna Publication.
3. S. K. Sharma and A. K. Sharma, Complex Analytic Functions, New Age International Publications.
4. R. Roop Kumar, Complex Analysis, Pearson.


**Physics Lab-VI**

**Course Code: PHO-3251** **Credits: 2**

**Course Objectives:** To acquire basic Study of Lorentz force and discrete and continuous LC transmission lines and also Study of alkali or alkaline earth spectra using a concave grating and Analysis of a given band spectrum.

**Course Outcomes:** After learning this course, students will be able to

1. Explain the Lorentz force.
2. Experimental conformation of Zeeman effect for determination of Lande g-factor
3. Experimental plot graph showing the variation of magnetic field.
4. Study of alkali or alkaline earth spectra using a concave grating.

**List of Experiments:**

1. Study of Lorentz force.
2. Study of discrete and continuous LC transmission lines.
3. Study of spectra of hydrogen and deuterium (Rydberg constant and ratio of masses of electron to proton).
4. Absorption spectrum of iodine vapour.
5. Study of alkali or alkaline earth spectra using a concave grating.
6. Study of Zeeman effect for determination of Lande g-factor.
7. Analysis of a given band spectrum.
8. Study of Raman spectrum using laser as an excitation source
9. To plot graph showing the variation of magnetic field.
10. To plot the characteristics of PN-junction diode.

**Recommended Books:**


- D.P. Khandelwal, “A Laboratory Manual for Undergraduate Classes (Vani Publishing House, New Delhi).
- S.P. Singh, “Advanced Practical Physics” (Pragati Prakashan, Meerut).
- Worsnop and Flint- Advanced Practical physics for students.

# Semester VII

**Course: Mathematical Physics** **Credits:4**

**Course Code: PHO-4111**

**Block-I**: **Vector Calculus**

Unit-1: Scalar and vector fields, Directional derivatives, Gradient of scalar function,
Unit-2: Equation of tangent plane and normal, Divergence and curl,
Unit-3: Divergence and curl of a vector field, line, surface and volume integrals, Gauss's Divergence theorem, Stokes' theorem.
Unit-4: Green's theorem and Green's theorem in a plane. Application in physical processes.

**Block-II: Fourier Series-I**

Unit-5: Periodic functions. Orthogonality of sine and cosine functions,
Unit-6: Dirichlet Conditions (Statement only). Expansion of periodic functions in a series of sine and cosine functions and determination of Fourier coefficients.
Unit-7: Complex representation of Fourier series.

**Block-III: Fourier Series-II**

Unit-8: Expansion of functions with arbitrary period. Expansion of non-periodic functions over an interval.
Unit-9: Even and odd functions and their Fourier expansions. Application.
Unit-10: Summing of Infinite Series.
Unit-11: Term-by-Term differentiation and integration of Fourier Series. Parseval Identity.

**Block-IV: Differential Equations and polynomials**

Unit-12: First order differential equations, linear second order differential equations with constant coefficient.
Unit-13: Singular Points of Second Order Linear Differential Equations and their importance. Frobenius method and its applications to differential equations.
Unit-14: Legendre, Bessel, Hermite and Laguerre Differential Equations. Properties of Legendre Polynomials: Rodrigues Formula, Generating Function, Orthogonality.
Unit-15: Simple recurrence relations. Expansion of function in a series of Legendre Polynomials. Unit-16: Bessel Functions of the First Kind: Generating Function, simple recurrence relations. Zeros of Bessel Functions and Orthogonality.

**Block-V: Partial Differential Equations**

Unit-17: Partial Differential Equations: Solutions to partial differential equations, using separation of variables:
Unit-18: Laplace's Equation in problems of rectangular, cylindrical and spherical symmetry. Unit-19: Wave equation and its solution for vibrational modes of a stretched string, rectangular and circular membranes.

**Reference Books:**

1. Mathematical Methods for Physicists: Arfken, Weber, 2005, Harris, Elsevier.
2. Fourier Analysis by M. R. Spiegel, 2004, Tata McGraw-Hill.

3. Mathematics for Physicists, Susan M. Lea, 2004, Thomson Brooks/Cole.
4. Differential Equations, George F. Simmons, 2006, Tata McGraw-Hill.
5. Partial Differential Equations for Scientists & Engineers, S.J. Farlow, 1993, Dover Pub.
6. Mathematical methods for Scientists & Engineers, D.A. McQuarrie, 2003, Viva Books.

**Course Outcomes:**

At the end of the course Mathematical Physics course, student will be able to

1. **Explain** vector calculus.
2. **Apply** Fourier series for periodic and non-periodic functions.
3. **Interpret** first order differential equations and linear second order differential equations.
4. **Summarize** various polynomials.
5. **Show** partial differential equations.

**Course Title: Solid State**

**Course Code: PHO-4112** **Credits 4**

**Block I: Crystal structure & Lattice dynamics**

Unit-1: Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with a Basis – Central and Non-Central Elements. Unit Cell.

Unit-2: Reciprocal Lattice. Types of Lattices. Brillion Zones. Types of Bonds. Ionic Bond. Covalent Bond. Van der Waals Bond. Diffraction of x-rays by Crystals. Bragg's Law.

Unit-3: Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains. Acoustical and Optical Phonons.

Unit-4: Qualitative Description of the Phonon Spectrum in Solids. Einstein and Debye Theories of Specific Heat of Solids. $T^3$Law.

**Block II: Magnetic Properties of Matter**

Unit-5: Dia-, Para-, Ferri- and Ferromagnetic Materials. Classical Langevin Theory of dia – and Unit-6: Paramagnetic Domains. Quantum Mechanical Treatment of Paramagnetism.Curie's law,

Unit-7: Weiss's Theory of Ferromagnetism and Ferromagnetic Domains.

Unit-8: Discussion of B-H Curve. Hysteresis and Energy Loss.

**Block III: Dielectric Properties of Materials**

Unit-9: Polarization. Local Electric Field at an Atom. Depolarization Field. Dielectric Constant. Unit-10: Electric Susceptibility. Polarizability. Classical Theory of Electric Polarizability.

Unit-11: Clausius-Mosotti Equation.

Unit-12: Normal and Anomalous Dispersion. Complex Dielectric Constant.

**Block IV: Electrical Properties of Materials**

Unit-13: Elementary Band Theory of Solids. Bloch Theorem. Kronig-Penney Model.

Unit-14: Effective Mass of Electron. Concept of Holes. Band Gaps. Energy Band Diagram and Classification of Solids. Law of Mass Action.

Unit-15: Insulators, and Semiconductors. Direct and Indirect Band Gap. Intrinsic and Extrinsic Semiconductors. p- and n- Type Semiconductors.

Unit-16: Conductivity in Semiconductors. Hall Effect in Semiconductors (Qualitative Discussion Only)

**Block V: Superconductivity**

Unit-17: Experimental Results. Critical Temperature. Critical magnetic field. Meissner effect. Unit-18: Type I and type II Superconductors, London's Equation and Penetration Depth.

Unit-19: Isotope effect. Idea of BCS theory (No derivation): Cooper Pair and Coherence length. Unit-20: Variation of Superconducting Energy Gap with Temperature. Experimental Evidence of Phonons. Josephson Effect.

**Books Recommended/Suggested Reading:**

1. Charles Kittel, Introduction to Solid State Physics, 7th Edition, John Wiley and Sons, Inc.
2. A J Dekkar, Solid State Physics, Macmillan India Limited, 2000.
3. J. S. Blackmore, Solid State Physics, Cambridge University Press, Cambridge.
4. N. W. Ascroft and N. D. Mermin, Solid State Physics, (Harcourt Asia, Singapore, 2003).
5. M. Ali Omar, Elementary solid state physics: principles and applications, (Pearson Education, 1999)

**Course Outcomes:**

At the end of the Solid-State Physics course, student will be able to

1. **Recall** crystal structure and lattice dynamics.
2. **List** dia-, Para-, Ferri- and Ferromagnetic materials.
3. **Define** electrical and dielectric properties of materials.
4. **Explain** superconductivity.

**Course: Digital Electronics**

**Course Code: PHO-4113** **Credits 4**

**Block-I: Number System and Codes**

Unit-1: Decimal, Binary, Hexadecimal and Octal number systems,

Unit-2: Base conversions, Binary, octal and hexadecimal arithmetic (addition, subtraction by complement method, multiplication),

Unit-3: Representation of signed and unsigned numbers,

Unit-4: Binary Coded Decimal code.

**Block-II: Logic Gates and Boolean algebra:**

Unit-5: Introduction to Boolean Algebra and Boolean operators,

Unit-6: Truth Tables of OR, AND, NOT,

Unit-7: Basic postulates and fundamental theorems of Boolean algebra, Truth tables,

Unit-8: construction and symbolic representation of XOR, XNOR, Universal (NOR and NAND) gates.

**Block-III: Combinational Logic Analysis and Design**

Unit-9: Standard representation of logic functions (SOP and POS),

Unit-10: Karnaugh map minimization, Encoder and Decoder,

Unit-11: Multiplexers and De multiplexers, Implementing logic functions with multiplexer, Unit-12: Binary Adder, binary subtractor, parallel adder/subtractor.

**Unit-IV: Sequential logic design**

Unit-13: Latches and Flip flops, S-R Flip flop, J-K Flip flop,

Unit-14: T and D type Flip flop, Clocked and edge triggered Flip flops, master slave flip flop, Unit-15: Registers, Counters (synchronous and asynchronous and modulo-N), State Table, State Diagrams,

Unit-16: counter design using excitation table and equations. , Ring counter and Johnson counter.

**Block-V: Programmable Logic Devices & Digital Logic families**

Unit-17: Basic concepts- ROM, PLA,.

Unit-18: Basic concepts- PAL, CPLD, FPGA.

Unit-19: Fan-in, Fan out, Noise Margin, Power Dissipation, Figure of merit,

Unit-20: Speed power product, TTL and CMOS families and their comparison.

***Books Recommended/Suggested Reading:***


1. M. Morris Mano Digital System Design, Pearson Education Asia ( Fourth Edition ).
2. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994).
3. W. H. Gothmann, Digital Electronics: An Introduction To Theory And Practice, Prentice Hall of India (2000).
4. R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994).


**Course Outcomes:**

At the end of the course Digital Electronics course, student will be able to

1. **Tell** number system and codes.
2. **Classify** logic gates and **explain** Boolean algebra.
3. **Develop** and implement logic functions, sequential logic design.
4. **Make use of** programmable logic devices.

**Course Name: Environmental Chemistry**
**Course Code: CHO-4111** **Credit: 4**

**Course Objectives:**
The course aims to explain the importance of energy. The renewable as well as non-renewable energy sources, their impact on environment and various polluting sources are also discussed in this course.

**Block-I: Introduction & Renewable Sources**
Unit 1: Introduction: Concept of Environmental Chemistry-scope and importance, nomenclature of environmental chemistry, Segments of environment, natural resources.
Unit 2: Renewable resources: solar and biomass energy.
Unit 3: Nonrenewable resources: thermal power and atomic energy, Reaction of atmospheric oxygen and hydrological cycle.

**Block-II: Air Pollution**
Unit 1: Definition, sources of air pollution, classification of air pollution, photochemical smog. Unit 2: Green house gas effect, ozone depletion.
Unit 3: Bhopal gas disaster, controlling methods.

**Block-III: Water Pollution**
Unit 1: Water Pollution: introduction, physical and chemical properties, water quality and its criteria.
Unit 2: Dissolved oxygen, biochemical oxygen demand, chemical oxygen demand, suspended solids.
Unit 3: Total dissolved solids, alkalinity, hardness of water, industrial waste water treatment.

**Block-IV: Toxicity**
Unit 1: Chemical Toxicology: toxicity and its impact on environment.
Unit 2: Cyanide and its toxic effect, pesticides and its biochemical effect.
Unit 3: toxicity of lead, mercury, arsenic and cadmium.

**Block-V: Ecosystem**
Unit 1: Ecosystem: concept, function and type of ecosystem, abiotic and biotic components.
Unit 2: Energy flow and energy dynamics of ecosystem, food chains, food web, tropic levels.
Unit 3: Biological cycles of carbon, nitrogen and phosphorous.

**Suggested readings:**

1. Fundamentals of Ecology by M.C. Dash
2. A text book of environmental Chemistry by W.Moore and F.A. Moore
3. "Environmental chemistry: an analytical approach" by Overway, Kenneth S
4. Environmental chemistry : a global perspective by VanLoon, Gary W
5. Barriers to biogas use for renewable energy [eBook] by Willis, John


**Course Outcomes:**
After the successful completion of the course students will be able to
1. Define environment
2. Explain renewable and non-renewable energy sources
3. Interpret polluting sources
4. Identify toxic metals
5. Discuss ecosystem

**Course Name: Reaction Mechanism**
**Course Code: CHO-4112** **Credit: 4**

**Course Objectives:**
The aims of this course is to the explain the different types of mechanism in organic chemistry. The free radical mechanism, types of elimination reactions and their effect on the reactivity of the reactions, rearrangement reactions and pericyclic reactions for the formation of different compounds also discussed in this course.

**Block-I: Free Radical Reactions**
Unit-1: Free Radical Reactions, Types of free radical reactions, free radical substitution mechanism, the mechanism at an aromatic substrate, and neighboring group assistance.
Unit 2: Reactivity for aliphatic and aromatic substrates at a bridgehead. Reactivity in the attacking radicals.
Unit 3: The effect of solvents on reactivity. Allylic halogenation (NBS), oxidation of aldehydes to carboxylic acids, auto-oxidation, coupling of alkynes, and arylation of aromatic compounds by diazonium salts. Sandmeyer reaction. Free radical rearrangement. Hunsdiecker reaction.

**Block-II: Elimination Reactions**
Unit 1: The E2, E1, and E1cB mechanisms and their spectrum. Orientation of the double bond.
Unit 2: Reactivity–effects of substrate structures, attacking the base, the leaving group, and the medium.
Unit 3: Mechanism and orientation in pyrolytic elimination, Chugaev, Cope, and Hoffman elimination.

**Block-III: Rearrangements**
A detailed study of the following rearrangements:
Unit 1: Pinacol-pinacolone, Demjanov rearrangement, Benzil Bensilic acid.
Unit 2: Favorskii rearrangement, Hofman, Curtius and Schmidt rearrangement.
Unit 3: Baeyer-Villiger and Fries rearrangement.

**Block-IV: Addition to Carbon-Hetero Multiple Bonds**
Unit 1: Addition to Carbon-Hetero Multiple Bonds Reductions of saturated and unsaturated carbonyl compounds, acids, esters, and nitriles using metal hydride.
Unit 2: Addition of Grignard reagents, organocopper, organozinc, reagents to carbonyl and unsaturated carbonyl compounds.
Unit 3: Addition of Grignard reagents organolithium to carbonyl and unsaturated carbonyl compounds. Stobbe and Baylis Hillman.

**Block-V: Pericyclic Reactions**
Unit 1: Pericyclic Reactions Molecular orbital symmetry, Frontier orbitals of ethylene, 1,3-butadiene, 1,3,5- hexatriene and allyl system. Classification of pericyclic reactions. Woodward -Hoffmann correlation diagrams. FMO and PMO approach.
Unit 2: Electrocyclic reactions - conrotatory and disrotatory notions, 4n, 4n+2, and allyl systems. Cycloadditions - antarafacial and suprafacial additions, 4n and 4n+2 systems, 2 + 2 addition of ketenes, 1,3-dipolar cycloadditions and cheleotropic reactions.

Unit 3: Sigmatropic rearrangements - suprafacial and antarafacial shifts of H, sigmatropic shifts involving carbon moieties, 3,3- and 5,5- sigmatropic rearrangements. Claisen, Cope, and aza-Cope rearrangements. Fluxional tautomerism. Ene reaction.

**Books/References:**

1. Advanced Organic Chemistry: Reactions, Mechanism and Structure, Jerry March, 6th Edition John Wiley.
2. Advanced Organic Chemistry, F. A. Carey and R. J. Sundberg, Vol. I & II, Springer.
3. Organic Chemistry, J. Clayden, N.Greevs, S. Wawen and P. Wothers, Oxford Press.
4. Modern Organic Reactions, HO House, Benjamin.
5. Principles of Organic Synthesis, R.O.C. Norman and J. M. Coxon, Blackie Academic & Professional. 6. Pericyclic Reactions, S. M. Mukherji, Macmillan, India.

**Course Outcomes:**

After the successful completion of the source students will be able to

1. Define free radicals and eliminations reactions
2. Explain rearrangement reactions
3. Interpret the chemistry of addition to Carbon-Hetero Multiple Bonds
4. Understand pericyclic reactions

**Course Name: Advanced Spectroscopy**
**Course Code: CHO-4113** **Credit: 4**

**Course Objectives:**

This course aims to explain the interaction of radiations with matter. The various types of spectroscopy such as NMR, ESR, Mass, electronic and photoelectron spectroscopy and their applications are explained in this course.

**Block-I: $^{1}$H-NMR Spectroscopy (PMR)**

**Unit 1:** NMR Spectroscopy: introduction; nuclear spin; NMR active molecules; basic principles of Proton Magnetic Resonance; choice of solvent and internal standard; equivalent and non-equivalent protons.

**Unit 2:** chemical shift and factors influencing it; ring current effect; significance of the terms: up-/downfield, shielded and deshielded protons; spin coupling and coupling constant (1st order spectra); relative intensities of first-order multiplets: Pascal's triangle; chemical and magnetic equivalence in NMR.

**Unit 3:** Anisotropic effects in alkene, alkyne, aldehydes and aromatics; NMR peak area, integration; relative peak positions with coupling patterns of common organic compounds; interpretation of NMR spectra of simple compounds, Applications

**Block-II: Electron Spin Resonance Spectroscopy**

Unit 1: Introduction, Its principles.
Unit 2: Hyperfine structures.
unit 3: ESR of simple radicals (benzoquinone radical anion).

**Block-III: Introduction to Mass Spectrometry**

**Unit 1:** Principle of mass spectrometry, the mass spectrum.
**Unit 2:** Mass spectrometry diagram, molecular ion, Metastable ion, fragmentation process.
**Unit 3:** McLafferty rearrangement.

**Block-IV: Electronic spectroscopy**

Unit 1: Atomic Spectroscopy, Energies of atomic orbitals, vector representation of momenta and vector coupling, spectra of hydrogen atom and alkali metal atom.

Unit 2: Molecular Spectroscopy: Energy levels, molecular orbitals, vibronic transitions, vibrational progressions and geometry of the excited states, Franck-Condon principle, electronic spectra of polyatomic molecules.
Unit 3: Emission Spectra; radiative and non-radiative decay, internal conversion, spectra of transition metal complexes, charge-transfer spectra.

**Block-V: Photoelectron, photoacousatic and photoluminescence spectroscopy**

Unit 1: Photoelectron Spectroscopy, Basic principles; ionization process, Koopman's theorem. Photoelectron spectra of simple molecules, ESCA, chemical information from ESCA. Auger electron spectroscopy-basic idea.
Unit 2: Photoacoustic Spectroscopy, Basic principles of photoacoustic spectroscopy (PAS), PAS-gases and condensed systems, chemical and surface applications.
Unit 3: Photoluminescence spectroscopy, Basic principles of photoluminescence spectroscopy; Fluorescence and Phosphorescence Spectra, instrumentation, and applications

**Suggested readings:**


1. Barrow G.M.: INTRODUCTION TO MOLECULAR SPECTROSCOPY, McGraw Hill (1962).
2. Banwell C.N.: FUNDAMENTALS OF MOLECULAR SPECTROSCOPY, McGraw Hill, N.Y. (1972).
3. Brand J.C.D. and Speakman J.C.: MOLECULAR STRUCTURE: THE PHYSICAL APPROACH, Edward Arnold, London, 2nd Ed., (1975).
4. Chang R.: BASIC PRINCIPLES OF SPECTROSCOPY, McGraw Hill, New York (1970).
5. Harris D.C. and Bertolucci M.D.:SYMMETRY AND SPECTROSCOPY: AN INTRODUCTION TO VIBRATIONAL AND ELECTRONIC SPECTROSCOPY, Dover Publications, New York (1990).
6. Hollas J.M.: MODERN SPECTROSCOPY, John Wiley & Sons, 4th Ed., (2004).
7. Ghosh P.K.: INTRODUCTION TO PHOTOELECTRON SPECTROSCOPY, John Wiley (1988).
8. Holls J.M.: MODERN SPECTROSCOPY, John Wiley (1988).


**Course Outcomes:**
After the successful completion of the course students will be able to
1. Explain $^{1}$H-NMR Spectroscopy (PMR) and ESR spectroscopy
2. Interpret Mass Spectrometry
3. Understand photoelectron, photoacousatic and photoluminescence spectroscopy

**Subject Name: Linear Algebra**
**Subject Code: MAO-4111** **Credits: 6**

**Course Objectives:**
The course aims to provide a comprehensive understanding of linear algebra, including vector spaces, linear transformations and inner product spaces, to enable students to apply these concepts in various mathematical and practical contexts.

**Block I: Vector Spaces**
Unit 1: Vector Spaces and their Properties
Unit 2: Subspaces and their Characteristics

Unit 3: Linear Independence and Dependence
Unit 4: Basis and Dimension

**Block II: Linear Transformations**
Unit 5: Linear Transformations and their Definitions
Unit 6: Algebra of Linear Transformations
Unit 7: Rank-Nullity Theorem
Unit 8: Matrix Representations of Linear Transformations

**Block III: Linear Functionals and Dual Spaces**
Unit 9: Linear Functionals and their Properties
Unit 10: Dual Space and its Relationship with Vector Spaces
Unit 11: Characteristic Values
Unit12: Cayley-Hamilton Theorem

**Block IV: Inner Product Spaces and Norms**
Unit 13: Inner Product Spaces and their Properties
Unit 14: Cauchy-Schwarz Inequality
Unit 15: Orthogonal Vectors and Orthonormal Sets

**Suggested Readings:**
1. Topics in Algebra by I. N. Herstein.
2. Linear Algebra by K. Hoffman and R. Kunze.

**Course Outcomes:**
1. Analyze vector space properties for understanding.
2. Evaluate matrix representations of linear transformations for problem-solving.
3. Explain the relationship between dual spaces and vector spaces.
4. Apply characteristic values in advanced mathematical contexts.
5. Assess inner product space properties for completeness.

**Course Name: Analytical Geometry**
**Course Code: MAO-4112** **Credits: 6**

**Course Objectives:**
This course aims to develop a deep understanding of analytical geometry, including transformations, conic sections, three-dimensional coordinates and basic solid geometry concepts.

**Block I: Coordinate Transformations**
Unit 1: Change of Coordinate Axes
Unit 2: Invariants in Coordinate Transformation
Unit 3: Pair of Straight Lines and Angle between Two Lines
Unit 4: General Equation of Second Degree Representing a Pair of Straight Lines

**Block II: Conic Sections**
Unit 5: General Equation of Conic Sections

Unit 6: Intersection of Lines with Conics, Tangents and Normals
Unit 7: Revisit of the concepts of circle, parabola, ellipse, hyperbola and their parametric equations
Unit 8: Tracing and Parametric Equations of Conics

**Block III: Three-Dimensional Geometry**
Unit 9: Three-Dimensional Coordinates
Unit 10: Projections and Direction Cosines
Unit 11: Planes in Cartesian and Vector Form
Unit 12: Straight Lines in Three Dimensions

**Block IV: Solid Geometry**
Unit 13: Equation of Spheres
Unit 14: Plane Sections of Spheres
Unit 15: Basic Concepts of Cones
Unit 16: Basic Concepts of Cylinders

**Suggested Readings:**
1. Robert J.T Bell, Elementary Treatise on Coordinate Geometry of three dimensions, Macmillan India Ltd.
2. P.R. Vittal, Analytical Geometry 2d & 3D, Pearson.
3. S.L. Loney, The Elements of Coordinate Geometry, McMillan and Company, London.
4. R.J.T. Bill, Elementary Treatise on Coordinate Geometry of Three Dimensions, McMillan India Ltd., 1994.

**Course Outcomes (COs):**
1. Analyze and apply coordinate transformations and conditions for pairs of straight lines.
2. Derive and apply the general equation of conic sections, including tangent and normal properties.
3. Utilize 3-dimensional coordinates, projections and direction cosines to solve geometric problems.
4. Apply the principles of solid geometry to spheres, cones and cylinders.
5. Synthesize concepts to solve complex geometric problems involving transformations and conic sections.

**Course Name: Mathematical Statistics**
**Code: MAO-4113** **Credits: 6**

**Course Objectives:** To provide students with a solid foundation in statistical methods, focusing on data collection, representation, descriptive statistics, probability distributions, bivariate data analysis, and hypothesis testing. Through theoretical concepts and practical applications, students will develop skills in analyzing data, making informed decisions, and drawing meaningful conclusions.

**Block I: Data Collection and Representation**
**Unit 1:** Data Types and Collection
**Unit 2:** Scales and Classification of Data

**Unit 3:** Diagrammatic Representation of Data

**Block II: Descriptive Statistics**

**Unit 4:** Measures of Central Tendency
**Unit 5:** Measures of Dispersion
**Unit 6:** Elementary Probability and Random Variables

**Block III: Probability Distributions**

**Unit 7:** Standard Probability Distributions
**Unit 8:** Bernoulli and Binomial Distributions
**Unit 9:** Poisson Distributions
**Unit 10:** Normal Distributions

**Block IV: Bivariate Data Analysis**

**Unit 11:** Scatter Diagram and Correlation
**Unit 12:** Regression Lines and Coefficients
**Unit 13:** Fitting of Polynomials and Exponential Curves

**Block V: Hypothesis Testing and Analysis of Variance**

**Unit 14:** Testing of Hypothesis
**Unit 15:** Z-test, t-test, and F-test
**Unit 16:** Chi-square Test and Goodness of Fit
**Unit 17:** Introduction to Analysis of Variance

***Books Recommended/Suggested Reading:***


1. *Spiegel, M. R. Theory and Problems of Statistics, Schaum Publishing Company.*
2. *Gupta S. C. and Kapoor V. K.; Fundamentals of Mathematical Statistics, S. Chand and Sons.*
3. *Hogg R. V., Mckean J. and Craig A. T.; Introduction to Mathematical Statistics, Pearson.*
4. *Miller I. and Miller M.; John E. Freund's Mathematical Statistics with Applications, Pearson.*
5. *Rohatgi V. K. and Saleh A. K. Md. E.; An Introduction to Probability and Statistics, Wiley.*
6. *Kapoor J. N. and Saxena H. C.; Fundamentals of Mathematical Statistics, S. Chand and Sons.*


**Subject Code: ZCO-4111**
**Subject: Systematics And Applied Entomology** **Credits: 4**

**Block- I**

**Unit-1** Ancestry and Evolution of Insects
**Unit-2** Classification of Insects
**Unit-3** Principles of Construction and Use of Dichotomous Keys in Insect Identification Methods of Collection,
**Unit-4** Preservation and Culture of Insects Parental Care in Insects

**Block- II**

**Unit-5** Brief Knowledge of Habit, Habitats and General Characters of the Following Orders With Special Reference to the Families Mentioned: Thysanura (Machilidae, Lepismatidae)

**Unit-6** Collembola, Odonata, Orthoptera (Acrididae, Tettigonidae, Gryllidae), Phase Theory in Locusts, Phithioptera (Anoplura, Mallophaga)

**Unit-7** Isoptera, Thysanoptera, Heteroptera (Pentatomidae, Belostomatidae), Homoptera (Aphidae, Coccidae), Coleoptera (Coccinellidae, Curculionidae)

**Unit-8** Lepidoptera (Noctuidae, Nymphalidae), Hymenoptera (Ichneumonidae, Formicidae); Diptera (Muscidae, Syrphidae)

**Block- III**

**Unit-9** Principles and Practices of Pest Control, Pest Control Procedures: Natural Control, Applied Control (Cultural, Biological and Insecticidal)

**Unit-10** Modes of Action of Insecticides, Factors Affecting Toxicity of Insecticides, Non-Insecticidal Methods : Antifeedents, Attractants and Repellents, Feeding Deterrents, Chemosterilants, Pheromones and Insect Growth Regulators (IGR's)

**Unit-11** Integrated Pest Management (IPM)

**Unit-12** Insecticide Application Equipments: Sprayers, Dusters, Granule Applicators Distribution, Habit and Habitats, Life-Cycle, Nature of Damage and Control of Pests of: Stored Grains (Sitophilus Oryzae, Tribolium Castaneum, Callosobruchus Chinensis); Sugarcane (Pyrilla Perpusilla, Chio Infuscatellus); Paddy(Leptocorisa Acuta, Hieroglyphus Banian/Nigrorepletus), Cotton (Dysdercus Koengii, Pectinophora Gossypiella); Cereals (Heliocoverpa Armigera, Agrotis Ypsilon) Vegetables((Raphidopalpa (=Aulacophora) Foveicollis, Pieris Brassicae); Fruits(Bactrocera (= Dacus) Cucurbitae, Papilio Demoleus); Forests (Defoliator: Tasar Silkworm, Antheraea Paphia; Sap-Sucker Of Khamer Or Gamhar, Tingis Beesoni; Teak Borer, Aeolesthes Holosericea); And Polyphagous Pests (Locusts, Termites)

**Block- IV**

**Unit-13** Lac Industry: Strains of Lac Insects, Lac Cultivation, Composition and Uses of Lac

**Unit-14** Apiculture: Kinds of Honey Bees and Bee Hives, Structure of Typical Bee Hive Organization of Honey Bees, The Language of Honey Bees, Bee Keeping Methods, Economic Importance and Diseases of Honey Bees. Parasites of Honey Bee (Varroa Destructor, Varroa Jacobsoni and Galleria Mellonella).

**Unit-15** Sericulture: Mulberry and Non-Mulberry Sericulture, Composition Processing of Silk and Silk Industry in India. Diseases of Silkworm (White Muscadine and Pebrine Disease).

**Unit-16** Life-Cycle and Control of Insects of Medical Importance of Man and Animals: House Flies, Mosquitoes, Phelbotomus (Sandfly) and Tabanus (Horse Fly)

**Course Name- Biology of Insects (Morphology, Physiology & Development)**
**Course Code- ZCO-4112 Credit : 4**

**Block-1**
**Unit-1** Integument: Structure, Functions and Modifications of Insect Cuticle, Moulting and Sclerotization
**Unit-2** Structure of an Insect Head, Thorax and Abdomen; Appendages of Head (Mouthparts and Antennae) and Thorax (Legs and Wings)
**Unit-3** Structure of a Wing of an Insect, Types of Wings, Hypothetical Wing Venation, Wing-Coupling Mechanisms and Flight Mechanism
**Unit-4** Structure and Modifications of Male and Female Genitalia in Insects
**Block-2**
**Unit-5** Structure and Functioning of Various Types of Respiratory Organs, Modes of Respiration, Physiology of Respiration in Terrestrial, Aquatic and Endoparasitic Insects
**Unit-6** Generalized Plan of Nervous System in Insects and Its Modifications
**Unit-7** Neuroendocrine System in Insects and The Role Of Neurosecretion In Various Metabolic Activities, Metamorphosis and Development of Insects
**Unit-8** Structure and Functions of Different Types of Visual and Sound Producing Organs in Insects
**Block-3**
**Unit-9** Structure and Modifications of Alimentary Canal
**Unit-10** Food and Feeding Mechanism of a Generalised Insect With Special Reference to Physiology of Digestion in Different Insects
**Unit-11** Structure and Functions of Blood and Mode of Circulation in Insects
**Unit-12** Principal Organs of Excretion of Insects Found in Different Habitats, Physiology of Excretion With Special Reference to Osmoregulation in Insects
**Block-4**
**Unit-13** Structure, Function and Physiology of Mechanoreceptors and Chemo Receptors in Insects
**Unit-14** Bioluminescence: Light Producing Organs, Mechanism and Significance of Light Production in Insect
**Unit-15** Structure of Pheromone Producing Glands, Different Types of Pheromones and their Chemical Nature
**Unit-16** Structure and Modification of Male and Female Reproductive Systems in Insects, Development: Structure of Egg, Maturation, Cleavage, Blastokinesis, Formation of Germ Layers and Segmentation; Different Types of Larvae and Pupae, Polyembryony and Parthenogenesis in Insects

**Course Name- Economic Zoology and Vermicology**
**Course Code- ZCO-4113 Credit : 4**

**Block-1**
**Unit-1** The General Study of Parasites in Terms of Morphology, Mode of Transmission, Symptoms, Prevention and Control.
**Unit-2** Types of Parasites Unicellular Parasite. Protozoans (Entamoeba Histolytica, Plasmodium Spp.,) Trypanosoma Spp. Leishmenia Spp. Etc.) Giardia and Vector Biology.
**Unit-3** Study: Multicellular Parasites,
**Unit-4** Platyhelminthes (Tape Worms and Liver Flukes) Aschelminthes (Ascaris) Nematoda- Sea Eligans.

**Block-2**

**Unit-5** Pests and Parasites, Apiculture, Sericulture, Lac Culture, Pisciculture, Dairy and Farming's Products.

**Unit-6** Pesticides (Organchlorines, Arganophosphates, Carbanates, Pyrethroids, Triazmes, Bardeux Nixture), Mode of Action of Pesticides

**Unit-7** Advantages and Disadvantages of Pesticides Hazards of Pesticides

**Unit-8** Biological Methods of Pest Control.

**Block-3**

**Unit-9** Earthworm Diversity: Classification Earthworm Types: White Worm Behavior of Earthworms As Indicators of Soil Fertility

**Unit-10** Earthworms As Bioreactors; Earthworms and Plant Growth, Organic Matter-Dynamics and Nutrient Cycling, Feeding Habit and Food

**Unit-11** Vermicomposting :Advantages of Vermicomposting, Vermicomposting in Daily Life, Vermiculture Vs. Vermicomposting

**Unit-12** Chemical Compostion of Vermicompost Vermicomposting at Home and Agricultural Farm; The Business of Worms; Interaction of Vermicompost Earthworms.

**Block-4**

**Unit-13** Earthworm Bio-Technology:Fundamentals of Sustainability; Enrichment of Vermicompost and Earthworms for Sustainable Production

**Unit-14** Earthworms in Bio-Remediation, Earthworms in Alternative Medicine, Earthworm Meal Production Transgenic Earthworms.

**Unit-15** Organic Farming: Eco-Friendly Farming System Technologies. Evaluation Study of Ecological Constraints (Climatic and Edaphic,).

**Unit-16** Appropriate Technologies, in Agro-Forestry, Natural-Management, Planted Forests, (Ranching, Farmers Perception to Organic Farming and any Case Study).

**Course Name- Economic Botany**

**Course Code- BDO-4111** **Credit : 4**

**Course Objective:**

1. To make the students familiar with economic importance of diverse plants that offer resources to human life.
2. It emphasizes the plants used as- food for man, fodder for cattle, feed for poultry, plants having medicinal value and also plant source of huge economic value etc

**Course Learning Outcomes:**

1. After studying Economic Botany, students would have first hand information of plants used as food, the various kinds of nutrients available in the plants.
2. The dietary requirements of proteins, fats, amino-acids, vitamins etc that can be met by plants.
3. The students will learn to perform the micro-chemical tests to demonstrate various components.
4. The students will learn about the use of fiber plants, beverages, fruits and vegetables that are integral to day to day life of plants.
5. Students will learn to explore the regional diversity in food crops and other plants and their ethno-botanical importance as well.

**Block-1 Origin of Cultivated Plants:**

**Unit-1** Concept of Centres of Origin, their importance with reference to Vavilov's work.

**Unit-2** Examples of major plant introductions; Crop domestication and loss of genetic diversity; evolution of new crops/varieties
**Unit-3** Importance of germplasm diversity
**Unit-4** Timber plants :General account with special reference to teak and pine
**Block-2 Cereals:**
**Unit-5** Wheat and Rice (origin, morphology, processing & uses); Brief account of millets.
**Unit-6** Legumes: Origin, morphology and uses of Chick pea
**Unit-7** Pigeon pea and fodder legumes
**Unit-8** Importance to man and ecosystem.
**Block-3 Sources of sugars and starches:**
**Unit-9** Morphology and processing of sugarcane, products and by-products of sugarcane industry. Potato – morphology, propagation & uses.
**Unit-10** Listing of important spices, their family and part used. Reference to fennel, saffron, clove and black pepper Economic importance with special Spices
**Unit-11** Beverages: Tea, Coffee (morphology, processing & uses), Fibers: Classification based on the origin of fibers; Cotton
**Unit-12** Coir and Jute (morphology, extraction and uses).
**Block-4 Sources of oils and fats & Natural Rubber**
**Unit-13** General description, classification, extraction, their uses and health implications groundnut, coconut, linseed, soybean, mustard and coconut (Botanical name, family & uses).
**Unit-14** Essential Oils: General account, extraction methods, comparison with fatty oils & their uses.
**Unit-15** Para-rubber: tapping, processing and uses. Drug-yielding plants:Therapeutic and habitforming drugs with special reference to Cinchona
**Unit-16** Digitalis, Papaver and Cannabis; Tobacco (Morphology, processing, uses and health hazards)

**Suggested Readings**
1) Kochhar, S.L. (2012). Economic Botany in Tropics, MacMillan & Co. New Delhi, India.
2) Wickens, G.E. (2001). Economic Botany: Principles & Practices. Kluwer Academic Publishers, The Netherlands.
3) Chrispeels, M.J. and Sadava, D.E. 1994 Plants, Genes and Agriculture. Jones & Bartlett Publishers.

**Course Name- Ecology and Biostatistics**
**Course Code- BDO-4112** **Credit : 4**

**Course outcome**
1. Acquaint the students with complex interrelationship between organisms and environment;
2. Make them understand methods for studying vegetation, community patterns and processes, ecosystem functions, and principles of phytogeography.
3. Understanding the strategies for sustainable natural resource management and biodiversity conservation.
4. Practical knowledge of the different statistics tools and techniques.
**Block-1 Ecological factors:**

**Unit-1** Soil (Origin, formation, composition, soil profile)
**Unit-2** Plant adaptation in relation to water (Hydrophytes and xerophytes)
**Unit-3** Light (Sciophytes and heliophytes)
**Unit-4** Temperature Pollution: Water, Soil and Radioactive.
**Block-2 Biodiversity conservation**
**Unit-5** Ecosystem: Types, structure, energy flow, trophic organization, food chains and food webs, ecological pyramids.
**Unit-6** Biogeochemical cycles: Cycling of carbon, nitrogen and phosphorous
**Unit-7** Population: Characteristics, Growth curves, Ecotypes and Ecads
**Unit-8** Plant communities: Characteristics, plant succession, Biological spectrum
**Block-3 Biostatistics:**
**Unit-9** Definition and scope of statistics
**Unit-10** sampling techniques
**Unit-11** Representation of data: tabular graphical etc
**Unit-12** Measures of central tendency: Arithmetic mean, mode, median
**Block-4 Measures of dispersion**
**Unit-13** Range
**Unit-14** Mean deviation
**Unit-15** Variation
**Unit-16** Standard deviation; Chi-square test for goodness of fit Regression analysis
**Suggested readings**


- Banerjee, P.K. (2006). Introduction to Biostatistics. S. Chand and Company Ltd., Ram Nagar, New Delhi.
- Chapman, J.L. and Reiss, M.J. (2003). Ecology: Principles and Applications. Second Edition. Cambridge University Press, UK. ISBN 0 521 58802 2. 335 pages.
- Odum, E.P. (2011). Fundamental of Ecology. 5th Edition. Saunders. ISBN 9780030584145. 613 pages.
- Rastogi, V.B. (2015). Biostatistics. Medtech, 3 rd Edition.
- Real, L.A. and Brown, J.H. (Eds.) (1991). Foundations of Ecology: Classic Papers with Commentaries. The University of Chicago Press. ISBN-10 0-226-70594-3. 904 pages
- Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition
- Shukla, R.S. and Chandel P.S. (2005). A text book of Plant Ecology. S. Chand and Company Ltd., Ram Nagar, New Delhi.
- Singh, J.S. Singh S.P. and Gupta, S.R. (2014). Ecology, Environment and Resource Conservation. S. Chand and Compony Pvt. Ltd., New Delhi.


**Course Name- Molecular Biology & Bioinformatics**
**Course Code- BDO-4113** **Credit : 4**

**Course Objective:** To gain the knowledge of structure and functions of DNA and RNA
1. A computer-based approach is now central to biological research.
2. Bioinformatics operates at the intersection of biology and informatics and has a strong mathematical component.
3. Training students in various aspects of Bioinformatics is the objective of this course.
**Course Learning Outcomes:**
1.Understanding of nucleic acid, organization of DNA in prokaryotes and Eukaryotes, DNA replication mechanism, genetic code and transcription process.

2.Processing and modification of RNA and translation process, function and regulation of expression.
3.Application in biotechnology
4. With a working knowledge of the practical and theoretical concepts of bioinformatics, you will be well qualified to progress onto advanced graduate study.
5. The portfolio of skills developed on the programme is also suited to academic research or work within the bioinformatics industry as well as range of commercial settings.

**Block-1**

**Unit-1** Nucleic acids: Carriers of genetic information, Historical perspective; DNA as the carrier of genetic information

**Unit-2** Introduction to Bioinformatics: Introduction, Branches of Bioinformatics, Aim, Scope and Research areas of Bioinformatics.

**Unit-3** Griffith's, Hershey & Chase, Avery, McLeod, McCarty, Fraenkel-Conrat's experiment.

**Unit-4** Databases in Bioinformatics: Introduction, Biological Databases, Classification format of Biological Databases, Biological Database Retrieval System.

**Blcok-2 The Structures of DNA and RNA / Genetic Material & Biological Sequence Databases**

**Unit-5** National Center for Biotechnology Information (NCBI): Tools and Databases of NCBI, Database Retrieval Tool, Sequence Submission to NCBI, Basic local alignment search tool (BLAST), Nucleotide Database, Protein Database, Gene Expression Database.

**Unit-6** EMBL Nucleotide Sequence Database (EMBL-Bank): Introduction, Sequence Retrieval, Sequence Submission to EMBL, Sequence analysis tools. DNA Data Bank of Japan (DDBJ): Introduction, Resources at DDBJ, Data Submission at DDBJ. Protein Information Resource (PIR): About PIR, Resources of PIR, Databases of PIR, Data Retrieval in PIR. Swiss-Prot: Introduction and Salient Features

**Unit-7** DNA Structure: Miescher to Watson and Crickhistoric perspective, DNA structure, Salient features of double helix, Types of DNA, Types of genetic material, denaturation and renaturation, cot curves; Organization of DNA- Prokaryotes, Viruses, Eukaryotes.

**Unit-8** RNA Structure Organelle DNA -- mitochondria and chloroplast DNA.The Nucleosome Chromatin structure- Euchromatin, Heterochromatin- Constitutive and Facultative heterochromatin.

**Block-3 The replication of DNA:**

**Unit-9** Sequence Alignments: Introduction, Concept of Alignment, Multiple Sequence Alignment (MSA), MSA by CLUSTALW, Scoring Matrices, Percent Accepted Mutation (PAM), Blocks of Amino Acid Substitution Matrix (BLOSUM).

**Unit-10** Chemistry of DNA synthesis (Kornberg's discovery); General principles – bidirectional, semi- conservative and semi discontinuous replication, RNA priming; Various models of DNA replication, including rolling circle, θ (theta) mode of replication

**Unit-11** replication of linear ds-DNA, replication of the 5'end of linear chromosome; Enzymes involved in DNA replication. Transcription: Transcription in prokaryotes and eukaryotes.

**Unit-12** Principles of transcriptional regulation; Prokaryotes: Regulation of lactose metabolism and tryptophan synthesis in E.coli. Eukaryotes: transcription factors, heat shock proteins, steroids and peptide hormones; Gene silencing.

**Block-4 Central dogma and genetic code & Translation**

**Unit-13** Molecular Phylogeny: Methods of Phylogeny, Software for Phylogenetic Analyses, and Consistency of Molecular Phylogenetic Prediction., Key experiments establishing-The Central Dogma (Adaptor hypothesis and discovery of mRNA template), Genetic code (deciphering & salient features).
**Unit-14** Processing and modification of RNA Split genes-concept of introns and exons, removal of introns, spliceosome machinery, splicing pathways, group I and group II intron splicing, alternative splicing eukaryotic mRNA processing(5' cap, 3' polyA tail); Ribozymes; RNA editing and mRNA transport.
**Unit-15** Ribosome structure and assembly, mRNA; Charging of tRNA, aminoacyl tRNA synthetases; Various steps in protein synthesis, Applications of Bioinformatics: Structural Bioinformatics in Drug Discovery, Quantitative structureactivity relationship (QSAR) techniques in Drug Design, Microbial genome applications, Crop improvement.
**Unit-16** Proteins involved in initiation, elongation and termination of polypeptides; Fidelity of translation; Inhibitors of protein synthesis; Post-translational modifications of proteins.

**Suggested Readings**

1) Watson J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M., Losick, R. (2007). Molecular Biology of the Gene, Pearson Benjamin Cummings, CSHL Press, New York, U.S.A. 6th edition.
2) Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons Inc., U.S.A. 5th edition.
3) Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. Benjamin Cummings. U.S.A. 9th edition.
4) Russell, P. J. (2010). i-Genetics- A Molecular Approach. Benjamin Cummings, U.S.A. 3rd edition.
5) Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10th edition.
6) Ghosh Z. and Bibekanand M. (2008) Bioinformatics: Principles and Applications. Oxford University Press.
7) Pevsner J. (2009) Bioinformatics and Functional Genomics. II Edition. Wiley-Blackwell.
8) Campbell A. M., Heyer L. J. (2006) Discovering Genomics, Proteomics and Bioinformatics. II Edition. Benjamin Cummings.

**Course Name: Research Methodology**
**Course Code: BRM-0001** **Credits 4**

**Course Objectives:** To familiarize students with basic of research, research process and enable the participants in conducting research work and formulating research synopsis and report.

**Block I: Research Formulation**

**Unit 1:** Introduction, meaning of research,
**Unit 2:** Types, Role of research in important area and Process of Research,
**Unit 3:** Defining research Problems, Hypothesis Formulation.

**Block II: Research Elaborated**

**Unit 4:** Research Design, Research plan, Concept of sample, Sample size, various types of sampling techniques.

**Unit 5:** Types of Data and Methods of its Collection**;** Questionnaire Design,

**Unit 6:** Precautions in preparation of questionnaire, Measurement scales.

**Block III: Data Analysis and Interpretation-1**

**Unit 7:** Processing and Analysis of Data by application of statistical tools

**Unit 8:** various kinds of charts and diagrams used in data analyses

**Unit 9:** Application of Data Analysis

**Block IV: Data Analysis and Interpretation-2**

**Unit 10:** Hypothesis Testing (F-test, ANOVA, Chi –square test, t-test)

**Unit 11:** Multivariate Statistical techniques- Multiple regression, discriminate analysis, Factor analysis, Multivariate analysis of variance

**Unit 12:** Conjoint analysis, Cluster analysis, Multidimensional Scaling, Role of computer in research, Excel- A tool for statistical analysis, SPSS, Interpretation and conclusion

**Block V: Report Writing**

**Unit 13:** Report Writing, Significance of report writing, Steps in report writing

**Unit 14:** Layout of research report, Types of reports; Appendices

**Unit 15:** Bibliography, Characteristics of a good report; Precautions for report writing; Ethics in business research.

***Books Recommended/Suggested Reading:***


1. *Kothari C. R.: Research Methodology, New Age International Publishers.*
2. *Sinha S. C. and Dhiman A. K.; Research Methodology, EssEss Publications.*
3. *Anderson T. W.; An Introduction to Multivariate Statistical Analysis, Wiley.*
4. *Garg B. L., Karadia R., Agarwal F. and Agarwal U. K.; An Introduction to Research Methodology, RBSA Publishers.*


**Course Outcomes:**

After the completion of the course, student shall be able to:

1. Elaborate various concepts related to research.
2. Enumerate various kinds of research design & process.
3. Develop adequate knowledge on measurement & scaling techniques as well as the quantitative data analysis.
4. Demonstrate various techniques of data analysis-and hypothesis testing procedures.
5. Articulate appropriate research ethics for doing meaningful research.

Course Name: Physics Lab-VII
Course Code: PHO-4151 Credits 2

List of Experiments:

1. To determine the value of e/m by Thompson method.
2. To determine the value of Planck's constant by Photo cell.
3. To determine the value of Rydberg's constant with the help of a Hydrogen tube lamp and using (a) a prism (b) a transmission grating.
4. To perform the Inverting & Non- Inverting Amplifier Using OP- Amp.
5. To perform the Differentiator & Integrator Using OP- Amp.
6. To calculate the Frequency of Wein- bridge Oscillator Using Op Amp.
7. To perform the Schmitt trigger Using OP-Amp.
8. To draw the frequency Response curve of Low pass filter & High pass filter Using OP Amp.
9. To draw the frequency Response curve of Band pass filter & Band stop filter Using OP Amp.
10. To perform the Square Wave generator, Using OP Amp.
11. To perform the Triangular Wave generator, Using OP Amp.

**Recommended Books:**


- D.P. Khandelwal, "A Laboratory Manual for Undergraduate Classes (Vani Publishing House, New Delhi).
- S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
- Worsnop and Flint- Advanced Practical physics for students.


**Course Title: Advanced Physical Analysis**
**Course Code: CHO-4151 Credit: 2**

**Course Objectives:**
The objective of this course is to explain the advanced techniques for determining the water quality parameters, transport number, enthalpy of reaction and molecular weight of polymers.

**List of Experiments**

**1.** Analysis of water quality parameters: pH, conductance, dissolved oxygen, hardness, chloride and fluoride.

**2.** Determine the transport number of $Ag^+$ and $NO_{3-}$ ions in solution using 0.1 M and 0.01 M $AgNO_3$ solutions (Given: Mean ionic activity coefficients of $AgNO_3$ in 0.01 M and 0.1 M solutions are 0.89 and 0.73, respectively).

**3.** To determine the enthalpy of solution of solid Calcium Chloride ($CaCl_2$).

**4.** To determine the rate constant of a reaction between acetone and iodine in presence of mineral acid & a catalyst and to show that this reaction with respect to iodine is of zero order.

**5.** Determination of critical solution temperature and composition of the phenol-water system and to study the effect of impurities on it.

**6.** To determine the transition temperature of hydrated sodium bromide by solubility method.

**7.** Determination of molecular weight of a polymer (e.g. Polystyrene) by viscometric method.

**8.** Kinetic Study of hydrolysis of an ester in presence of HCl

**9.** Kinetics of reaction between $K_2S_2O_8$ and Kl.

**Suggested Readings:**


1. Shoemaker D.P., Garland C.W. and Nibler J.W.: EXPERIMENTS IN PHYSICAL CHEMISTRY, McGraw Hill, New York (1996).
2. Yadav J.B.: ADVANCED PRACTICAL PHYSICAL CHEMISTRY, Goel Publishing House (2000).
3. Lewitt B.P.: FINDLEY'S PRACTICAL PHYSICAL CHEMISTRY, Longman (1990).


**Course Outcomes:**

After the successful completion of the course student will be able to

1. Determine the water quality parameters
2. Calculate the transport number and molecular weight
3. Define the rate constant
4. Evaluate the transition temperature.

**Subject Name: Mathematics Lab-I**
**Subject Code: MAO-4151** **Credits: 2**

**Course Objectives:** This course aims to introduce students to the practical applications of mathematical software tools like Mathematica, MATLAB, Maple, Scilab, Maxima, etc. Students will learn to utilize these tools for graphing functions, solving equations, and performing various mathematical operations.

**List of the Practicals:** to be done using Mathematica /MATLAB /Maple /Scilab/Maxima/ Python, etc.

1. Plotting the graphs of the following functions:

(i) ax

(ii) [x] (greatest integer function)

(iii) $x^{2n}$; $n \in N$

(iv) $x^{2n-1}$; $n \in N$

(v) $\frac{1}{x^{2n-1}}$; $n \in N$

(vi) $\frac{1}{x^{2n}}; n \in N$

(vii) $\sqrt{ax+b}, |ax+b|, c \pm |ax+b|$

(ix) $\frac{|x|}{x}, \sin\left(\frac{1}{x}\right), x\sin\left(\frac{1}{x}\right), e^{x}, e^{-x}$ for $x \neq 0$.

$(x) e^{ax+b}, \log(ax+b), \frac{1}{ax+b}, \sin(ax+b), \cos(ax+b), |\sin(ax+b)|, |\cos(ax+b)|$.

Observe and discuss the effect of changes in the real constants a and $b$ on the graphs.

(2) By plotting the graph find the solution of the equation

$$x = e^{x}, x^2 + 1 = e^{x}, 1 - x^2 = e^{x}, x = \log_{10}(x), \cos(x) = x, \sin(x) = x, \cos(y) = \cos(x), \sin(y) = \sin(x),$$ etc.

(3) Plotting the graphs of polynomial of degree 2,3,4 and 5, and their first and second derivatives.

(4) Sketching parametric curves, e.g., Trochoid, Cycloid, Epicycloid and Hypocycloid, etc.

(5) Tracing of conic in Cartesian coordinates.

(6) Graph of circular and hyperbolic functions.

(7) Obtaining surface of revolution of curves.

(8) Complex numbers and their representations, Operations like addition, Multiplication, Division, Modulus. Graphical representation of polar form.

(9) Find numbers between two real numbers and plotting of finite and infinite subset of $R$.

(10) Matrix Operations: Addition, Multiplication, Inverse, Transpose, Determinant, Rank, Eigenvectors, Eigenvalues, Characteristic equation and verification of the Cayley-Hamilton theorem, Solving the systems of linear equations.

**Course Outcomes:**

1. Graphically analyze and interpret mathematical functions using software tools.
2. Apply graphical methods to find solutions for a variety of equations.
3. Perform matrix operations and solve systems of linear equations efficiently.

**Subject Name: Mathematics Lab-II**
**Subject Code: MAO-4151** **Credits: 2**

**Course Objectives:** This course aims to equip students with the practical skills to solve mathematical problems using computer algebra software. Students will learn to apply various numerical techniques to find solutions for equations, systems of linear equations, interpolation, numerical integration, eigenvalues, polynomial fitting, and ordinary differential equations, thereby gaining proficiency in computational mathematics.

**List of the Practicals:** to be done using computer algebra software (CAS), for example Mathematica/MATLAB/Maple/ Maxima/Scilab/Python, etc.

1. Solution of transcendental and algebraic equations by
i) Bisection method
ii) Newton Raphson method (Simple root, multiple roots, complex roots).
iii) Secant method.
iv) Regula Falsi method.

2. Solution of system of linear equations
i) LU decomposition method
ii) Gaussian elimination method
iii) Gauss-Jacobi method
iv) Gauss-Seidel method

3. Interpolation
i) Lagrange Interpolation
ii) Newton's forward, backward and divided difference interpolations

4. Numerical Integration
i) Trapezoidal Rule
ii) Simpson's one third rule
iii) Weddle's Rule

5. Method of finding Eigenvalue by Power method (up to $4 \times 4$)

6. Fitting a Polynomial Function (up to third degree)

7. Solution of ordinary differential equations
i) Euler method ii) Runge Kutta method (order 4)

**Course Outcomes:**
1. Utilize computer algebra software (CAS) to enhance accuracy and efficiency in solving transcendental and algebraic equations.
2. Employ CAS to perform LU decomposition and iterative methods for solving systems of linear equations, promoting numerical accuracy.
3. Apply CAS for interpolation, numerical integration, and ordinary differential equation solutions, enhancing computational precision and analytical capabilities.

**Course Name- Lab on Environmental Science, Behavioral, Ecology, Developmental Biology, Wildlife, Ethology**

**Course Code- ZCO-4151** **Credit : 2**

1. Introduction of environmental Science: Definition, principles and scope of environmental science, structure and composition of atmosphere, hydrosphere, lithosphere and biosphere.
2. Ecosystems: definition, structure and function of ecosystem, energy flow in an ecosystem, food chain, food web and ecological, case studies of the following ecosystem: forest ecosystem, grassland ecosystem, desert ecosystem and aquatic ecosystem.

3. Natural resources: Renewable and Non-renewable resources: land resources and land use change, land degradation soil erosion and desertification. Deforestation: causes and impacts due to mining, dam building on environment, of surface and ground water, floods, droughts, conflicts over water (international & inter-state). Energy resources: Renewable and nonrenewable energy sources, growing energy needs case studies.
4. Biodiversity and conservation: Level of biodiversity- genetic, species and ecosystem diversity, Bio geographic zones of India, biodiversity patterns and global biodiversity hotsports. India as a mega-biodiversity nation, endangered and endemic species of India. Threats to biodiversity - Habitat loss, poaching of wildlife, man-wildlife conflict, biological invasions, conservation of biodiversity-in-situ ex-situ conservation of biodiversity.
5. Environmental Pollution: Types, causes, effects and controls, air, water, soil and noise pollution. Nuclear hazards and human health risks. Solid waste management-Control measures of urban and industrial waste. Pollution case studies.
6. Environmental Policies & Practices: Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture. Environmental lawsEnvironmental Protection Act- Air (Prevention & Control of Pollution) Act. Water (Prevention & Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, International agreements-Montreal and Kyoto protocols and Conservation of Biological Diversity (CBD).
Basic Concepts of Ecology
Definition of ecology and its relation to humanity.
The environment: Abiotic factors, biotic factors, edaphic factors.
Concept of ecosystem with reference to pond, Grassland, Forest & River ecosystem. Energy flow in ecosystem. Pyramids of number, biomass and energy. Food chain-grazing and detritus, Food web and trophic levels. Biosphere: Hydrosphere, Lithosphere and Atmosphere. Biogeochemical cycles: Carbon and Nitrogen cycles.
Population: Definition and characteristics: density, natality, mortality, migration, emigration and immigration, growth and growth-curves. Dispersion and aggregation. Negative and positive interactions including commensalism, mutualism, predation, competition and parasitism.

# Semester VIII

**Course Title: Nuclear and Particle Physics**
**Course Code: PHO-4211** **Credits 4**

**Block I: General properties of nuclei:**

Unit-1: Constituent of nucleus and their intrinsic properties, size of the nucleus, radii, charge density.

Unit-2: Nuclear charge: measurement of nuclear charge, Alpha scattering methods, nuclear mass, measurement of mass using Bainbridge spectrograph, mass defect, binding energy, variation of binding energy with atomic mass number.

Unit-3: Elementary idea of nuclear fusion-fission, nuclear angular momentum, nuclear magnetic dipole moment,

Unit-4: Nuclear electric quadrupole moment: definition, units, significance of positive and negative values.

**Block II: Radioactive decay:**

Unit-5: Radioactive series decay, growth and decay of daughter product, ideal, transient, and secular equilibrium.

Unit-6: Alpha decay: basic features of alpha decay, Gamow factor, Giger Nutttal law, energy spectrum of alpha particles, fine structure.

Unit-7: Beta decay: energy kinematics of Beta decay, neutrino hypothesis, continuous nature of beta particle spectrum. Gamma decay and selection rules for Gamma decay.

Unit-8: Nuclear reactions:- Types of reaction, conservation laws, Q-value: negative Q-value reaction and threshold energies, energetic of $\alpha$, $\beta+$ , $\beta$ - and electron capture (EC) decay.

**BLock III: Interaction of nuclear radiation with matter:**

Unit-9: Energy loss due to ionization (Bethe block formula), range and straggling,

Unit-10: Cerenkov radiation, interaction of Gamma radiation with matter,

Unit-11: Photoelectric effect, Compton scattering and Pair production.

**Block IV: Detectors and Scintillator**

Unit-12: Detectors for Nuclear radiations, Gas filled detectors, G.M counter, ionization chamber.

Unit-13: Basic principle of Scintillation detectors and construction of Photo multiplier tube (PMT).

Unit-14: Principle of Semi-Conductor (SC) detectors.

Unit-15: Position sensitive gas filled detectors.

**Block V: Particle Physics:**

Unit-16: Basic interactions and their mediating quanta, types of particles and its families,

Unit-17: Fermions and Bosons, Leptons and Hadrons, particles and antiparticles,

Unit-18: Idea of resonances, conservation rules in fundamental interactions. Determination of spins and parity of pions,

Unit-19: Spins of particles, associated production, strangeness and decay mode, charge kaons, Isospin and its conservation,
Unit-20: Concept of Quark model: Quarks their quantum numbers.

***Books Recommended/Suggested Reading:***


1. *Kenneth S. Krane : Introductory nuclear Physics by (Wiley India Pvt. 2008).*
2. *Bernard L. Cohen : Concepts of nuclear physics by (Tata Mcgraw Hill 1998).*
3. *D. Griffith : Introductory to Elementary Particles (John Wiley & Sons).*
4. *Enge, H. A. : Introductory to nuclear Physics (Addison Wesely).*
5. *Evans, R. D. : Atomic Nucleus (Macgraw Hill).*
6. *Kapoor, S. S. & Ramamurthy, V. S. : Nuclear Radiation Detectors (New Age).*
7. *Knoll, G. F. : Radiation Detectors.*
8. *Dodd, J. E . : Ideas of Particles Physics (Cambridge Univ. Press.).*
9. *Martin, B. R & Shaw, R. G. : Ghoshal,: Particle Physics (John Wiley).*
10. *S. N. : Atomic and Nuclear Physics (S. Chand & Company, Ltd)*


**Course outcomes:**

At the end of the course Nuclear and Particle Physics course, student will be able to
**List** general properties of nuclei.
**Explain** about radioactive series decay.
**Demonstrate** the interaction of nuclear radiation with matter.
**Explain** the basic interactions of particle physics.

**Subject Name: Atmospheric Physics**
**Subject Code: PHO-4212** **Credits 4**

**Block I: General features of Earth's atmosphere**

Unit-1: Thermal structure of the Earth's Atmosphere, Composition of atmosphere, Hydrostatic equation,
Unit-2: Potential temperature, Atmospheric Thermodynamics, Greenhouse effect, Local winds, monsoons, fogs, clouds, precipitation,
Unit-3: Atmospheric boundary layer, Sea breeze and land breeze. Instruments for meteorological observations including RS/RW,
Unit-4: Meteorological processes and convective systems, fronts, Cyclones and anticyclones, thunderstorms.

**Unit II: Atmospheric Dynamics**

Unit-5: Scale analysis, Fundamental forces, Basic conservation laws, The Vectorial form of the momentum equation in rotating coordinate system,
Unit-6: Scale analysis of equation of motion, Applications of the basic equations, Circulations and vorticity,
Unit-7: Atmospheric oscillations, Quasi biennial oscillation, annual and semiannual oscillations,

Unit-8: Mesoscale circulations, The general circulations, Tropical dynamics.

**Block III: Atmospheric Waves**

Unit-9: Surface water waves, wave dispersion, acoustic waves, buoyancy waves,
Unit-10: propagation of atmospheric gravity waves (AGWs) in a non-homogeneous medium,
Unit-11: Lamb wave, Rossby waves and its propagation in three dimensions and in sheared flow,
Unit-12: wave absorption, non-linear consideration.

**Unit IV: Atmospheric Radar and Lidar**

Unit-13: Radar equation and return signal, Signal processing and detection, Various type of atmospheric radars,
Unit-14: Application of radars to study atmospheric phenomena, Lidar and its applications,
Unit-15: Application of Lidar to study atmospheric phenomenon.
Unit-16: Data analysis tools and techniques.

**Unit V: Atmospheric Aerosols**

Unit-17: Spectral distribution of the solar radiation, Classification and properties of aerosols,
Unit-18: Production and removal mechanisms, Concentrations and size distribution, Radiative and health effects,
Unit-19: Observational techniques for aerosols, Absorption and scattering of solar radiation, Rayleigh scattering and Mie scattering,
Unit-20: Bouguert-Lambert law, Principles of radiometry, Optical phenomena in atmosphere, Aerosol studies using Lidars.

***Books Recommended/Suggested Reading:***


1. Fundamental of Atmospheric Physics, M.L Salby; Academic Press, Vol 61, 1996.
2. The Physics of Atmosphere – John T. Houghton; Cambridge University press; 3 rdedn. 2002.
3. An Introduction to dynamic meteorology – James R Holton; Academic Press, 2004.
4. Radar for meteorological and atmospheric observations – S. Fukao and K. Hamazu, Springer Japan, 2014.


**Course Outcomes:**

At the end of the Atmospheric Physics course, student will be able to

**Tell** about the general features of Earth's atmosphere.

**Define** fundamental forces, conservation laws, circulations and vorticity.

**Explain** about atmospheric waves and its propagation**.**

**Illustrate** various types of radar and lidar and its applications.

**Summarize** atmospheric aerosols and its properties.

**Course Name: Analog Systems and Applications**

**Course Code: PHO-4213** **Credits 4**

**Block-I: Bipolar Junction Transistors and Amplifiers**

Unit-1: n-p-n and p-n-p Transistors. Physical Mechanism of Current Flow.

Unit-2: Characteristics of CB, CE and CC Configurations. Active, Cutoff and Saturation Regions. Unit-3: Current gains α and β. Relations between α and β. h-parameter Equivalent Circuit.

Unit-4: Analysis of a single-stage CE amplifier using Hybrid Model. Input and Output Impedance. Current, Voltage and Power Gains.

**Block-II: Transistor Biasing and Feedback**

Unit-5: Load Line analysis of Transistors. DC Load line and Q-point.

Unit-6: Fixed Bias and Voltage Divider Bias. Principle of Feedback.

Unit-7: Effects of Negative Feedback on Input Impedance, Output Impedance,

Unit-8: Gain, Stability, Distortion and Noise.

**Block-III: Amplifiers**

Unit-9: RC Coupled Amplifiers, FET and Oscillators RC-coupled amplifier and its frequency response.

Unit-10: Construction of JFET. Idea of Channel Formation. Different Regions of I-V Curves.

Unit-11: Definitions of rd and gm. Basic construction of MOSFET and its Working, Enhancement and Depletion Modes.

Unit-12: Barkhausen's Criterion for self-sustained oscillations. RC Phase shift oscillator, Hartley oscillators.

Unit-13: Wein bridge oscillator.

**Block-IV: Operational Amplifier**

Unit-14: Operational Amplifier and its Applications Operational Amplifiers (Black Box approach).

Unit-15: Characteristics of an Ideal and Practical OpAmp. (IC 741). CMRR. Slew Rate and concept of Virtual ground.

Unit-16: Inverting and non-inverting amplifiers, Adder, Subtractor,

Unit-17: Differentiator, (5) Integrator,

Unit-18: Log amplifier, Zero crossing detector (8)

**Reference Books:**


1. Elements of Electronics, M.K. Bagde, S.P. Singh and Kamal Singh, 2002, S. Chand & Company Ltd.
2. Integrated Electronics, J. Millman and C. C. Halkias, 1991, Tata Mc-Graw Hill.
3. Electronics: Fundamentals and Applications, J.D. Ryder, 2004, Prentice Hall.
4. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall.
5. Electronic Devices, 7/e Thomas L. Floyd, 2008, Pearson India.

**Course Name: Bio-Analytical and Bio-Organic Chemistry**
**Course Code: CHO-4211 Credit: 4**

**Course objectives:**
This course aims to explain the role of essential and non-essential elements in chemistry. The general introduction of bio-organic chemistry, the chemistry of host-guest interaction, cell structure and the concept of immunoassay are discussed in this course.

**Block-I: Bio-organic chemistry**
Unit-1: Basic considerations and Proximity effect. Fischer's lock and key and Koshland's induced fit hypothesis.
Unit 2: Concept and identification of active site by the use of inhibitors, affinity labelling and enzyme modification by site-directed mutagenesis.
Unit 3: Cofactor, vitamins, coenzymes, prosthetic groups, and apoenzymes.
**Block-II: Host-guest chemistry**
Unit 1: Host-guest chemistry. Crown ethers and cyclodextrins.
Unit 2: Cyclodextrin based enzyme models, synzymes (synthetic enzymes), chiral recognition and catalysis.
Unit 3: Chiral reagents and chiral catalysts: NADH, Asymmetric hydrogenation using CBS reagent and BINAP, Proline catalyzed asymmetric reactions.
**Block-III: Immunoassay**
Unit 1: Principles of Radioimmunoassay- antigens, antibody and its complexes; Specificity of immunoassays.
Unit 2: Preparation of antibody; Separation of antigen- double antibody technique; Unit 3: Fluorescence immunoassay- homogeneous and heterogeneous immunoassays, applications
**Block-IV: Enzyme immunoassays and Clinical Analysis Introduction**
Unit 1: ELISA – non-competitive and competitive binding, applications.
Unit2: Clinical Analysis Introduction; Composition of blood and recommended range of concentration of its constituents; Collection and preservation of samples- hemolysis, anticoagulant, glycolysis, protein free filtrate.
Unit 3: Clinical analysis- Serum electrolytes, blood glucose and blood urea nitrogen, uric acid, albumin, phosphates, barbiturates; Analytical techniques used in clinical analysis- Spectrometry, Ion Selective Electrodes and others.
**Block-V: Cell structure and functions**
Unit-1: Structure of prokaryotic and eukaryotic cells, intracellular organelles and their functions.
Unit 2: comparison of plant and animal cells.
Unit 3: Overview of metabolic processes-catabolism and anabolism.

**Suggested readings:**
1. Bioorganic Chemistry: Chemical approach to enzyme action, Hermann Dugas and C.Penny, SpringerVelag, 1981.
2. Enzyme structure and Mechanism, A. Fersht, W. H. Freeman, 1995.
3. Modern Analytical Chemistry, D. Harvey, McGraw Hill Higher Education, New York, 2ooo.
4. Analytical Chemistry, G.D. Christian, 6th Edn., John Wiley & Sons, Inc., U.S.A., 2oo4.
5. Instrumental Analysis, D.A. Skoog, F.J. Holler, S.R. Crouch, Cengage Learning, India, 2o1o.

**Course Outcomes:**

After the successful completion of the course students will be able to

1. Explain bio-organic chemistry
2. Define host-guest interactions
3. Understand immunoassay
4. Identify cell structure

**Course Name: Advanced Physical Chemistry**
**Course Code: CHO-4212** **Credit: 4**

**Course Objectives:**

This course aims to explain the advanced topics and their applications in physical chemistry. Application of quantum mechanics to hydrogen and hydrogen like atoms, rigid rotators and concept of symmetry as well as point group are also discussed in this course.

**Block-I: Chemical kinetics**

Unit 1: Simple collision theory: Mechanism of unimolecular and bimolecular reactions, Kinetics of reaction in solutions: salt effect, effect of pressure and dielectric constant on reaction rates.
Unit 3: Kinetics of heterogeneous reaction: Langmuir's theory of unimolecular and bimolecular surface reactions.
Unit 3: Fast reactions: Study by stop flow technique, relaxation method, flash photolysis, magnetic resonance method. Absolute reaction rate theory.

**Block-II: Quantum chemistry - I**

Unit 1: Application of Schrodinger equation to the harmonic oscillator.
Unit 2: The rigid rotator
Unit 3: the hydrogen and hydrogen like atoms, wave functions and orbital diagrams.

**Block-III: Quantum chemistry- II**

Unit 1: Approximate methods in quantum mechanics, Perturbation and variation principle
Unit 2: Application of variation methods and perturbation theory to the Helium atom.
Unit 3: Electron configuration, Russell-Saunders Terms and Coupling schemes, Slater-Condon parameters, Zeeman splitting, the method of self consistent field, the virial theorem.

**Block-IV: Molecular symmetry**

Unit 1: The defining properties of a Group, some examples, subgroups, classes.
Unit 2: Molecular symmetry, symmetry elements, operations, products of symmetry operations.
Unit 3: Equivalent symmetry elements and equivalent atoms, general relations among symmetry elements and operations.

**Block-V: The point groups**

Unit 1: The symmetry point groups, symmetries with multiple high order axes, systematic procedure for symmetry
Unit 2: classification of molecules, classes of symmetry operations. Properties of matrices and vectors, representations of groups, consequences of the Great Orthogonality theorem, character tables.
Unit 3: Wave functions as bases for Irreducible representations, symmetry-adapted Linear Combinations.

**Suggested readings:**

1. Laidler K.J.: CHEMICAL KINETICS, 3rd Ed., Benjamin Cummings (1997).

2. Bensen S.W.: THE FOUNDATIONS OF CHEMICAL KINETICS, Mogama Hill, N.Y. (1982).
3. McQuarrie D.A.: QUANTUM CHEMISTRY, Viva Books Pvt. Ltd., New Delhi (2003).
4. Pilar F.L.: Elementary QUANTUM CHEMISTRY, 2nd Ed., Dover Publication Inc., N.Y. (2001).
5. Pauling L. and Wilson E.B.: INTRODUCTION TO QUANTUM MECHANICS, McGraw Hill (1985).
6. Bishop D.M.: GROUP THEORY AND CHEMISTRY, Clarendon Press, Oxford, U.K. (1993).
7. Cotton F.A.:**CHEMICAL APPLICATIONS OF GROUP THEORY, 3rd Ed.,**(2008).
8. Douglas B.E. & Hollingsworth C.A.:**SYMMETRY IN BONDING AND SPECTRA, Academic Press (**1985).
9. Rakshit P.C.: PHYSICAL CHEMISTRY, Revised and Enlarged, 7th Edition, Sarat Book House (2014)
10. Chandra A.K.: INTRODUCTORY TO QUANTUM CHEMISTRY, 4th Ed., McGraw Hill Education (2009).

**Course Outcomes:**

After the successful completion of the course students will be able to

1. Explain chemical kinetics
2. Apply concept of quantum mechanics
3. Define molecular symmetry and point groups

**Course Title: Advanced Organic Synthesis**
**Course Code: CHO-4213** **Credit: 4**

**Course Objectives:**

The study of natural products and heterocyclic compounds offers an excellent strategy toward identifying novel biological probes for a number of diseases. Historically, natural products have played an important role in the development of pharmaceutical drugs for a number of diseases including cancer and infection. Therefore, the aims of this course is to explain the chemistry of enolates, nitrogen compounds, heterocyclic compound and natural products.

**Block-I: Organic Synthesis via Enolates**

Unit 1: Acidity of α-hydrogens, alkylation of diethyl malonate and ethyl acetoacetate

Unit 2: Synthesis of ethyl acetoacetate: the Claisen condensation, Keto-enol tautomerism of ethyl acetoacetate.

Unit 3: Alkylation of 1, 3-dithianes, Alkylation and acylation of enamines.

**Block-II: Organic Compounds of Nitrogen**

Unit 1: Preparation of nitroalkanes and nitroarenes, Chemical reactions of nitroalkanes. Mechanisms of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media, Picric acid.

Unit 2: Halonitroarenes: reactivity, Structure and nomenclature of amines, physical properties, Stereochemistry of amines, Separation of a mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Amine salts as phase-transfer catalysts, Preparation of alkyl and aryl amines (reduction of nitro compounds, nitrities), reductive amination of aldehydic and ketonic compounds, Gabriel-phthalimide reaction, Hofmann bromamide reaction.

Unit 3: Reactions of amines, electrophilic aromatic substituton in aryl amines, reactions of amines with nitrous acid. Synthetic transformations of aryl

diazonium salts, azo coupling.

**Block-III: Heterocyclic Chemistry**

Unit 1: Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine.

Unit 2: Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution, Mechanism of nucleophilic substitution reaction in pyridine derivatives, Comparison of basicity of pyridine, piperidine and pyrrole.

Unit 3: Introduction to condensed five and six membered heterocycles, Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Nepieralski synthesis, Mechanism of electrophilc substitution reactions of indole, quinoline and isoquinoline.

**Block-IV: Natural Products**

Unit 1: Alkaloids**:** Natural occurrence, General structural features, their physiological action, Hoffmann's exhaustive methylation, Emde's modification;.

Unit 2: Medicinal importance of Nicotine, Hygrine, Quinine, Morphine, Cocaine, and Reserpine.

Unit 3: Natural Occurrence and classification of terpenes, isoprene rule.

**Block-V: Flavones**

Unit 1: General description, classification, structure and Synthesis of Flavones.

Unit 2: Flavanols and Isoflavones

Unit 3: Analytical and Synthetical evidences in support of the structure of Quercetin.

**Suggested Readings:**


1. Morrison, R. N. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Clayden, J., Greeves, N. &Warren, S. *Organic Chemistry*, 2nd edition, Oxford University Press, 2012.
3. Graham Solomons, T.W., Fryhle, C. B. *Organic Chemistry*, John Wiley & Sons, Inc.
4. Smith, J. G. *Organic Chemistry*, Tata McGraw-Hill Publishing Company Limited.
5. March, J. *Advanced Organic Chemistry*, Fourth edition, Wiley.
6. Acheson, R.M. Introduction to the Chemistry of Heterocyclic compounds, John Welly& Sons (1976).
7. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
8. Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
9. Singh, J.; Ali, S.M. & Singh, J. Natural Product Chemistry, Pragati Prakashan (2010).


**Course outcomes:**

**After the successful completion of the course students will be able to**

1. Define organic synthesis via enolates
2. Explain compounds of nitrogen
3. Classify heterocyclic chemistry
4. Discuss natural products

**Course Name: Functional Analysis**
**Code: MAO-4211** **Credits: 4**

**Course Objectives:** To familiarize with the basic tools of Functional Analysis involving normed spaces, Banach spaces and Hilbert spaces, their properties dependent on the dimension and the bounded linear operators from one space to another**.**

**Course Outcomes:**
On successful completion of this course, students shall be able to:

1. To learn to recognize the fundamental properties of normed spaces and of the transformations between them.
2. Distinguish between Banach spaces and Hilbert spaces, decompose a Hilbert space in terms of orthogonal complements, check totality of orthonormal sets and sequences, represent a bounded linear functional in terms of inner product.
3. Extend a linear functional under suitable conditions, check reflexivity of a space, ability to apply uniform boundedness theorem, open mapping theorem and closed graph theorem, check the convergence of operators and functional and weak and strong convergence of sequences.
4. Understand the notions of dot product and Hilbert space and apply the spectral theorem to the resolution of integral equations.
5. Verify the requirements of a norm, completeness with respect to a norm, relation between compactness and dimension of a space, check boundedness of a linear operator and relate to continuity, convergence of operators by using a suitable norm, compute the dual spaces.

**Block I: Normed Spaces**

**Unit 1:** Normed linear spaces
**Unit 2:** Quotient spaces, Product spaces
**Unit 3:** Infinite series in normed space
**Unit 4:** Finite dimensional normed spaces

**Block II: Banach Space**

**Unit 5:** Bounded linear operators and bounded linear functional.
**Unit 6:** Unbounded linear operators,
**Unit 7:** Open Mapping and Closed Graph Theorem
**Unit 8:** Reflexive normed spaces and their properties

**Block III: Spaces of Bounded Linear Functional**

**Unit 9:** Dual Spaces
**Unit 10:** Duals of some standard normed spaces,
**Unit 11:** Hahn-Banach Theorems

**Block IV: Hilbert Space and Orthonormality**

**Unit 12:** Complete Inner Product Spaces
**Unit 13:** Orthonormal Sets
**Unit 14:** Projections and Riesz Representation Theorems

**Block V: Operators on Hilbert spaces**
**Unit 15:** Adjoint of an Operator
**Unit 16:** Normal, Unitary, and Self-Adjoint Operators
**Unit 17:** Positive Operators
**Unit 18:** Compact Self-Adjoint Operators

***Books Recommended/Suggested Reading:***


1. *Kesavan S.; Functional Analysis, Springer.*
2. *Kreyszig Erwin; Introductory Functional Analysis with Applications, Wiley.*
3. *Sen Rabindranath; A First Course in Functional Analysis: Theory and Applications, Anthem Press.*
4. *Shalit Orr Moshe; A First Course in Functional Analysis, Chapman and Hall/CRC.*
5. *Robinson James C.; An Introduction to Functional Analysis, Cambridge University Press.*


**Course Name: General Topology**
**Code: MAO-4212** **Credits: 4**

**Course Objectives:** To introduce basic concepts of point set topology, basis and subbasis for a topology and order topology. Further, to study continuity, homeomorphisms, open and closed maps, product and box topologies and introduce notions of connectedness, path connectedness, local connectedness, local path connectedness, countability axioms and compactness of spaces.

**Course Outcomes:**
On successful completion of this course, students shall be able to:
1. Understand and apply concepts related to sets and relations.
2. Apply concepts of topology in different spaces.
3. Analyze continuity and its relationship with topological equivalence.
4. Evaluate and apply separation axioms and compactness.
5. Analyze and apply concepts of connectedness and function spaces.

**Block I: Basic Notions**
**Unit 1:** Sets and Relations
**Unit 2:** Functions
**Unit 3:** Cardinality and Order of Sets

**Block II: Topology of Spaces**
**Unit 4:** Topology of the Line and Plane
**Unit 5:** Topological Spaces
**Unit 6:** Bases and Subbases

**Block III: Continuity and Metric Spaces**
**Unit 7:** Continuity and Topological Equivalence

**Unit 8:** Metric and Normed Spaces
**Unit 9:** Countability

**Block IV: Separation Axioms and Compactness**
**Unit 10:** Separation Axioms
**Unit 11:** Compactness
**Unit 12:** Product Spaces
**Block V: Connectedness and Function Spaces**
**Unit 13:** Connectedness
**Unit 14:** Complete Metric Spaces
**Unit 15:** Function Spaces

***Books Recommended/Suggested Reading:***


1. *Munkres J. R.; Topology, Pearson Education India.*
2. *Simmons G.; Introduction to Topology and Modern Analysis, McGraw-Hill Education.*
3. *Sharma J. N. and Chauhan J. P.; Topology (General and Algebraic), Krishna Publication.*
4. *Martin D. Crossley.; Essential Topology, Springer Undergraduate Mathematics Series.*
5. *M. A. Armstrong; Basic Topology, Undergraduate Text in Mathematics, 1983.*
6. *Joshi K. D.; Introduction to General Topology, New Age International Publishers.*


**Course Name: Operations Research**
**Code: MAO-4213** **Credits: 4**

**Course Objectives:** To introduce students to the fundamental concepts, methodologies, and techniques of operations research, with a focus on linear programming, duality, sensitivity analysis, transportation and assignment problems, game theory, and non-linear programming.

**Course Outcomes:**
On successful completion of this course, students shall be able to:

1. Understand the origin, definition, scope, and applications of operations research, as well as the formulation and solution methods of linear programming problems, including the simplex method, Big-M method, and Two-phase method.
2. Analyze duality in linear programming problems, interpret dual variables, and apply the dual simplex method.
3. Apply mathematical formulations and solution techniques to solve transportation problems, including balanced and unbalanced cases, as well as assignment problems.
4. Evaluate matrix, algebraic, and graphical methods in game theory and assess the sufficiency of Karush-Kuhn-Tucker (KKT) optimality conditions under convexity.
5. Create mathematical models using Lagrange multipliers and apply Farkas Lemma.

**Block I: Introduction of Linear Programming Problem**

**Unit 1:** Origin, Definition and Scope of OR

**Unit 2:** Methodology, Applications and phases of OR

**Unit 3:** Formulation of Linear Programming Problem, Graphical Method

**Unit 4:** Simplex method and its variants: Big-M method and Two-phase method

**Unit 5:** Degeneracy and Cycling in LPP

**Block II: Duality and Sensitivity Analysis**

**Unit 6:** Duality in LPP and interpretation of dual variables

**Unit 7:** Primal-Dual relationship, Dual Simplex Method

**Unit 8:** Sensitivity Analysis

**Block III: Transportation and Assignment Problem**

**Unit 9:** Mathematical formulation and initial basic feasible solution of Transportation Problem

**Unit 10:** Balanced and Unbalanced Transportation Problem

**Unit 11:** Optimal Solution of Transportation Problem

**Unit 12:** Mathematical formulation and solution of Assignment Problem

**Block IV: Game Theory**

**Unit 13:** Two person zero games, Minimax and maximum principle

**Unit 14:** Game with and without Saddle point, Dominance rule

**Unit 15:** Matrix, Algebraic and Graphical Method

**Block V: Non-Linear Programming**

**Unit 16:** Lagrange multipliers, Farkas Lemma

**Unit 17:** Constraint qualification, KKT optimality conditions

**Unit 18:** Sufficiency of KKT under convexity

**Unit 19:** Quadratic programming, Wolfe's method

***Books Recommended/Suggested Reading:***


1. *Hadley G.; Operations Research, Oxford IBH publishing Company.*
2. *Sinha S. M.; Mathematical Programming-Theory and Methods, Elsevier.*
3. *Minoux M.; Mathematical Programming-Theory and Algorithms, Wiley-Blackwell.*
4. *Bradley S. P.; Applied Mathematical Programming, Addison-Wesley.*
5. *Hillier F. S. and Lieberman G. J.; Introduction to Operations Research, McGraw-Hill.*
6. *Walker R. C.; Introduction to Linear Programming, Prentice Hall.*


**Course Name: Animal Biotechnology**

**Course Code: ZCO-4211** **Credits: 4**

**Course Objective**

To create awareness on advanced streams like Stem Cell Biology, Animal Cell Culture, Genomics and Proteomics, Drug Design, Genetic Engineering and Bioinformatics.

**Course Outcome**

- Be able to describe the structure of animal genes and genomes.

- Be able to describe how genes are expressed and what regulatory mechanisms contribute to control of gene expression.
- Be able to describe basic principles and techniques in genetic manipulation and genetic engineering.
- Be able to describe gene transfer technologies for animals and animal cell lines.
- Be able to describe techniques and problems both technical and ethical in animal cloning.
- Be able to describe the contribution 'functional genomics' is making and is likely to make in animal biotechnology now and in the future.

**Block I: Gene Transfer Technology in Animals**

**Unit-1:** Viral And Non-Viral Methods, Sperm Mediated Gene Transfer.

**Unit 2:** Transfection of Animal Cell Lines and their Immortalization**.**

**Unit-**3**:** Gene Knock Out Animal Models, Current Status of Production of Transgenic Animals.

**Unit 4:**Animal Cloning: Techniques, Relevance, Case Studies and Ethical Issues**.**

**Block 2: In Vitro Fertilization (IVF)**

**Unit-**5**:** In Vitro Fertilization (IVF) and Embryo Transfer (ET) Technology in Humans

**Unit-**6 Superovulation, Micromanipulation, IVF And Embryo Culture in Farm Animals (E.G. Cow)

**Unit-**7 Embryo Transfer In Cattle, Gene Transfer or Transfection (Using Eggs And Cultured Stem Cells)

**Unit-**8 Targeted Gene Transfer; Transgenic Animals (Mice, Sheep, Pigs, Rabbits, Goats, Cows and Fish)

**Block 3 : Biosafety Regulations**

**Unit -9** Primary Containment for Biohazards and Biosafety Levels, Biosafety Guidelines – Government of India.

**Unit -10** Definition of Genetically Modified Organisms (Gmos) & Living Modified Organisms (Lmos); Roles of Institutional Animal Ethical Committee, Review Committee on Genetic Manipulation (RCGM), Genetic Engineering Approval Committee (GEAC) Etc.

**Unit -11** Prevention of Cruelty on Animals Act Govt. of India, Concept of Bioethics, Public Concerns on Human Genome Research and Transgenics – Genetic Testing and Screening, Ethics in Clinical Trials and Good Clinical Practices(GCP)

**Unit-12** Ethical, Legal and Social Implications (ELSI) & Human Genome Project; Ethics in Human Cloning and Patenting Human Genes.

**Block 4 :**

**Unit -13** Intellectual Property Rights and Its Types-Patents, Trademarks, Copyright & Related Rights, Industrial Design, Traditional Knowledge, Geographical Indications

**Unit -14** Protection of New GMOs, Basics of Patents (Types, Patent Application and Specifications), Concept of Prior Art and Patent Filling Procedures, Process Patent Vs Product Patent.

**Unit -15** Introduction to General Agreement on Tariffs and Trade (GATT), World Trade Organization (WTO)

**Unit -16** World Intellectual Property Organization (WIPO) and Trade Related Intellectual Property Rights (TRIPS).

**Course Name: Animal Cell Culture**
**Course Code: ZCO-4212** **Credits: 4**

**Course Objective**

To continue culturing the cell obtained from the primary cell and gain basic knowledge about culturing animal cells.

**Block I: Animal Cell Culture**

**Unit-1:** Equipment and Materials for Animal Cell Culture Technology. Design and Layout of Culture Room, Sterilization and Aseptic Techniques.

**Unit-2:** Culture Medium: Natural Media, Synthetic Media, Sera. Introduction to Balanced Salt Solutions and Simple Growth Medium.

**Unit-3** Brief Discussion on the Chemical, Physical and Metabolic Functions of Different Constituents of Culture Medium, Role of Carbon Dioxide, Serum and Supplements in Animal Cell Culture.

**Unit-4** Characteristics of Cells in Culture: Contact Inhibition, Anchorage Dependence and Cell-Cell Communication.

**Block II: Culture Techniques**

**Unit-5:** Mechanical and Enzymatic Disaggregation of Tissue and Setting up of Primary Cultures, Candling of Eggs, Preparation of Chick Fibroblast, Culture of Lymphocytes For Chromosomal Studies.

**Unit-6:** Roller and Suspension Culture Techniques. Large-Scale Production of Cells Using Bioreactors, Micro- Carries and Perfusion Techniques.

**Unit-7:**Measurement of Viability and Cytotoxicity. Biological Characterization of the Cultured Cells, Karyotyping, Cryopreservation and Revival. Detection of Contaminants in Cell Cultures.

**Unit-8:** Detection of Contaminants in Cell Cultures.

**Block III:Fermentation Technology**

**Unit-9:** Fermentation Technology for the Growth of Animal Cells and their Products (Bioreactors, Hollow Fiber Reactors, Air-Lift Fermentors, Chemostats and Microarriers).

**Unit-10:**Established Cell Line Cultures: Definition of Cell Lines, Maintenance and Management; Cell Adaptation.

**Unit-11:**Stem Cell Cultures, Embryonic Stem Cells and their Applications. Somatic Cell Genetics. Organ and Histotypic Cultures

**Unit-12:** Cell Cloning, Cell Synchronization and Cell Manipulation. Various Methods of Separation of Cell Types, Advantages and Limitations; Flow Cytometry. Production and Characterization of Monoclonal Antibodies and their Application.

**Block IV: Commercial Applications of Animal Cell Culture**

**Unit-13:** Cell Culture Based Vaccines, Tissue Culture as a Screening System; Cytotoxicity, in-vitro Testing of Drugs and Diagnostic Tests

**Unit-14:**Mass Production of Biologically Important Compounds (E.G. Vaccines and Pharmaceutical Proteins).

**Unit-15:**Production of Recombinant Hemoglobin, Blood Substituents, Artificial Blood.

**Unit-16:**Production of Recombinant Hemoglobin, Blood Substituents, Artificial Blood. Harvesting of Products, Purification and Assays. Three Dimensional Cultures and Tissue Engineering (Artificial Skin and Artificial Cartilage).

**Course Name: Wildlife Conservation**
**Course Code: ZCO-4213** **Credits: 4**

**Course Objective**

To protect the remaining population of endangered species by banning hunting, giving legal protection to their habitats and finally, restricting wildlife trade.

**Block 1: Indian Wildlife**

**Unit-1** Introduction, Distribution of Wildlife in Ecological Subdivision of India

**Unit-2** IUCN Categories

**Unit-3** Protected Area Network: National Parks, Wildlife Sanctuaries, Biosphere Reserves and Zoos in India

**Unit-4** Gene Pool, Habit, Habitat and Breeding Biology of Few Mammals (Viz., Elephant and Tiger). Block 2: Reasons for Wildlife Depletion

**Block-2**

**Unit-5** Habitat Fragmentation, Habitat Destruction

**Unit-6** Commercial Wildlife Exploitation, Overgrazing Etc.,

**Unit-7** Wildlife Conservation (Policies and Programmes)

**Unit-8** Special Projects for Endangered Species (Project Tiger, Gir Lion Sanctuary Project and Crocodile Breeding Project).

**Block 3: Principle and Practice of Wildlife Management**

**Unit-9** Management of Special Habitats; Riparian Zones, Grasslands Introduction to Conservation Biology

**Unit-10** Conservation Values and Ethics of Conservation of Natural Resources.

**Unit-11** Conservation of Biodiversity, Patterns and Processes, Concepts of Biodiversity, Levels of Biodiversity, Genetic Diversity, Intra Specific Diversity.

**Unit-12** Species Richness, Richness of Higher Taxa, Ecosystem and Biome Diversity.

**Block 4:**

**Unit-13** International Conventions on Conservation (Ex-Situ and in-Situ Conservation, Conservation Breeding (E.G. Vulture, Pygmy Hog, Gharial, Etc.)

**Unit-14** Institutions and Their Role in Conservation (Zoos, Natural History Museums and Collections, Zoological Survey of India and Its Regional Centres).

**Unit-15** National and International Zoological Institutes, Societies and Academic Bodies

**Unit-16** Brief Account of Wildlife Acts and their Amendments in India and World, Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

**Course Name: Ecology & Environment**
**Course Code: BDO-4211** **Credits: 4**

**Course Objective**

To protect the remaining population of endangered species by banning hunting, giving legal protection to their habitats and finally, restricting wildlife trade.

**Block-1 Natural resources & Sustainable utilization**

**Unit-1** Land Utilization, Soil degradation and management strategies; Restoration of degraded lands. Water , Wetlands; Threats and management strategies, Ramsar sites.

**Unit-2** Forests: Major and minor forest products; Depletion, Biological Invasion, Energy: Renewable and non-renewable sources of energy

**Unit-3** Contemporary practices in resource management : EIA, GIS, Participatory Resource Appraisal,

**Unit-4** Ecological Footprint with emphasis on carbon footprint, Resource Accounting

**Block-2 Ecology & Ecosystem Definition of Ecology, Ecological Factors, Positive and negative interactions.**

**Unit-5** Ecosystem – Concept of an ecosystem-structure and function of an ecosystem. Abiotic and biotic com-Energy flow in an ecosystem Ecological Succession-Definition & types.

**Unit-6** Processes and types (autogenic, allogenic, autotrophic, heterotrophic, primary & secondary), Hydrosere and Xerosere. Food chains and food webs, Ecological pyramids, production and productivity; And components.

**Unit-7** Types of ecosystems: Forest Ecosystem, Grassland, Crop land

**Unit-8** aquatic Ecosystems Ecological Adaptations – Hydrophytes, Xerophytes, Halophytes, Epiphytes and Parasites.

**Block-3 Soil Formation, Properties & Conservation Soil**

**Unit-9** Origin, Formation, composition, Soil types, Soil Profile

**Unit-10** Soil Microorganisms, soil processes, Soil Erosion, Biogeochemical cycles

**Unit-11** Soil Conservation: Biological– Contour farming, Mulching, Strip cropping, Terracing and Crop rotation.

**Unit-12** Mechanical–Basin Listing, Construction of dams, Watershed Management, Soil reclamation.

**Block-4 Biodiversity and its conservation**

**Unit-13** Definition -genetic, species, and ecosystem diversity.

**Unit-14** Value of biodiversity: social, ethical, aesthetic and option values; hotspots of Biodiversity threats to biodiversity, Biotic communities and populations, their characteristics and dynamics.

**Unit-15** Endemic and endangered species of plants in India. Ecological niche, ecotypes, ecological indicators. Conservation of Biodiversity: Ex-situ and in-situ conservation, Red data book, botanical gardens, National park, Sanctuaries, hot & hottest spots and Bioreserves.

**Unit-16** Role of Seed Bank and Gene Bank Valuing plant resources, ecotourism, Role of NBPGR, FAO, BSI.

**Suggested Readings:**

1. Chapman and Riss. Ecology: Principles and Applications, Latest Ed., Cambridge University Press 2.Shukla, R.S. & Chandel, P.S. Plant Ecology, Latest Ed., S. Chandel and Co.

3.Kumar, H.D. Modern Concept of Ecology, Latest Ed. Vikas Publishing House

4.Begon, M., Herper, J.L. and Townsend, C.R. Ecology- Individuals, Populations and Communities (3rd ed.), Oxford Blackwell Science

5. Verma, P.S. & Agarwal, U.K. Concept of Ecology, Latest Ed., S. Chand & Company BOTANY-UG-2020 Page 53

6. Odum, F.P. Fundamentals of Ecology, Latest Ed., Saunders

7. Sharma, P.D. Elements of Ecology, Latest Ed., Rastogi Publications

8. Ambasht, R.S. & Ambasht, N.K. A Text Book of Plant Ecology, Latest Ed., CBS Publication & Distributors

9.Mani, M.S. Bio-Geography of India, Latest Ed., Springer-Verlag.

10.Mackenzie et al. Ecology, Latest Ed., Viva Books.

**Course Name:** Plant Biotechnology
**Course Code: BDO-4212** **Credits: 4**

**Course Objective:**
1. To give students new knowledge and widening of the knowledge acquired in other course by handling of classical and modern plant biotechnology processes, including tissue culture for healthy plants, plants with improved characteristics.
2. To explore the use of biotechnology to both generate genetic variation in plants and to understand how factors at the cellular level contribute to the expression of genotypes and hence to phenotypic variation.
3. Understanding of biotechnological processes such as recombinant DNA technology and its applicative value in pharmaceuticals (vaccines, antibodies, antibiotics etc.), food industry (transgenic crops with improved qualities (nutraceuticals, industrial enzymes etc.), agriculture (biotic and abiotic stress tolerant plants, disease and pest resistant plants, improved horticultural varieties etc.), ecology (plants role in bioremediation). This knowledge is central to our ability to modify plant responses and properties for global food security and commercial gains in biotechnology and agriculture.
4. In the laboratory classes, students will perform some of the techniques currently used to generate information and detect genetic variation.

Course Learning Outcomes The successful students will be able to:
1. Learn the basic concepts, principles and processes in plant biotechnology.
2. Have the ability of explanation of concepts, principles and usage of the acquired knowledge in biotechnological, pharmaceutical, medical, ecological and agricultural applications.
3. Use basic biotechnological techniques to explore molecular biology of plants
4. Explain how biotechnology is used to for plant improvement and discuss the biosefty concern and ethical issue of that use.

Block 1: Plant Tissue Culture
Unit-1 Historical perspective; Composition of media; Nutrient and hormone requirements (role of vitamins and hormones); Totipotency.
Unit-2 Organogenesis; Embryogenesis (somatic and zygotic); Protoplast isolation, culture and fusion; Tissue culture applications (micropropagation, androgenesis, virus elimination, secondary metabolite production
Unit-3 haploids, triploids and hybrids; Cryopreservation; Germplasm Conservation).

Block 2: Recombinant DNA technology
Unit-4 Restriction Endonucleases (History, Types I-IV, biological role and application); Restriction Mapping (Linear and Circular)
Unit-5 Cloning Vectors: Prokaryotic (pUC 18 and pUC19, pBR322, Ti plasmid, BAC); Lambda phage, M13 phagemid
Unit-6 Cosmid, Shuttle vector; Eukaryotic Vectors (YAC)
Block 3: Gene Cloning
Unit-7 Recombinant DNA, Bacterial Transformation and selection of recombinant clones, PCRmediated gene cloning
Unit-8 Gene Construct; construction of genomic and cDNA libraries, screening DNA libraries to obtain gene of interest by genetic selection
Unit-9 complementation, colony hybridization; PCR

Block 4: Methods of gene transfer
Unit-10 Agrobacterium-mediated, Direct gene transfer by Electroporation, Microinjection, Microprojectile bombardment
Unit-11 Selection of transgenics– selectable marker and reporter genes (Luciferase, GUS, GFP).
Block 5: Applications of Biotechnology
Unit-12 Pest resistant (Bt-cotton); herbicide resistant plants (RoundUp Ready soybean); Transgenic crops with improved quality traits (Flavr Savr tomato, Golden rice)
Unit-13 Improved horticultural varieties (Moondust carnations); Role of transgenics in bioremediation (Superbug); edible vaccines
Unit-14 Industrial enzymes (Aspergillase, Protease, Lipase); Gentically Engineered Products–Human Growth Hormone; Humulin; Biosafety concerns.

Suggested Readings
1) Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
2) Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.
3) Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms. Vikas Publication House Pvt. Ltd., New Delhi. 5th edition.
4) Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons, U.K. 5th edition.
5) Stewart, C.N. Jr. (2008). Plant Biotechnology & Genetics: Principles, Techniques and Applications. John Wiley & Sons Inc. U.S.A.

**Course Name:** Herbal Technology
**Course Code:** BDO-4213
Credits: 4
**Course Objective**
This subject gives the student the knowledge of basic understanding of herbal drug industry, the quality of raw material, guidelines for quality of herbal drugs, herbal cosmetics, natural sweeteners, nutraceutical etc. The subject also emphasizes on Good Manufacturing Practices (GMP), patenting and regulatory issues of herbal drugs Upon completion of this course the student should be able to:
1. Understand raw material as source of herbal drugs from cultivation to herbal drug product
2. Know the WHO and ICH guidelines for evaluation of herbal drugs
3. Know the herbal cosmetics, natural sweeteners, nutraceuticals
4. Appreciate patenting of herbal drugs, GMP .
**Course Learning Outcomes: Knowledge Skills**
1. An appreciation of the contribution of medicinal plants to traditional and modern medicine and the importance of holistic mode of treatment of the Indian traditionalsystems of medicine.
2. To develop an understanding of the constraints in promotion and marketing of medicinal plants.
**Professional and Practical Skills**
1. Transforming the knowledge into skills for promotion of traditional medicine.
2. Developing entrepreneurship skills to establish value addition products, botanical extracts and isolation of bioactive compounds.
**Block-1**

**Unit 1:** Herbal medicines: history and scope - definition of medical terms
**Unit 2:** role of medicinal plants in Siddha systems of medicine
**Unit 3:** Cultivation - harvesting - processing - storage - marketing and utilization of medicinal plants.
**Unit 4:** Pharmacognosy - systematic position medicinal uses of the following herbs in curing various ailments
**Block-2**
**Unit 5:** Tulsi, Ginger, Fenugreek, Indian Goose berry and Ashoka.
**Unit 6:** Phytochemistry - active principles and methods of their testing - identification and utilization of the medicinal herbs;
**Unit 7:** Catharanthus roseus (cardiotonic)
**Unit 8:** Withania somnifera (drugs acting on nervous system)
Block-3
**Unit 9:** Clerodendron phlomoides(anti-rheumatic)
**Unit 10:** Centella asiatica (memory booster).
**Unit 11:** Analytical pharmacognosy: Drug adulteration - types, methods of drug evaluation
**Unit 12:** Biological testing of herbal drugs - Phytochemical screening tests for secondary metabolites
**Block-4**
**Unit 13:** alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds
**Unit 14:** Medicinal plant banks micro propagation of important species
**Unit 15:** Withania somnifera
**Unit 16:** neem and tulsi-Herbal foods-future of pharmacognosy
**Suggested Readings:**
1) Glossary ofIndian medicinal plants, R.N.Chopra, S.L.Nayar and I.C.Chopra, 1956. C.S.I.R, New Delhi.
2) The indigenous drugs of India, Kanny, Lall, Dey and Raj Bahadur, 1984. International Boo Distributors.
3) Herbal plants and Drugs Agnes Arber, 1999. Mangal Deep Publications.
4) Ayurvedic drugs and their plant source. V.V. Sivarajan and Balachandran Indra 1994. Oxford IBH publishing Co.
5) Ayurveda and Aromatherapy. Miller, Light and Miller, Bryan, 1998. Banarsidass, Delhi.
6) Principles of Ayurveda, Anne Green, 2000. Thomsons, London.
7) Pharmacognosy, Dr.C.K.Kokate et al. 1999. Nirali Prakashan

**Course Code: PHO-4251**

**Physics Lab-VIII** **Credits 02**

**Lab Experiment List**

1. Energy band gap of semiconductor by reverse saturation current method
2. Energy band gap of semiconductor by four probe method
3. Hybrid parameters of transistor
4. Characteristics of FET, MOSFET, SCR, UJT
5. FET Conventional Amplifier
6. FET as VVR and VCA

7. Study and Verification of AND gate using TTL IC 7408
8. Study and Verification of OR gate using TTL IC 7432
9. Study and Verification of NAND gate and use as Universal gate using TTL IC 7400
10. Study and Verification of NOR gate and use as Universal gate using TTL IC 7402
11. Study and Verification of NOT gate using TTL IC 7404
12. Study and Verification of Ex-OR gate using TTL IC 7486

**Suggested Readings:**


1. R.L. Boylestad, L. Nashelsky, "Electronic Devices and Circuit Theory", Prentice-Hall of India Pvt. Ltd., 2015, 11e
2. J. Millman, C.C. Halkias, Satyabrata Jit, "Electronic Devices and Circuits", McGraw Hill, 2015, 4e
3. B.G. Streetman, S.K. Banerjee, "Solid State Electronic Devices", Pearson Education India, 2015, 7e
4. J.D. Ryder, "Electronic Fundamentals and Applications", Prentice-Hall of India Private Limited, 1975, 5e
5. S.L. Gupta, V. Kumar, "Hand Book of Electronics", Pragati Prakashan, Meerut, 2016, 43e
6. D. Leach, A. Malvino, Goutam Saha, "Digital Principles and Applications", McGraw Hill, 2010, 7e
7. William H. Gothmann, "Digital Electronics: An Introduction to Theory and Practice", Prentice-Hall of IndiaPrivate Limited, 1982, 2e
8. R.P. Jain, "Modern Digital Electronics", McGraw Hill, 2009, 4e


## Course Title: Advanced instrumental analysis

**Course Code: CHO-4251** **Credit: 2**

**Course Objectives:**

The program *aims* to impart in depth knowledge with hands on training of various advanced instruments.

**List of Experiments**

1.Kinetic study of the reaction between acetone and iodine in presence of acids.
2.Optical Measurements: (a) Determination of composition of binary mixture containing potassium dichromate and potassium permanganate
3. Colorimetric estimations of heavy metals such as Cr, Pb, Hg, Cu etc. using spectrophotometry and AA spectroscopy (any two).
4. Estimation of chromium using certified standard materials colorimetrically
5. Green synthesis of nitro salicylic acid.
6. Analysis of major anions (F, Cl, $NO_3$, $SO_4$) and major cations (Na, Ca, K, Mg, $NH_4$) in water by ion-exchange chromatography.
7. To determine the surface tensions of methyl alcohol, ethyl alcohol & n-hexane at room temperature and also calculate the atomic parachors of C, H & O.
8. To determine DO & BOD of a given water sample.Analysis of water quality parameters: pH, conductance, dissolved oxygen, hardness, chloride and fluoride.

**Suggested readings:**


1. Yadav J.B.: ADVANCED PRACTICAL PHYSICAL CHEMISTRY, Krishna Prakashan Media (P) Ltd., Meerut (2016).

2. Giri S., Bajpai D.N. and Pandey O.P.: PRACTICAL CHEMISTRY, 5th Ed., S. Chand & Company Ltd., New Delhi (1983).
3. Woollins J.D.: INORGANIC EXPERIMENTS, VCH, Weinheim (1994).
4. VOGELS TEXTBOOK OF QUANTITATIVE CHEMICAL ANALYSIS, 6th Edition (2002).
5. Burns D.T. and Rattenbury E.M.: INTRODUCTORY PRACTICAL PHYSICAL CHEMISTRY, Pergamon Press (1966).
6. Daniels F., Williams J.W., Bender P., Alberty R.A., Cornwell C.D. and Harriman J.E.: EXPERIMENTAL PHYSICAL CHEMISTRY, McGraw Hill (1962).
7. Day R.A. and Underwood A.L.: QUANTITATIVE ANALYSIS, Prentice Hall India Pvt. Ltd., New Delhi, 3rd Ed., (1997).
8. Khosla B.D., Gulati A. and Garg V.C.: SENIOR PRACTICAL CHEMISTRY, R. Chand & Co., (2008).
9. Shoemaker D.P., Garland C.W. and Nibler J.W.: EXPERIMENTS IN PHYSICAL CHEMISTRY, McGraw Hill, New York (1996).

**Course Objectives:**

After the successful completion of the course students will be able to

1. Explain spectroscopic analysis.
2. Perform water quality analysis.

**Course Name-Plant Identification technology**

**Course Code-BDO-4251** **Credit : 2**

**Course outcomes:** After the completion of the course the students will be able:

1. To learn how plant specimens are collected, documented, and curated for a permanent record.
2. To observe, record, and employ plant morphological variation and the accompanying descriptive terminology.
3. To gain experience with the various tools and means available to identify plants.
4. To develop observational skills and field experience.
5. To identify a taxonomically diverse array of native plants.
6. To recognize common and major plant families.
7. To Understand aesthetic characters of flowering plants by making-landscapes, gardens, bonsai, miniatures
8. Comprehend the concepts of plant taxonomy and classification of Angiosperms.

**Block-1**

**Unit-1** Herbarium: Plant collecting, Preservation and Documentation: Stepwise Practicing Herbarium techniques: a. FIELD EQUIPMENTS, Global Positioning System (GPS) instrument & Collection of any wild 25 plant specimens b. Learn to handle Herbarium making tools c.

**Unit- 2** Pressing and Drying of collected plant specimens d. Special treatments for all varied groups of plants e. Mount on standard herbarium sheets f. Label them using Standard method g. Organize them and give Index Register Number

**Unit-3** Taxonomic Identification using plant structure a. Classify 25 plants on the basis of Taxonomic description (Plant Morphology, Anatomy, Reproductive parts, Habit, adaptation anomalies)

**Unit-4** according to Bentham and Hooker natural system of classification in the following families: Malvaceae, Fabaceae (Papilionaceae), Solanaceae, Scrophulariaceae, Acanthaceae, Labiatae (Lamiaceae), Rubiaceae.

**Block -2**

**Unit-5** a.Conducting Spot identification (Binomial, Family) of common wild plants from families included in the theoretical syllabus (list to be provided) and making FIELD NOTE BOOK and filling Sample of a page of field-book, used in Botanical Survey of India.

**Unit-6** b. Describe/compare flowers in semi-technical language giving V.S. of flowers, T.S. of ovaries, floral diagrams and Floral Formulae.

**Unit-7** Identify and assign them to their respective families giving reasons.

**Unit-8** COLLECTION, PRESERVATION AND STORAGE OF ALGAE, FUNGI BRYOPHYTES, PTERIDOPHYTES

**Block - 3**

**Unit-9** Botanical Nomenclature & reporting Method: a. Give nomenclature to collected plants as per ICN rules and prepare labels as per BSI b.

**Unit-10** Author Citation, Effective Publication and Principle of Priority: To show a specimen paper on Basic structure of a taxonomic Research published on a new species in taxonomic journal.

**Unit-11** COMPUTERS - Learning to use EXCEL Microsoft PowerPoint and Word., WORKING WITH FOLDER AND WINDOWS UTILITY., CREATE AND MANAGE FILES AND FOLDER TREE,

**Unit-12** Practice browsing different sites using search engines. practice and understand different E-Mail services – Outlook, Yahoo mail, Rediff mail etc.

**Block - 4**

**Unit-13** Practice Creating E-Mail accounts, Sending, Receiving & Storing of mails.

**Unit-14** Create and Participate in virtual conferencing in an interactive Zoom Meeting

**Unit-15** Computer Application in taxonomy, 1. Create a Bonsai of any plant 2. Develop a miniature garden 3. Draw Layouts of various types of gardens 4. Plant Propagation methods practice

**Unit-16** Use Taxonomic Softwares (Dichotomous Key) , Practicals on Phylogenetic analysis 3. Make line drawing of Plants for description 4.Using of plant identification apps on android phones

**Suggested Readings**

1.Day, S.C. (2003)A Art of Miniature Plant Culture. - Agrobios. Jodhpur, India.

2.Dhopte, A.M. (2003) Principles and Techniques for Plant Scientists. - Agrobios,Jodhpur, India. 3.Khan, M.R. (1995) Horticulture and Gardening.- NiraliPrakashan, Pune. India.

4.PramilaMehra Gardening for everyone-. Hind pocket book private limited, New Dehli. 5.Kumarsen V. Horticulture , Saras Publication

6.Ramesh Bangia Learning Computer Fundamentals.,., Khanna Book Publishers

7.Bose T.K. & Mukherjee, D., 1972, Gardening in India, Oxford & IBH PublishingCo., New Delhi.

8.Sandhu, M.K., 1989, Plant Propagation, Wile Eastern Ltd., Bangalore, Madras.

9.Randhawa, G.S. and Mukhopadhyay, A. 1986. Floriculture in India. Allied Publishers.

10. Bole, P. V. and Vaghani, Y. (1986) Field guide to the common trees of India. Oxford University Press; Bombay.

**Faculty and Support Staff**

The University has identified the dedicated requisite faculty and support staff as mandated by the UGC and they are allocated the positions exclusively for ODL mode. The course material prepared by the CDOE faculty is at par with the regulations 2020.

List of Faculty associated with B.Sc. program is as follows:-

| S. No. | Name of Faculty | Designation | Nature of Appointment | Qualification | Subject |
|---|---|---|---|---|---|
| 1 | Dr. Yatendra Pal Singh | Professor | Full-Time | Ph.D | Physics |
| 2 | Dr. Suraj Sahu | Assistant Professor | Full-Time | Ph.D | Physics |
| 3 | Dr. Harish Saraswat | Assistant Professor | Full-Time | Ph.D | Chemistry |
| 4 | Dr. Sakshi Saxena | Assistant Professor | Full-Time | Ph.D | Chemistry |
| 5 | Dr. Swati Agarwal | Assistant Professor | Full-Time | Ph.D | Mathematics |
| 6 | Dr. Hira Fatima | Assistant Professor | Full-Time | Ph.D | Mathematics |
| 7 | Dr. Khan Bilal Mukhtar Ahmed | Assistant Professor | Full-Time | Ph.D | Botany |
| 8 | Dr. Pinky Saini | Assistant Professor | Full-Time | Ph.D | Botany |
| 9 | Dr. Neha Singh | Assistant Professor | Full-Time | Ph.D | Zoology |
| 10 | Dr. Deepshikha Saxena | Associate Professor | Full-Time | Ph.D | Zoology |

**Delivery Mechanism**

The ODL of MU follows a modern ICT (Information & Communication Technology) enabled approach for instruction. The methodology of instruction in ODL of MU is different from that of the conventional/regular programs. Our ODL system is more learner-oriented and the learner is an active participant in the teaching-learning process. ODL of MU academic delivery system comprises:

**A. Print Material**

The printed material of the programme supplied to the students will be unit wise for every course.

**B. Counselling Sessions**

Normally, counselling sessions are held as per a schedule drawn beforehand by the Subject Coordinator. There will be 6 counselling/ contact classes for 4 credit courses will be held on the campus on Saturday and on Sunday of 2 hour duration for each course in face to face mode (In case of 2 credit course contact hours are required 6 hours, in case of 1 credit course contact hours required 3 hours, in case of 5 credit course contact hours required 15 hours, in

case of 6 credit course contact hours required 18 hours). Contact classes will be held in the campus on Saturdays and on Sundays.

**C. Medium of Instruction**

Medium of Course Instruction: English
Medium of Examination: English

**Student Support Systems**

Universities Study Centres or Learner Support Centre shall be headed by a coordinator, not below the rank of Assistant professor and shall be augmented with academic and non-academic staff depending on the learner.

The university has made appropriate arrangements for various support services including counselling schedule and resource-oriented services evaluation methods and dates both online and offline modes for easy and smooth services to the students of distance mode.

At present the university have only one study centre on the campus. The institution is not promoting any study centres outside the campus. All student support services will be provided to the student through a single window method/mode onsite and online.

**F. Procedure for Admissions, Curriculum, Transaction and Evaluation Admission Process**

Admission to the B.Sc. Programme will be done on the basis of screening of candidate's eligibility on first come first serve basis. The University will follow the reservation policy as per norms of the Government. Admission shall not be a right to the students and MU, CDOE shall retain the right to cancel any admission at any point of time if any irregularity is found in the admission process, eligibility etc.

**Maximum Duration**

A. The maximum duration of the B.Sc. Programme is Eight years. Thereafter, students seeking completion of the left-over course(s) will be required to seek fresh admission.
B. The student can complete his programme within a period of 8 years failing which he/she shall seek fresh admission to complete the programme.

**Eligibility**

10+2 in Biology for B.Sc. ZBC from any recognized board.
10+2 in Mathematics for B.Sc. PCM from any recognized board.

**Fee Structure**

| Name of the Program | Degree | Duration | Year | Tuition Fee/Year | Exam Fee/Year | Total (in Rs.) |
|---|---|---|---|---|---|---|
| Bachelor of Science (ZBC/PCM) | UG | 4 to 8 Years | 1 | 13500 | 2000 | 15500 |
| | | | 2 | 12000 | 2000 | 14000 |
| | | | 3 | 12000 | 2000 | 14000 |
| | | | 4 | 12000 | 2000 | 14000 |

| | |
|---|---|
| Total | 57500 |

**Activity Schedule**

| S. No. | Name of the Activity | Tentative months schedule (specify months) during year | | | |
|---|---|---|---|---|---|
| | | From | To | From | To |
| 1 | Admission | Jul | Sep | Jan | Mar |
| 2 | Assignment submission (if any) | Sep | Oct | Mar | Apr |
| 3 | Evaluation of assignment | Oct | Nov | Apr | May |
| 4 | Examination | Dec | | Jun | |
| 5 | Declaration of result | Jan | | Jul | |
| 6 | Re-registration | Jul | | Jan | |
| 7 | Distribution of SLM | Jul | Sep | Jan | Mar |
| 8 | Contact programmes (counseling, practicals, etc.) | Sep | Nov | Mar | May |

## Credit System

MU, CDOE proposes to follow the 'Credit System' for most of its programs. Each credit amounts to 30 hours of study comprising all learning activities. Thus, a 8 credit course requires 240 hours, 6 credit course requires 180 hours , 4 credit course requires 120 hours and 2 credit course requires 60 hours of study. This helps the student to understand the academic effort to complete a course. Completion of an academic programme requires successful clearing of both, the assignments and the term-end examination of each course in a programme.

| Duration of the Programme | Credits | Name of the Programme | Level of the Programme |
|---|---|---|---|
| 4 to 8Yrs | 160 | B.Sc. | Bachelor's Degree |

## Assignments

Distance Education learners have to depend much on self study. In order to ascertain the writing skill and level of comprehension of the learner, assignment work is compulsory for all learners. Each assignment shall consist of a number of questions, case studies and practical related tasks. The assignment question papers will be uploaded to the website within a scheduled time and the learners shall be required to respond them within a specified period of time. The response of the learner is examined by a faculty member.

## Evaluation

The evaluation system of the programme is based on two components:

A. **Continuous evaluation in the form of assignments (weightage 30%):** This Component carries a weightage of 30%. There will be at least one graded assignment and test per course. These assignments are to be submitted to the Co-ordinator of the CDOE/Study Centre to which the student is assigned or attached with.

B. **Term-end examination (weightage 70%):** This will be held twice every year in the months of June and December. The students are at liberty to appear in any of the examinations conducted by the University during the year. A student will be allowed to appear in the Term-End Examination only after she/he has registered for that course and submitted the assignment. For appearing in the Examination, every student has to submit an Examination form through online (www.mangalayatan.in)/or offline before the due dates as given in the schedule of operations. If a student misses any term-end examination of a course for any reason, s/he may appear for any of them or all the courses subject to the maximum of 8 courses in the subsequent term-end examinations. This facility will be available until a student secures the minimum pass grade in the courses but up to a maximum period of four semesters, since the date of registration of the course is valid for four semesters. Beyond this period s/he may continue for another four semesters by getting Re-registration by paying fee again. In that case, the score of qualified assignments and/or term-end examination will be retained and the student will be required to complete the left out requirements of such reregistered courses. Minimum requirement for passing a course will be 40% marks.

## G. Laboratory Support and Library Resources

The library of Mangalayatan University aims to empower the teaching mission and intellectual culture of the community through availability through an organized collection of information as well as instruction in its access, relevance and evaluation. The University Library enriches advance learning and discovery by providing access to a broad array of resources for education, research and creative work to ensure the rich interchange of ideas in the pursuit of knowledge.
The Centre for Distance and Online Education of Mangalayatan University has initiated the process of setting up a dedicated Library for ODL program.

We are offering some analytical techniques-based experiments for B.SC students. Students will perform the spectroscopic based titrations, determination of viscosity of polymer and determination of biological oxygen demand and dissolved oxygen demand. We are offering qualitative analysis. At this stage, students will perform the detection of elements as well as functional group. Students will also perform the inorganic mixture analysis of group I, II, III, IV, V and their separation. Students will perform the experiments based on the purification techniques, functional group determination and melting and boiling point estimation. We are offering different instruments related to the experiments such as electronic weight machine, heating plates and we have all the glass ware like Beker, burette, pipette etc.

In the Physics labs experiment like Value of g by bar pendulum: MI of Flywheel; Moment of inertia of unknown body by inertia table; Force constant of spring; determination of Modulus of rigidity, bulk modulus, and Young modulus; Modulus of rigidity by searl's method; Frequency of AC by sonometer; Variation of Magnetic field along the axis of current carrying coil; by Conversion of Galvanometer into Ammeter and Voltmeter; Polarimeter; Diffraction grating; Nodal Slides, logic gates, characteristics of Zener diode and diode valve etc.

Some advanced experiments are also there in the Physics lab like Hall effect; Planck's constant. Digital electronics experiments are also there in the lab like Half adder, full Adder, Multiplexer and demultiplexer, Flip flops etc.

In the Maths labs experiment we have different software's
The University has well equipped Computer Laboratories, Lecture Capturing Systems, Audio Video facilities, ICT enabled class rooms, Wi-Fi facilities etc.

**H. Cost Estimate of the programme and the provisions**

Initial expenses have been done by the University in terms of provision of infrastructure, manpower, printing of Self Study Material etc. The University intends to allocate expenses out of the total fee collection as per following details:

| | | |
|---|---|---|
| a) SLM Development and Distribution | : | 20% |
| b) Postal and ICT Expenses | : | 10% |
| c) Salary and other Administrative expenses | : | 50% |
| d) Future Research development reserve | : | 10% |
| e) Lab Instruments and Chemicals | : | 10% |

Once programmes are operational, the programme budget from fee receipts will be planned as per the guidelines of University Grants Commission.

**I. Quality Assurance**

The University has established the Centre for Internal Quality Assurance (CIQA) in the University campus. The CIQA will monitor and maintain the quality of the ODL programmes. It has the following objectives in making the compliances of quality implementations.

**Objectives**

The objective of Centre for Internal Quality Assurance is to develop and put in place a comprehensive and dynamic internal quality assurance system to ensure that programmes of higher education in the Open and Distance Learning mode and Online mode being implemented by the Higher Educational Institution are of acceptable quality and further improved on continuous basis.

**Functions of CIQA**

The functions of Centre for Internal Quality Assurance would be following

1) To maintain quality in the services provided to the learners.
2) To undertake self-evaluative and reflective exercises for continual quality improvement in all the systems and processes of the Higher Educational Institution.
3) To contribute in the identification of the key areas in which Higher Educational Institution should maintain quality.
4) To devise mechanism to ensure that the quality of Open and Distance Learning programmes and Online programmes matches with the quality of relevant programmes in conventional mode.

5) To devise mechanisms for interaction with and obtaining feedback from all stakeholders namely, learners, teachers, staff, parents, society, employers, and Government for quality improvement.
6) To suggest measures to the authorities of Higher Educational Institution for qualitative improvement.
7) To facilitate the implementation of its recommendations through periodic reviews.
8) To organize workshops/seminars/symposium on quality related themes, ensure participation of all stakeholders, and disseminate the reports of such activities among all the stakeholders in Higher Educational Institution.
9) To develop and collate best practices in all areas leading to quality enhancement in services to the learners and disseminate the same all concerned in Higher Educational Institution.
10) To collect, collate and disseminate accurate, complete and reliable statistics about the quality of the programme(s).
11) To ensure that Programme Project Report for each programme is according to the norms and guidelines prescribed by the Commission and wherever necessary by the appropriate regulatory authority having control over the programme;
12) To put in place a mechanism to ensure the proper implementation of Programme Project Reports.
13) To maintain a record of Annual Plans and Annual Reports of Higher Educational Institution, review them periodically and generate actionable reports.
14) To provide inputs to the Higher Educational Institution for restructuring of programmes in order to make them relevant to the job market.
15) To facilitate system based research on ways of creating learner centric environment and to bring about qualitative change in the entire system.
16) To act as a nodal coordinating unit for seeking assessment and accreditation from a designated body for accreditation such as NAAC etc.
17) To adopt measures to ensure internalization and institutionalization of quality enhancement practices through periodic accreditation and audit.
18) To coordinate between Higher Educational Institution and the Commission for various qualities related initiatives or guidelines.
19) To obtain information from other Higher Educational Institutions on various quality benchmarks or parameters and best practices.
20) To record activities undertaken on quality assurance in the form of an annual report of Centre for Internal Quality Assurance.
21) It will be mandatory for Centre for Internal Quality Assurance to submit Annual Reports to the Statutory Authorities or Bodies of the Higher Educational Institution about its activities at the end of each academic session. A copy of report in the format specified by the Commission, duly approved by the statutory authorities of the Higher Educational Institution shall be submitted annually to the Commission.

After enrolling in B.Sc. Programme at Mangalayatan University in ODL mode, student will exhibit understanding in areas such as critical thinking, effective communication and develop problem solving, scientific temperament with right set of ethics and attitude towards environment and sustainability. After completion of B.Sc. Programme, student will participate in multiple functional areas of science and technology.

# MANGALAYATAN UNIVERSITY, ALIGARH

# CENTRE FOR DISTANCE AND ONLINE EDUCATION

# PROGRAMME PROJECT REPORT

# MASTER OF SCIENCE (PHYSICS)

## M.Sc. (Physics)

## 2023-24

## Introduction

Master of Science in Physics (M.Sc. Physics) is a postgraduate program that focuses on advanced physical concepts and theories. This program is designed to help students develop a deep understanding of various physical principles and their applications in diverse fields such as engineering, physics, computer science, and finance. The curriculum includes topics such as classical Mechanics, Mathematical Physics, Quantum Mechanics, Electronics, Condensed Matter Physics, Classical Electrodynamics, Nuclear and Particle Physics, Statistical Mechanics in addition to discipline, electives, and computational courses. Students pursuing M.Sc. in Physics learn how to use physics to solve real-world complex problems and develop critical thinking and analytical skills. After completion of the program, students shall be well-equipped to pursue careers in academia, research, and many other fields.

M.Sc. Physics students are trained to work independently and collaboratively on research projects, helping them to develop valuable teamwork and communication skills. They are exposed to modern Physical tools and techniques, such as computer simulations and programming languages, which further enhances their problem-solving abilities. This program also encourages students to apply their knowledge in practical settings, allowing them to develop innovative solutions of complex problems and students may proceed to build their career in the research. This is a challenging and rewarding program that provides students with a strong foundation in Physics and prepares them for a wide range of exciting career opportunities.

## A. Programme's Mission and Objectives

### Mission

- To cater and ensure excellent theoretical and practical training through teaching, counseling, and mentoring with a view to achieve professional and academic excellence.
- To connect with industry and incorporating knowledge for research enhancement.
- To generate, disseminate and preserve knowledge for the benefit and betterment of society.

### Objectives

M.Sc. in Physics programme aims to provide students with advanced classical Mechanics, Mathematical Physics, Quantum Mechanics, Electronics, Condensed Matter Physics, Classical Electrodynamics, Nuclear and Particle Physics, Statistical Mechanics in addition to discipline, electives, and computational courses. The programme also aims to provide students with the skills required to carry out independent research in Physics, including skills in literature review, mathematical modelling, data analysis, and technical writing. Furthermore, the program prepares students for further studies in Physics, including Ph.D. programmes.

## B. Relevance of the Programme with HEI's Mission and Goals

The vision and mission of HEI, Mangalayatan University, Aligarh are:

### Vision:

To be an institution where the most formative years of a young mind are spent in the guided pursuit of excellence while developing a spirit of inquisitive questioning, an ability to excel in the pressure of a fast-changing professional world, and a desire to grow into a personality rather than a person, in an environment that fosters strong moral and ethical values, teamwork, community service and environment consciousness.

### Mission:

- To be the enablers of the confluence of academic rigor and professional practicality.
- To bring global best practices to students through widespread use of technology.
- To empower our faculty to constantly develop new skills and excel professionally.

- To provide the best campus environment to students and faculty with all facilities to nurture their interest.

M.Sc. (Physics) programme of the University strives to realize its vision and mission by rectifying student centric issues on priority and also to empower local community with the help of various social clubs running in University like NSS, KADAM and Alumni association. The University promotes multidisciplinary and allied research in various fields that supports and harnesses joyful learning environment. The goals of ODL(Open Distance Learning) program is to provide educational facilities to all qualified and willing persons who are unable to join regular courses due to personal or professional reasons. There are many potential learners who cannot afford to join regular courses due to professional responsibilities and personal commitments. For such cases M.Sc. (Physics) through ODL modecan be helpful in increasing knowledge base and skill up-gradation. The program aims to provide alternative path to wider potential learners who are in need of refresher courses to update their skills.

**C. Nature of Prospective Target Group of Learners**

Distance Education of Mangalayatan University (MU) shall target the working professional's executives as well as those who cannot attend a full-time program due to prior occupation or other assignments. The candidates desirous of taking admission in M.Sc. (Physics) program shall have to meet the eligibility norms as follows-

1. To obtain admission in M.Sc. (Physics) program offered through ODL mode.
2. The learner must have completed graduation in science stream (PCM/PCMB)

**D. Appropriateness of Programme to be conducted in ODL mode to acquire specific skills and competence**

The University has identified the following **Programme Outcomes** and **Programme Specific Outcomes** as acquisition of specific skills and competence in M.Sc. (Physics) Program.

**Programme Outcomes (PO's)**

After completing the M.Sc. (Physics) programme, students will be able to:

a. PO1: Knowledge outcomes: Acquire knowledge and ability to develop creative solutions, and better understanding of the future developments of the subject. Also, evolve analytical and logical thinking abilities.
b. PO2: Skill Outcomes: Learn and understand the new concepts and get prepared for placement by developing scientific skills. Further ability to communicate scientific information in a clear and concise manner.
c. PO3: General Competence: Be able to understand the role of science in solving real life problems and get an ability to participate in debates and discussions constructively.
d. PO4: Scientific Aptitude and Innovation: Know the recent developments, future possibilities and able to gather, assess, and make use of new information and applying this knowledge to find creative solutions.

**Programme Specific Outcomes:**

After completing the M.Sc. (Physics) programme through ODL Mode, students will be able to:

a. PSO1: Evaluate hypotheses, theories, methods and evidence within their proper contexts.

b. PSO2: Select, interpret and critically evaluate information from a range of sources that include books, scientific reports, journals, case studies and the internet.
c. PSO3: Develop proficiency in the analysis of complex problems and the use of mathematical techniques to solve them.
d. PSO4: Provide a systematic understanding of the concepts and theories of Physics and their application in the real world – to an advanced level, and enhance career prospects in a huge array of fields.

## E. Instructional Design

The program is divided into four semester sand minimum credit requirement is 76 to get M.Sc. (Physics) degree in ODL mode from Mangalayatan University. Minimum time period for acquiring M.Sc. (Physics) degree will be two years and maximum time period to acquire is 4 years.

**Evaluation Scheme**

| **Semester-I** | | | | | | |
|---|---|---|---|---|---|---|
| **S. No.** | **Course Code** | **Course Name** | **Credit** | **Continuous Assessment** | **Term End Exam** | **Grand Total** |
| | | | | **MM** | **MM** | |
| 1 | PHO-6111 | Mathematical Physics-I | 4 | 30 | 70 | 100 |
| 2 | PHO-6112 | Classical Mechanics | 4 | 30 | 70 | 100 |
| 3 | PHO-6113 | Quantum Mechanics-I | 4 | 30 | 70 | 100 |
| 4 | PHO-6115 | Classical Electrodynamics | 4 | 30 | 70 | 100 |
| 5 | PHO-6151 | Physics Lab-I (General Lab-I) | 4 | 0 | 100 | 100 |
| **Total** | | | 20 | 120 | 380 | 500 |

| **Semester-II** | | | | | | |
|---|---|---|---|---|---|---|
| **S. No.** | **Course Code** | **Course Name** | **Credit** | **Continuous Assessment** | **Term End Exam** | **Grand Total** |
| | | | | **MM** | **MM** | |
| 1 | PHO-6211 | Statistical Mechanics | 4 | 30 | 70 | 100 |
| 2 | PHO-6212 | Quantum Mechanics-II | 4 | 30 | 70 | 100 |
| 3 | PHO-6213 | Nuclear and Particle Physics | 4 | 30 | 70 | 100 |
| 4 | PHO-6214 | Programming in C | 4 | 30 | 70 | 100 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5 | PHO-6251 | Physics Lab-II (General Lab-II) | 4 | 0 | 100 | 100 |
| 6 | PHO-6252 | Programming in C Lab | 2 | 0 | 100 | 100 |
| **Total** | | | 22 | 120 | 480 | 600 |

| **Semester-III** | | | | | | |
|---|---|---|---|---|---|---|
| **S. No.** | **Course Code** | **Course Name** | **Credit** | **Continuous Assessment** | **Term End Exam** | **Grand Total** |
| | | | | **MM** | **MM** | |
| 1 | PHO-7111 | Research Methodology | 6 | 30 | 70 | 100 |
| 2 | PHO-7112 | Atomic and Molecular Physics | 4 | 30 | 70 | 100 |
| 3 | PHO-7113 | Electronics | 4 | 30 | 70 | 100 |
| 4 | PHO-7114 | Condensed Matter Physics | 4 | 30 | 70 | 100 |
| 5 | PHO-7151 | Physics Lab-III | 4 | 0 | 100 | 100 |
| **Total** | | | 22 | 120 | 380 | 500 |

| **Semester-IV** | | | | | | |
|---|---|---|---|---|---|---|
| **S. No.** | **Course Code** | **Course Name** | **Credit** | **Continuous Assessment** | **Term End Exam** | **Grand Total** |
| | | | | **MM** | **MM** | |
| 1 | PHO-7211 | Mathematical Statics | 4 | 30 | 70 | 100 |
| 2 | PHO-7212 | MOOC | 4 | 30 | 70 | 100 |
| 4 | PHO-7291 | Dissertation | 8 | 0 | 100 | 100 |
| **Total** | | | 16 | 60 | 240 | 300 |

**MOOCs**

The University shall give flexibility in opting for MOOCs (Massive Online Open Courses) by the students pertaining to the prescribed curriculum and also the credits earned in the MOOCs may be

dealt as part of the evaluation scheme as per UGC (Open and Distance Learning Programmes and Online Programmes) Regulations,2020.

**Syllabi and Course Materials**

Syllabi, PPR and self-learning materials are developed mostly by experienced faculty members of Mangalayatan University in consultation with contents experts and the same will be forwarded to CIQA and BoS/Academic Council/ Executive Council for further suggestions and approval.

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## Semester: I

## Course Code: PHO-6111 Credit: 4

## Course: Mathematical Physics-I

**Course Objectives:** The primary objective is to teach the students basic mathematical methods that will be used in many of the other courses in the M.Sc. syllabus.

**Block-1: Theory of Functions of a Complex Variable:**

Unit-1: Analyticity and Cauchy-Reimann Conditions, Cauchy's integral theorem and formula

Unit-2: Taylor's series and Laurent's series expansion, Zeros and singular points, Multivalued functions, Branch Points and Cuts

Unit-3: Reimann Sheets and surfaces, Residues, Cauchy's Residue theorem, Jordan's Lemma

Unit-4: Evaluation of definite integrals, Principal Value, Bromwitch contour integrals.

**Block-2: Fourier Transform:**

Unit-5: Fourier transform, Sine, Cosine and Complex transforms with examples, Definition, Properties and Representations of Dirac Delta Function

Unit-6: Properties of Fourier Transforms, Transforms of derivatives

Unit-7: Parseval's Theorem, Convolution Theorem, Momentum representation, Applications to Partial differential equations,

Unit-8: Discrete Fourier transform, Introduction to Fast Fourier transform

**Block-3: Laplace Transforms:**

Unit-9: Laplace transform,

Unit 10: Properties and examples of Laplace Transform,

Unit-11: Convolution theorem and its applications,

Unit-12: Laplace transform method of solving differential equations.

**Block-4: Group Theory:**

Unit-13: Concept of a group (additive and multiplicative, isomorphism and homomorphism)

Unit-14: Matrix representation of a group, Reducible and irreducible representation of a group,

Unit-15: The Great Orthogonality Theorem (without proof), Continuous,

Unit-16: Lie groups.

**Course Outcomes:** Students will learn the required mathematical techniques that may have not been covered in the courses in B.Sc. CBCS programme and which will be useful in many other

courses in M.Sc.

***Text and References Books:***


1. *Arfken G.,Mathematical method for Physicists, Academic Press*
2. *Kreyszig.E., Advanced Engineering Mathematics, Wiley-India*
3. *Bell.W.W, Special Functions, Courier Dover Publication*
4. *Churchill. R.V., Functions of complex variable, McGraw-Hill Book Co.*
5. *Ghatak, A.K, Goyal, I.C. and Chau, S.J. , Mathematical Physics, Ubs-Bangalore*


## Course Code: PHO-6112 Credit: 4
## Course: Classical Mechanics

**Course Objectives:** Students will be equipped for advanced and specialized courses. The student learns to deal with particle mechanics at an advanced level and to learn the foundations of the classical theory of fields.

**Block I: Classical Mechanics Fundamentals and Principles**

Unit 1: General idea of Newtonian physics; Mechanics of a particle, mechanics of a system of particles

Unit 2: Constraints, generalized coordinates, D'Alembert's principle and Lagranges equations

Unit 3: Hamilton's principle, derivation of Lagrange's equations from Hamilton's principle, extension of Hamilton's principle to non-holonomic systems

Unit 4: Conservation theorems and symmetry properties, Generalized momenta, cyclic co-ordinates

**Block II: Canonical Transformations and Hamilton-Jacobi Method**

Unit 5: Equation of canonical transformation, examples of canonical transformation

Unit 6: Poisson and Lagrange brackets and their invariance under canonical transformation, Jacobi's Identity, Poisson's Theorem

Unit 7: Equations of motion infinitesimal canonical transformation in the poisson bracket formulation

Unit 8: Hamilton Jacobi Method, Generating functions.

**Block III: Celestial Mechanics and Small Oscillations**

Unit 9: Two body central force problem: bound state, reduction of two-body problem to one body problem

Unit 10: Motion in a central force field, The virial theorem, the inverse square law of force

Unit 11: The motion in central force in the Kepler problem

Unit 12: Concept of small oscillations, eigen value equation, simple application ($CO_2$), Normal coordinates and modes

**Block IV: Relativistic mechanics**

Unit 13: Four dimensional representation of the Lorentz transformations, covariance of the laws of nature
Unit 14: Four vectors; velocity momentum, force and their transformation,
Unit 15: Equation of motion of a point particle in four vector form
Unit 16: Relativistic Lagrangian and Hamiltonian of a charged particle in an em field

**Course Outcomes:** Students who have completed this course will have deep understanding of Lagrangian and Hamiltonian formulation of Mechanical systems and would be able to formulate and solve the Lagrangian and Hamiltonian equations of motion for different mechanical systems. The students will have deep understanding of variational principle, rigid body motion and theory of small oscillation.

***Books Recommended/Suggested Reading:***


1. *Goldstein H.; Classical Mechanics, 2nd edition, Narosa Publishing House.*
2. *Rana N.C. and Joag P. S.; Classical Mechanics, McGraw-Hill Education.*
3. *Gupta K. C.; Classical Mechanics, Wiley Publication.*
4. *Moller, M.C.; Theory of relativity, Oxford University.*


## Course Code: PHO-6113 Credit: 4

## Course: Quantum Mechanics-I

**Course Objectives:** The primary objective is to equip the students with the knowledge of fundamental concepts and tools of quantum mechanics.

**Block 1: Introduction of Quantum Mechanics**
Unit 1: Mathematical tools and brief introduction to origins of quantum Physics.
Unit 2: Review of quantum postulates. Properties of linear vector space,
Unit 3: Dirac notation. Operators, their Eigen values and Eigen functions, orthonormality, completeness and closure.
Unit 4: Generalized Uncertainty Principle. Unitary transformations, change of basis.

**Block 2: Abstract Formulation**
Unit 5: Matrix Representation of operators.
Unit 6: Continuous basis, position and momentum representation and their connection.
Unit 7: Change of basis and unitary transformation,
Unit 8: expectation values and Ehrenfest theorem

**Block 3: Quantum Dynamics**
Unit 8: Schodinger picture
Unit 9: Heisenberg picture and equation of motion
Unit 10: Clsssical limit, solution of harmonic oscillator by operator method

Unit 11: Symmetries in quantum mechanics, general view of symmetries,
Unit 12: Spatial transition, continuous and discrete, time transition, parity and time reversal

**Block4: Angular Momentum**
Unit 13: Angular Momentum, commutation relations of angular momentum
Unit 14: Orbital, Spin and total angular momentum operators.
Unit 15: Pauli spin matrices, their Commutation relations.
Unit 16: Eigen values and Eigen functions of L2 and Lz. Clebsch-Gordon coefficients

**Course Outcomes:** Students will learn the basic concepts of Quantum mechanics which applies to all the physical systems irrespective of their size and can be beautifully perceived at atomic and subatomic level. Students will be able to understand the various operators used to represent dynamic variables. The eigen values and eigen functions of linear harmonic oscillator and Hydrogen atom will help students to understand the behaviour of microscopic systems.

***Text and References Books:***

*1. Franz Schwabl : Quantum Mechanics.*
*2. J. J. Sakurai : Modern Quantum Mechanics.*
*3. N. Zettili : Quantum Mechanics.*
*4. P. A. M. Dirac :Priciples of Quantum Mechanics.*
*5. Bohm : Quantum Mechanics.*

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## Course Code: PHO-6114 Credit: 4

## Course: Classical Electrodynamics

**Course Objectives:** The primary objectives of this course aim at acquiring the stimulating knowledge of dynamical inter-relationship of electric and magnetic fields and their unification in creating electromagnetic waves, in an interesting way. Students must understand the concepts of electromagnetic wave propagation in vacuum, conducting and non-conducting media and also must be able to identify, formulate and solve fields equations and handle various problems of transporting energy or information in vacuum and through guided structures

**Block 1: Review of Maxwell's Equation**
Unit 1: Review of Maxwell's equations, propagation of EM waves in conducting medium, linear, circular, elliptical polarization.
Unit 2: Propagation of EM waves in conducting medium. Skin depth, Reflection and refraction from metallic surface.
Unit 3: Propagation of waves between perfectly conducting planes, waves in hollow-conductors,
Unit 4: TE and TM modes. Rectangular waveguides, resonant cavity

**Block 2: Particle Dynamics in EM field**

Unit 5: Relativistic Charged particle motion in uniform statics E and B fields
Unit 6: Cross E & B fields
Unit 7: Particle drifts in (velocity and curvature) in non-uniform statics B field.
Unit 8: Adiabatic invariance and magnetic mirror.

**Block 3:Radiation**
Unit 9: Lienard Weichert potential, field produced by charged particle in motion,
Unit 10: Radiation from accelerated charged particle, Larmor formula and its relativistic generalization,
Unit 11: Scattering of EM radiation by free charges. Thomson scattering,
Unit 12: Scattering by a system of charges, dipole radiation.

**Block 4: Lagrangian formulation of Electrodynamics:**
Unit 13: Lagrangian and Hamiltonian formulation for a free relativistic particle, for a charged particle in EM field
Unit 14: Interacting charged particle and fields
Unit 15: Energy-momentum tensor and related conservation laws
Unit 16: Canonical and Symmetric Stress Tensors, Solution of the wave equation in covariant form

**Course Outcomes:** After attending this course, students would be able to apply knowledge of mathematics and physics in understanding the coupled nature of electromagnetic fields. The role of different coordinate systems and vector calculus to describe the electromagnetic quantities as functions of space and time will be understood. Students will be able to explain fundamental laws governing electromagnetic fields and evaluate the physical quantities of electromagnetic fields (Field intensity, Flux density etc.) in different media. They would appreciate that the Maxwell's equations as field equations do not include the equation of motion of charged particles

***Text and Reference Books:***


1. *Jackson J.D., Classical Electrodynamics, Wiley India.*
2. *Marion J..B., Classical Electromagnetic Radiation, Academic Press.*
3. *Griffiths D. J., Introduction to Electromagnetics, Prentice Hall.*


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## Course Name: Physics (General) Lab-I Credit: 4

## List of Experiments

1. To determine the wavelength of the sodium light and the wavelength difference between D1 and D2 lines using Michelson interferometer.
2. To measure the thickness of thin wire using He-Ne laser.
3. To measure wavelength of He-Ne laser using diffraction grating.
4. To determine Hall coefficient and mobility of charge carriers in a given sample of semiconductor.
5. To measure wavelengths of the Balmer lines of hydrogen spectrum and to determine the Rydberg constant for hydrogen atom from the measurement of these lines.

6. To determine the wavelength of sodium light and D1 and D2 lines by Febry Perot interferometer.
7. To Study of losses in optical fiber.
   (a) Measurement of propagation loss.
   (b) Measurement of bending loss.
8. To measure Numerical Aperture of Optical Fibre.
9. Demonstrate the Faraday-Effect using Flint Glass.
10. To determine the e/m ratio using Zeeman Effect.

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## Semester-II

## Course Code: PHO-6211 Credit: 4

## Course: Statistical Mechanics

**Course Objectives:** Statistical mechanics is an indispensable tool for studying physical properties of matter "in bulk" on the basis of the dynamical behavior of its "microscopic" constituents. This course is designed to teach the phenomenological postulates and theories of the matter and their relationship with the quantum mechanics.

**Block 1: Classical ensemble theory**

Unit 1: Quantum statistical mechanics of identical particles, Condition for statistical equilibrium,

Unit 2: Symmetry of wave function, Postulate of equal a prior probability, Random walk, Ensemble in quantum statistics,

Unit 3: Grand Canonical Ensemble, Partition function, Quantum distribution functions (Bose-Einstein and Fermi- Dirac),

Unit 4: Derivation of distribution laws using grand partition function.

**Block 2: Quantum ensemble theory**

Unit 5: Phase space and Liouville's theorem, Microcanonical ensemble theory and its application to ideal gas of monatomic particles

Unit 6: Canonical ensemble and its thermodynamics, partition function, classical ideal gas in canonical ensemble theory, energy fluctuations,

Unit 7: Gibbs paradox and its solution, Sackur-Tetrode equation, a system of quantum harmonic oscillators as canonical ensemble, Grand canonical ensemble,

Unit 8: Significance of statistical quantities, classical ideal gas in grand canonical ensemble theory.

**Block 3:Ideal Bose systems**

Unit 9: Basic concepts and thermodynamic behaviour of an ideal Bose gas, Bose-Einstein condensation,

Unit 10: Black body radiation-Planck's formula, Ideal Fermi systems: thermodynamic behaviour of an ideal Fermi gas,

Unit 11: Discussion of heat capacity of a free-electron gas at low temperatures,

Unit 12: Electron gas in metals, H-theorem.

**Block 4: Phase transition**

Unit 13: Phase transitions, Ising model, Thermodynamic fluctuations, Critical exponents,
Unit 14: Thermodynamic limit and its importance Random walk
Unit 15: Brownian motion, Diffusion equation, Fluctuation-Dissipation theorem.
Unit 16: Concepts of universality of phase transitions, Ising and Heisenberg models

**Course Outcomes:** On completion of the course students will have understanding of Physics of equilibrium systems, Fermi and Bose systems, Bose-Einstein condensation and Phase transitions, magnetism and super fluids, and critical phenomena.

***Text and Reference Books:***


1. *Landau and Lifshitz, Statistical Physics, Reed Educational & professional publication Ltd.*
2. *Pathria R.K., Statistical Mechanics (2nd edition), Butterworth-Heinemann, Oxford.*
3. *Huang K., Statistical Mechanics, Wiley Eastern, New Delhi.*
4. *Agarwal B.K. and Eisner M., Statistical Mechanics: Wiley Eastern, New Delhi.*


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## Course Code: PHO-6212 Credit:4

## Course: Quantum Mechanics-II

**Course Objectives:** The primary objective is to teach the students the concept of commutation relations of angular momentum and symmetry along with Relativistic Quantum mechanics. The important topic of non relativistic scattering is also dealt with.

**Block 1: Approximation methods for stationary systems**

Unit 1: Time independent perturbation theory. Perturbation of non-degenerate states: first and second order perturbation.
Unit 2: Perturbation of a harmonic oscillator.Perturbation of degenerate states, removal of degeneracy.
Unit 3: Zeemaneffect, isotopic shift and Stark effects.
Unit 4: Variational and WKB methods.

**Block 2: Approximation methods for time dependent problems**

Unit 5: Interaction picture andTime dependent perturbation theory
Unit 6: Equations of Motion. Constant and harmonic perturbation.
Unit 7: Discrete and continuous case,transition probability.Fermi golden rule.
Unit 8: Adiabatic and sudden approximations.

**Block 3: Scattering Theory**

Unit 9: Scattering Theory Scattering of a wave packet.
Unit 10: The differential and total Cross section. The Born approximation.

Unit 11: Partial waves and phase shifts, The Lippman Schwinger equation.
Unit 12: Definition and properties of S-matrix, T matrix.Optical theorem.

**Block 4: Relativistic Quantum Mechanics**
Unit 13: Klein-Gordon and Dirac equations, properties of Dirac matrices.
Unit 14: Plane wave solution of Dirac equation. Spin and magnetic moment of the electron
Unit 15: Non-relativistic reduction of the Dirac equation.Central forces and the hydrogen atom.
Unit 16: Hydrogen atom in Dirac's theory, Dirac electron in constant magnetic field,

**Course Outcomes:** Students will learn the basic ideas of angular momentum and symmetry .Relativistic Quantum Mechanics will provide an exposure to how special relativity in quantum theory leads to intrinsic spin angular momentum as well as antiparticles approximations methods along with scattering theory shall presumably equip the student with sufficient knowledge to solve related problems.

***Text and Reference Books:***

*1. Franz Schwabl : Quantum Mechanics.*
*2. Eugen Merzbacher : Quantum Mechanics.*
*3. N. Zettili : Quantum Mechanics.*
*4. P. M. Mathews and K. Venkatesan: Quantum Mechanics.*
*5. P. A. M. Dirac :Priciples of Quantum Mechanics.*

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## Course Code: PHO-6213 Credit: 4

## Course: Nuclear and Particle Physics

**Course Objectives:** The primary objective is to introduce the basic ideas and concepts of Nuclear Physics and impart knowledge about nuclear basic properties, nuclear decays and nuclear reactions.

**Block 1:General properties of atomic nuclei**
Unit 1: General properties of atomic nuclei and nuclear forces (qualitative), binding energy,
Unit 2: Types of nuclear potential, Ground and excited states of deuteron,
Unit 3: Tensor force S & D states, spin dependence of nuclear force,
Unit 4: n-p scattering and p-p scattering at low energies.

**Block 2: Review of barrier penetration of alpha decay**
Unit 5: Review of barrier penetration of alpha decay & Geiger-Nuttal law.
Unit 6: Beta decays, Fermi theory, Allowed and forbidden transitions,
Unit 7: Experimental evidence for Parity-violation in beta decay, Idea of electron capture,
Unit 8: Multipolarity of gamma transitions and selection rules, internal conversion, idea of Coulomb excitation.

**Block 3: Nuclear models**
Unit 9: Extreme particle model with square-well & harmonic oscillator potentials
Unit 10: Spin-orbit coupling, shell model predictions, magnetic moment-Schmidt lines,

Unit 11: Single particle model, Total spin 'J' for various configurations,
Unit 12: Electric quadrupole moment. Collective modes of motion, nuclear vibrations and rotations.

**Block 4: Introduction of elementary particles**
Unit 13: Introduction of elementary particles.Quantum numbers and conservation laws,
Unit 14: Charge conjugation, time reversal invariance, CPT theorem.The Baryon decuplet, meson octet, quark spin and color.
Unit 15: Pion parity, helicity of neutrino, K-decay,CPviolation in K- decay and its experimental determination, resonances,
Unit 16: Special symmetry groups SU(2) and SU(3) classification of hadrons, quarks, Gell Mann-Okubu mass formula.

**Course Outcomes:** The present course in nuclear physics revolves around many important and crucial aspects of science satisfying the natural human curiosity about the nature. The study regarding the properties of matter at the nuclear scale will provide better insight for understanding of the stability of matter and evolution of the Universe as such. The knowledge of energetics of the nuclear reactions gives not only the insight regarding the feasibility of reaction yield at different energies but could be extended to the Planks Scale also. Many of the scientific advancements related to human health, energy production and industrial requirement etc., are inevitably linked to the basic research in nuclear physics at all levels.

***Text and Reference Books:***


1. *Enge H. A, Introduction to Nuclear Physics, Addison-Wesley Pub. Co.*
2. *Ghoshal S. N., Nuclear Physics , S. Chand & Company Limited*
3. *Evans R. D., Atomic Nucleus, McGraw-Hill*
4. *Perkins D. H., Introduction to High Energy Physics, Cambridge University Press.*


## Course Name: Programming in C Credit: 4
## Code: PHO-6214

**Course Objectives:** To equip students with a solid foundation in the C programming language, enabling them to understand programming paradigms, utilize fundamental programming constructs, manipulate data structures, and perform file processing operations.

**Block I: Basics of C programming**

**Unit 1:** Introduction to programming paradigms, Applications of C Language, Structure of C program.

**Unit 2:** C programming: Data Types, Constants, Enumeration Constants, Keywords.

**Unit 3:** Operators: Precedence and Associativity, Expressions, Input/Output statements, Assignment statements**.**

**Unit 4:** Decision making statements, Switch statement, Looping statements, Preprocessor directives, Compilation process.

**Block II:Arrays and Strings**

**Unit 5:** Introduction to Arrays: Declaration, Initialization, One dimensional array, Two dimensional arrays.

**Unit 6:** String operations: length, compare, concatenate, copy**.**
**Unit 7:** Selection sort, linear and binary search**.**

**Block III: Functions and pointers**

**Unit 8:** Modular programming - Function prototype, function definition, function call, Built-in functions (string functions, math functions).
**Unit 9:** Recursion, Binary Search using recursive functions, Pointers, Pointer operators, Pointer arithmetic, Arrays and pointers, Array of pointers.
**Unit 10:** Parameter passing: Pass by value, Pass by reference.

**Block IV:Structures and union**

**Unit 11:** Structure, Nested structures, Pointer and Structures, Array of structures.
**Unit 12:** Self referential structures, Dynamic memory allocation.
**Unit 13:** Singly linked list, typedef, Union, Storage classes and Visibility.

**Block V: File processing**

**Unit 14**: Files, Types of file processing: Sequential access, Random access, Sequential access file.
**Unit 15:** Random access file.
**Unit 16:** Command line arguments.

**Course Outcomes:**On successful completion of this course, students shall be able to:

1. Understand the basics of C programming, including program structure, data types, operators, decision-making and looping statements, and the compilation process.
2. Apply their knowledge of arrays and strings to declare, initialize, manipulate, and search for elements, using sorting algorithms and string operations effectively.
3. Analyze the concepts of functions and pointers to modularize programs, implement recursion and binary search, work with pointers and arrays, and comprehend parameter passing mechanisms.
4. Create and design structures and unions, including nested structures, pointers to structures, self-referential structures.

**Books Recommended/Suggested Reading:**


1. Kamthane A. N. and Kamthane A. A.; Programming in C, Pearson Education India.
2. Reema Thareja; Computer Fundamentals and Programming in C, Oxford University Press.
3. Dey P. and Ghosh M.; Programming in C, Oxford University Press.
4. Kernighan B. W. and Dennis M. R.; The C Programming Language, Pearson Education India.
5. Kanetkar Y. P.; Let us C, BPB Publications.
6. Jones J. A. and Harrow K.; Problem solving with C, Pearson Education India.


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## Course Name: Physics (General) Lab-II Credit: 4
## Course Code: PHO-6251

**List of Experiments**

1. To study of 8085 and 8086 Microprocessor training kit.
2. To perform addition of two 8 bit numbers; sum 8 and 16 bit.
3. To perform addition and subtraction of two 8 bit numbers; sum 16 bit.
4. To perform the decimal addition of two 8 bit number, sum 16- bit.
5. To find the largest number from a given number of string.
6. To perform multiplication of 8 bit data; product should be 16 bit.

7. To move a block of data from one memory location to another memory location.
8. To write an assembly language program to shift 8 bit no.(left shift).
9. To interface 8255 PPI to microprocessor and set port A as input port in Mode 0.
10. To interface ADC card to microprocessor & generate the digital output.
11. To interface DAC card to microprocessor & generate a square wave on CRO.
12. To study the plateau characteristics of a G-M counter
13. To determine the range of beta-rays
14. To study the energy dependence of the absorption coefficient of aluminum for gamma-rays.

## Course Name: Programming in C Lab Credit: 2
## Code: PHO-6252

**Course objectives:** This course aims to provide students with the fundamental knowledge and practical skills necessary for programming in the C language. Through hands-on programming exercises, students will develop proficiency in solving computational problems using C programming constructs and techniques.

**Programs:**

1. Write a C program to find roots of a quadratic equation.
2. Write a C program to find the total no. of digits and the sum of individual digits of a positive integer.
3. Write a C program to generate the Fibonacci sequence of first N numbers.
4. Write a C program to compute sin(x) using Taylor series approximation given by

   $$\sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + .....$$

   Compare output of the program with the built- in Library function. Print both the results with appropriate messages.
5. Write a C program to input two matrices and perform matrix multiplication on them.
6. Write a C program to check whether the given string is palindrome or not without using Library functions.
7. Write a C program to count the number of lines, words and characters in a given text.
8. Write a C program to generate prime numbers in a given range using user defined function.
9. Write a C program to find factorial of a given number using recursive function.
10. Write a C program to maintain a record of n student details using an array of structures with four fields - Roll number, Name, Marks and Grade. Calculate the Grade according to the following conditions.

| Marks | Grade |
|---|---|
| >=80 | A |
| >=60 | B |
| >=50 | C |
| >=40 | D |
| <40 | E |

Print the details of the student, given the student roll number as input.

**Course Outcomes**:

On successful completion of this course, students should be able to:

1. Apply understanding of C programming concepts to develop C programs that solve specific computational problems, such as finding roots of a quadratic equation, generating the Fibonacci sequence, performing matrix multiplication, checking for palindromes, counting lines/words/characters in a text, generating prime numbers, and calculating the grade of a student based on their marks.
2. Analyze and compare the output of their C programs with the results obtained from built-in library functions or other reference solutions. They will also be able to evaluate the efficiency and correctness of their programs by examining the logic, syntax, and algorithmic design employed.

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**Semester-III**

## Course Name: Research Methodology Credit: 6
## Code: PHO-7111

**Course Objectives:** To familiarize students with basic of research, research process and enable the participants in conducting research work and formulating research synopsis and report.

**Block I: Research Formulation**

**Unit 1:** Introduction, meaning of research,

**Unit 2:** Types, Role of research in important area and Process of Research,

**Unit 3:** Defining research Problems, Hypothesis Formulation.

**Block II: Research Elaborated**

**Unit 4:** Research Design, Research plan, Concept of sample, Sample size, various types of sampling techniques.

**Unit 5:** Types of Data and Methods of its Collection**;** Questionnaire Design,

**Unit 6:** Precautions in preparation of questionnaire, Measurement scales.

**Block III: Data Analysis and Interpretation-1**

**Unit 7:** Processing and Analysis of Data by application of statistical tools

**Unit 8:** various kinds of charts and diagrams used in data analyses

**Unit 9:** Application of Data Analysis

**Block IV: Data Analysis and Interpretation-2**

**Unit 10:** Hypothesis Testing (F-test, ANOVA, Chi –square test, t-test)

**Unit 11:** Multivariate Statistical techniques- Multiple regression, discriminate analysis, Factor analysis, Multivariate analysis of variance

**Unit 12:** Conjoint analysis, Cluster analysis, Multidimensional Scaling, Role of computer in research, Excel- A tool for statistical analysis, SPSS, Interpretation and conclusion

**Block V: Report Writing**

**Unit 13:** Report Writing, Significance of report writing, Steps in report writing

**Unit 14:** Layout of research report, Types of reports; Appendices

**Unit 15:** Bibliography, Characteristics of a good report; Precautions for report writing; Ethics in business research.

***Books Recommended/Suggested Reading:***


1. *Kothari C. R.: Research Methodology, New Age International Publishers.*
2. *Sinha S. C. and Dhiman A. K.; Research Methodology, EssEss Publications.*
3. *Anderson T. W.; An Introduction to Multivariate Statistical Analysis, Wiley.*
4. *Garg B. L., Karadia R., Agarwal F. and Agarwal U. K.; An Introduction to Research Methodology, RBSA Publishers.*


**Course Outcomes:** After the completion of the course, student shall be able to:

1. Elaborate various concepts related to research.
2. Enumerate various kinds of research design & process.
3. Develop adequate knowledge on measurement & scaling techniques as well as the quantitative data analysis.
4. Demonstrate various techniques of data analysis-and hypothesis testing procedures.
5. Articulate appropriate research ethics for doing meaningful research.

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## Course Code: PHO-7112 Credit: 4
## Course: Atomic and Molecular Physics

**Course Objectives:** To impart the knowledge about the fundamentals of atomic and molecular Physics of the systems, and to describe the structure of atoms and molecules on the basis of quantum mechanics.

**Block 1: Atomic structure**

Unit-1: Quantum Mechanical Treatment of one-electron Atom, Spin-Orbit interaction and fine structure of hydrogen atom,

Unit-2: Spectra of alkali elements. Singlet and triplet States of Helium, Central field approximation, Thomas-Fermi field,

Unit 3: Atomic wave function, Hartree and Hartree –Fock approximations, Spectroscopic Terms: L S and J J coupling schemes for many electron atoms,

Unit 4: Wave functions and energies of multiplets., Electric dipole and Electric Quadrupole.

**Block 2: Molecular structure**

Unit 5: Born - Oppenheimer approximation, Heitler-London theory of $H_2$

Unit 6: Rotation, vibration and electronic structure of diatomic molecules

Unit 7: Molecular orbit and valance bond methods for $H_2^+$ and $H_2$

Unit 8: Correlation diagram for heteronuclear molecules

**Block 3: Molecular spectra**

Unit 9: Rotation, vibration and electronic spectra of diatomic molecules

Unit 10: The Franck-Condon principle, electron spin and Hund's cases

Unit 11: Idea of symmetry elements and point groups and diatomic and polyatomic molecules

Unit 12: Infrared Spectroscopy and Raman spectroscopy, Photoelectron Spectroscopy

**Block 4: Spectroscopy**

Unit 13: Nuclear Magnetic Resonance, Chemical Shift, and Electron Spin Resonance (Introduction and their principles only).
Unit 14: General description and working of infra-red Spectrophotometer,
Unit 15: Photoelectron Spectrometer, Simple Raman Spectrometer,
Unit 16: NMR Spectrometer and ESR Spectrometer.

**Course Outcomes:** After completion of the course students will be able to understand thespectra produced by one and two valence electron systems, intensity of spectral lines and effect of magnetic field on one electron systems as well as origin of hyperfine structure. Students will acquire knowledge of rotational, vibrational and electronic spectra of molecules in addition to acquaintance with the principle of electron spin and nuclear magnetic resonance, nuclear quadrupole spectroscopy and their applications. They will also the Laser principle, basic Lasers and its applications.

***Text and Reference Books:***


1. *White H.E.: Introduction to atomic spectra, McGraw-Hill book company.*
2. *Weissbluth M.: Atoms and molecules, Academic Press Inc.*
3. *Barrow G.M.: Introduction to molecular spectroscopy, McGraw-Hill book company.*


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## Course Code: PHL-7213 Credit: 4

## Course: Electronics

**Course Objectives:** To gain a deeper understanding of linear and digital electronic circuits, to be able to conceptualize, implement and actualize both linear and digital electronics circuits. The course will enable students to study the design and implementation of digital circuits and also the microprocessor architecture as a basis for computers.

**Block 1: Linear Wave Shaping**

Unit 1: High Pass and Low Pass RC Networks: Detailed Analysis; Response to Sinusoidal, Step, Pulse, Square wave, Exponential and Ramp Inputs;
Unit 2: RC circuits applications, High pass RC circuit as a differentiator, Low Pass RC circuit as an Integrator; Unit 3: Criterion for good differentiation and integration.
Unit 4: Laplace Transforms and their application to circuit elements.

**Block 2: Amplifiers**

Unit 5: Difference Amplifiers; Broadband Amplifiers,
Unit 6: Methods for achieving broad-banding
Unit 7: Emitter Follower at High Frequencies;
Unit 8: Operational Amplifiers and its Applications

**Block 3: Power Supplies**

Unit 9: Electronically Regulated Power Supplies; Converters and Inverters; High and Low Voltage Supplies, Application of SCR as Regulator; SMPS;
Unit 10: Elements of Digital Circuit Technology: Transistor as a Switch – Switching times: Definition and Derivation
Unit 11: Rise Time, Fall Time, Storage Time, Delay Time, Turn On Time, Turn Off Time Charge Control Analysis
Unit 12: Multivibrators: Astable, Monostable and Bistable; Schmitt Trigger. (10 Lectures)

**Block 4: Flip Flops**
Unit 13: Flip Flops: RS, RST, JK, T, D, JK M/S Flip flops, Race problem, Preset and Clear functions;
Unit 14: Binary Codes: Gray, 8421, 2421. Arithmetic Circuits. Boolean Variables and Operators, Simplification of Boolean Expressions.
Unit 15: Karnaugh Maps; Registers and counter: Shift registers, types of synchronous and asynchronous, ring counter modulus and UP/DOWN counters;
Unit 16: D/A converter and A/D converter. Simultaneous and Counter method of A/D converter, Successive Approximation method

**Course Outcomes:** The course aims to develop a deep understanding of amplifier circuits. It will also serve as a foundation for understanding computer architecture. The student will be able to design and troubleshoot simple digital circuits.

**Reference Books:**
1. Integrated Electronics: Millman and Halkias.
2. Pulse Digital and switching waveforms: Millman & Taub
3. Digital Technology: WH Gothman
4. Digital Electronics: Principles and Practice- Virender Kumar
5. Digital Principles and Applications: Malvino & Leach
6. Digital Fundamentals: TL Floyd

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## Course Code: PHO-7114 Credit: 4
## Course: Condensed Matter Physics

**Course Objectives:** Knowledge of the role of Solid State Physics in important technological development.
At the end of the Condensed Matter Physics, student will be able to

| COs No. | Course Outcomes (COs) | Cognitive Level |
|---|---|---|
| 1. | **Tell** the basic symmetry operations performed in crystals and various types of defects that exist in crystals**.** | Remember |
| 2. | **Explain** the band theory and different types of band structures. | Understand |

| | | |
|---|---|---|
| 3. | **Demonstrate** the transport properties in bands. | Understand |
| 4. | **Illustrate** lattice and its thermal properties. | Understand |

**Block 1: Bonding in crystals**

Unit 1: Bonding in crystals: covalent, ionic, metallic, hydrogen bond, van der Waal's bond and the Madelung constant.

Unit 2: Crystalline solids, unit cell, primitive cell, Bravais lattices, Miller indices, closed packed structures. Atomic radius, lattice constant and density.

Unit 3: Connection between orbital symmetry and crystal structure.Scattering from periodic structures, reciprocal lattice, Brillouin Zones.

Unit 4: Free electrons in solids, density of states, Fermi surface, Fermi gas at T=0 K, Fermi statistics, specific heat capacity of electrons in metals, thermionic emission of electrons from metals.

**Block 2: Electronic band structure in solids**

Unit 5: Electronic band structure in solids, Electrons in periodic potentials,

Unit 6: Bloch's Theorem, Kronig-Penney model, nearly free electron model,

Unit 7: Tight-binding model: density of states, examples of band structures.

Unit 8: Fermi surfaces of metals and semiconductors.

**Block 3: Transport properties**

Unit 9: Transport properties: Motion of electrons in bands and the effective mass,

Unit 10: Currents in bands and holes, scattering of electrons in bands,

Unit 11: Boltzmann equation and relaxation time, electrical conductivity of metals,

Unit 12: Thermoelectric effects, the Wiedemann-Franz Law.

**Block 4: Lattice dynamics of atoms in crystals**

Unit 13: Vibrations of monoatomic and diatomic linear chains,

Unit 14: Acoustic and optical phonon modes, density of states, thermal properties of crystal lattices,

Unit 15: Thermal energy of the harmonic oscillator, specific heat capacity of the lattice,

Unit 16: Debye theory of specific heats.

***Text and Reference Books:***

*1. Hook and Hall : Solid State Physics (Manchester Physics Series).*

*2. Kittel : Introduction to Solid State Physics (John-Wiley).*

*3. Ibach and Luth : Solid State Physics (Springer-Verlag Berlin).*

*4. H. M. Rosenberg : Introduction to the Theory of Solids (Prentice Hall).*

*5. Blakemore : Solid State Physics (Pergamon).*

*6. J. P. Srivastava: Element of Solid State Physics (Prentice Hall).*

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## Course Name: Physics Lab-III Credit: 4

## Course Code: PHO-7151

**List of Experiments**

1. To Study of Basic Op-Amp circuits and perform the Inverting & Non- Inverting Amplifier Using OP- Amp.
2. To perform the Differentiator & Integrator Using OP- Amp.
3. To calculate the Frequency of Wein- bridge Oscillator Using Op Amp.
4. To perform the Schmitt trigger Using OP-Amp.
5. Draw the frequency Response curve of Low pass filter & High pass filter Using OP Amp.
6. Draw the frequency Response curve of Band pass filter & Band stop filter Using OP Amp.
7. To perform the Square Wave generator and Triangular Wave generator Using OP Amp.
8. Voltage Regulator using Op-Amp.
9. To perform the zero-crossing detector (sine wave to square wave convertor) using Op-Amp.
10. To measure the magnetic susceptibility of given samples and calculate their effective Bohr magneton number.
11. To measure the Lande' g factor for electrons using Electron Spin Resonance (ESR) technique.
12. Measurement of junction capacitance of p-n Junction and to determine the barrier potential and doping profile of depletion region.

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## Semester-IV

## Course Name: Mathematical Statistics Credit: 4

## Code: PHO-7211

**Course Objectives:** To provide students with a solid foundation in statistical methods, focusing on data collection, representation, descriptive statistics, probability distributions, bivariate data analysis, and hypothesis testing. Through theoretical concepts and practical applications, students will develop skills in analyzing data, making informed decisions, and drawing meaningful conclusions.

**Block I: Data Collection and Representation**
**Unit 1:** Data Types and Collection
**Unit 2:** Scales and Classification of Data
**Unit 3:** Diagrammatic Representation of Data

**Block II: Descriptive Statistics**
**Unit 4:** Measures of Central Tendency
**Unit 5:** Measures of Dispersion
**Unit 6:** Elementary Probability and Random Variables

**Block III: Probability Distributions**
**Unit 7:** Standard Probability Distributions
**Unit 8:** Bernoulli and Binomial Distributions
**Unit 9:** Poisson Distributions
**Unit 10:** Normal Distributions

**Block IV: Bivariate Data Analysis**
**Unit 11:** Scatter Diagram and Correlation

**Unit 12:** Regression Lines and Coefficients
**Unit 13:** Fitting of Polynomials and Exponential Curves

**Block V: Hypothesis Testing and Analysis of Variance**
**Unit 14:** Testing of Hypothesis
**Unit 15:** Z-test, t-test, and F-test
**Unit 16:** Chi-square Test and Goodness of Fit
**Unit 17:** Introduction to Analysis of Variance

***Books Recommended/Suggested Reading:***


1. *Spiegel, M. R. Theory and Problems of Statistics, Schaum Publishing Company.*
2. *Gupta S. C. and Kapoor V. K.; Fundamentals of Mathematical Statistics, S. Chand and Sons.*
3. *Hogg R. V., Mckean J. and Craig A. T.; Introduction to Mathematical Statistics, Pearson.*
4. *Miller I. and Miller M.; John E. Freund's Mathematical Statistics with Applications, Pearson.*
5. *Rohatgi V. K. and Saleh A. K. Md. E.; An Introduction to Probability and Statistics, Wiley.*
6. *Kapoor J. N. and Saxena H. C.; Fundamentals of Mathematical Statistics, S. Chand and Sons.*


**Course Outcomes:**On successful completion of this course, students shall be able to:

1. Apply appropriate methods to collect and classify different types of data,
2. Analyze data sets using measures of central tendency and dispersion to summarize and interpret the distribution and variability of the data.
3. Demonstrate an understanding of elementary probability concepts and random variables to analyze and predict outcomes in statistical situations.
4. Interpret and apply standard probability distributions, including Bernoulli, binomial, Poisson, and normal distributions, to model and analyze real-world scenarios.

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## Course Name: Any Advanced MOOC course Credit: 4
## Code: PHO-7212

**Source: SWAYAM/NPTEL**

**Faculty and Support Staff**

The University has identified the requisite faculty and support staff as mandated by UGC and formally they shall be allocated the required positions from amongst the existing faculty exclusively for ODL mode or fresh appointments as required so, shall be initiated for which Letter of Intent have been issued to the prospective faculty and staff. The course material prepared by this university will be on par with any open university/Distance education centre in the country.

List of Faculty associated with MSc- Physics program is as follows:-

| S. No. | Name of Faculty | Designation | Nature of Appointment | Qualification | Subject |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| 1 | Dr. Yatendra Pal Singh | Professor | Full Time | Ph.D | Physics |
| 2 | Dr. Pooja Mishra | Assistant Professor | Full Time | Ph.D | Physics |

**Delivery Mechanism**

The ODL of MU follows a modern ICT (Information & Communication Technology) enabled approach for instruction. The methodology of instruction in ODL of MU is different from that of the conventional/regular programs. Our ODL system is more learner-oriented and the learner is an active participant in the teaching-learning process. ODL of MU academic delivery system comprises:

**A. Print Material**

The printed material of the programme supplied to the students will be unit wise for every course.

**B. Counselling Sessions**

Normally, counselling sessions are held as per a schedule drawn beforehand by the Subject Coordinator. There will be 6 counselling/ contact classes for 4 credit course will be held on the campus on Saturday and on Sunday of 2 hour duration for each course in face to face mode (In case of 2 credit course contact hours are required 6 hours and in case of 6 credit course contact hours required 18 hours ). Contact classes will be held in the campus on Saturdays and on Sundays.

**C. Medium of Instruction**

Medium of Course Instruction: English
Medium of Examination: English

**Student Support Systems**

Universities Study Centres or Learner Support Centre shall be headed by a coordinator, not below the rank of Assistant professor and shall be augmented with academic and non-academic staff depending on the learner.

The university has made appropriate arrangements for various support services including counselling schedule and resource-oriented services evaluation methods and dates both online and offline modes for easy and smooth services to the students of distance mode.

At present the university have only one study centre on the campus. The institution is not promoting any study centres outside the campus. All student support services will be provided to the student through a single window method/mode onsite and online.

**F. Procedure for Admissions, Curriculum, Transaction and Evaluation**
**Admission Process**

Admission to the M.Sc. (Physics) Programme will be done on the basis of screening of candidate's eligibility on first come first serve basis. The University will follow the reservation policy as per norms of the Government. Admission shall not be a right to the students and MU, CDOE shall

retain the right to cancel any admission at any point of time if any irregularity is found in the admission process, eligibility etc..

**Maximum Duration**

A. The maximum duration of the M.Sc. (Physics) Programme is four years. Thereafter, students seeking completion of the left-over course(s) will be required to seek fresh admission.
B. The student can complete his programme within a period of 4 years failing which he/she shall seek fresh admission to complete the programme.

**Eligibility**

Science (PCM) Graduate from a recognised University is eligible for admission into M.Sc. (Physics) programme.

**Fee Structure**

| Name of the Program | Degree | Duration | Year | Tuition Fee/Year | Exam Fee/Year | Total (in Rs.) |
|---|---|---|---|---|---|---|
| Master of Science (Physics) | PG | 2 to 4 Years | 1 | 15000 | 2000 | 17000 |
| | | | 2 | 13500 | 2000 | 15500 |
| | | | | | Total | 32500 |

**Activity Schedule**

| S. No. | Name of the Activity | Tentative months schedule (specify months) during year | | | |
|---|---|---|---|---|---|
| | | From | To | From | To |
| 1 | Admission | Jul | Sep | Jan | Mar |
| 2 | Assignment submission (if any) | Sep | Oct | Mar | Apr |
| 3 | Evaluation of Assignment | Oct | Nov | Apr | May |
| 4 | Examination | Dec | | Jun | |
| 5 | Declaration of Result | Jan | | Jul | |
| 6 | Re-registration | Jul | | Jan | |
| 7 | Distribution of SLM | Jul | Sep | Jan | Mar |
| 8 | Contact Programmes (counseling, Practicals.etc.) | Sep | Nov | Mar | May |

**Credit System**

MU, CDOE proposes to follow the ‘Credit System’ for most of its programs. Each credit amounts to 30 hours of study comprising all learning activities. Thus, a 8 credit course requires 240 hours,

6 credit course requires 180 hours , 4 credit course requires 120 hours and 2 credit course requires 60 hours of study. This helps the student to understand the academic effort to complete a course. Completion of an academic programme requires successful clearing of both, the assignments and the term-end examination of each course in a programme.

| Duration of programme | Credits | Name of programme | Level of programme |
|---|---|---|---|
| 2 to 4 Yrs. | 80 | M.Sc. (Physics) | Master's Degree |

**Assignments**

Distance Education learners have to depend much on self study. In order to ascertain the writing skill and level of comprehension of the learner, assignment work is compulsory for all learners. Each assignment shall consist of a number of questions, case studies and practical related tasks. The Assignment Question Papers will be uploaded to the website within a scheduled time and the learners shall be required to respond them within a specified period of time. The response of the learner is examined by a faculty member.

Evaluation**:**The evaluation system of the programme is based on two components:

**A. Continuous Evaluation in the form of assignments (weightage 30%):** This Component carries a weightage of 30%. There will be at least one graded assignment and test per course. These assignments are to be submitted to the Co-ordinator of the CDOE/Study Centre to which the student is assigned or attached with.

**B. Term-end examination (weightage 70%):** This will be held twice every year in the months of June and December. The students are at liberty to appear in any of the examinations conducted by the University during the year. A student will be allowed to appear in the Term-End Examination only after she/he has registered for that course and submitted the assignment. For appearing in the Examination, every student has to submit an Examination form through online (www.mangalayatan.in)/ or offline before the due dates as given in the schedule of operations. If a student misses any term-end examination of a course for any reason, s/he may appear for any of them or all the courses subject to the maximum of 8 courses in the subsequent term-end examinations. This facility will be available until a student secures the minimum pass grade in the courses but up to a maximum period of four semesters, since the date of registration of the course is valid for four semesters. Beyond this period s/he may continue for another four semesters by getting Re-registration by paying fee again. In that case, the score of qualified assignments and/or term-end examination will be retained and the student will be required to complete the left out requirements of such re-registered courses. Minimum requirement for passing a course will be 40% marks.

**G. Laboratory Support and Library Resources**

The library of Mangalayatan University aims to empower the teaching mission and intellectual culture of the community through availability through an organized collection of information as

well as instruction in its access, relevance and evaluation.
The University Library enriches advance learning and discovery by providing access to a broad array of resources for education, research and creative work to ensure the rich interchange of ideas in the pursuit of knowledge.
The Directorate of Distance Education of Mangalayatan University has initiated the process of setting up a dedicated Library for ODL program and acquiring printed books and e-books for this purpose. The required International and National subject journals are also provided. We have a full functioning community radio service onboard (90.4 FM). We already have annual journal subscriptions and the capacity can be enlarged at later stages as the University lines up with more online journals.

The collection of the Library is rich and diverse especially in terms of the breadth and depth of coverage. Collection encompasses subjects in Management, Commerce, Information Technology, Computer Applications, and other allied areas. This collection further includes Books, Research Journals, Project Reports/Dissertations and online Journals.

The University has well equipped Computer Laboratories, Lecture Capturing Systems, Audio Video facilities, ICT enabled class rooms, Wi-Fi facilities etc.

**H. Cost estimate of the programme and the provisions**

Initial expenses have been done by the University in terms of provision of infrastructure, manpower, printing of Self Study Material etc. The University intends to allocate expenses out of the total fee collection as per following details:

| | | |
|---|---|---|
| a) SLM Development and Distribution | : | 20% |
| b) Postal and ICT Expenses | : | 10% |
| c) Salary and other Administrative expenses | : | 60% |
| d) Future Research development reserve | : | 10% |

Once programmes are operational, the programme budget from fee receipts will be planned as per the guidelines of University Grants Commission.

**I. Quality Assurance**

The University has established the Centre for Internal Quality Assurance (CIQA) in the University campus. The CIQA will monitor and maintain the quality of the ODL programmes. It has the following objectives in making the compliances of quality implementations.

**Objectives**

The objective of Centre for Internal Quality Assurance is to develop and put in place a comprehensive and dynamic internal quality assurance system to ensure that programmes of higher education in the Open and Distance Learning mode and Online mode being implemented by the Higher Educational Institution are of acceptable quality and further improved on continuous basis.

**Functions of CIQA**

The functions of Centre for Internal Quality Assurance would be following:

1) To maintain quality in the services provided to the learners.
2) To undertake self-evaluative and reflective exercises for continual quality improvement in all the systems and processes of the Higher Educational Institution.
3) To contribute in the identification of the key areas in which Higher Educational Institution should maintain quality.
4) To devise mechanism to ensure that the quality of Open and Distance Learning programmes and Online programmes matches with the quality of relevant programmes in conventional mode.
5) To devise mechanisms for interaction with and obtaining feedback from all stake holders namely, learners, teachers, staff, parents, society, employers, and Government for quality improvement.
6) To suggest measures to the authorities of Higher Educational Institution for qualitative improvement.
7) To facilitate the implementation of its recommendations through periodic reviews.
8) To organize workshops/seminars/symposium on quality related themes, ensure participation of all stakeholders, and disseminate the reports of such activities among all the stakeholders in Higher Educational Institution.
9) To develop and collate best practices in all areas leading to quality enhancement in services to the learners and disseminate the same all concerned in Higher Educational Institution.
10) To collect, collate and disseminate accurate, complete and reliable statistics about the quality of the programme(s).
11) To ensure that Programme Project Report for each programme is according to the norms and guidelines prescribed by the Commission and wherever necessary by the appropriate regulatory authority having control over the programme;
12) To put in place a mechanism to ensure the proper implementation of Programme Project Reports.
13) To maintain a record of Annual Plans and Annual Reports of Higher Educational Institution, review them periodically and generate actionable reports.
14) To provide inputs to the Higher Educational Institution for restructuring of programmes in order to make them relevant to the job market.
15) To facilitate system based research on ways of creating learner centric environment and to bring about qualitative change in the entire system.
16) To act as a nodal coordinating unit for seeking assessment and accreditation from a designated body for accreditation such as NAAC etc.
17) To adopt measures to ensure internalization and institutionalization of quality enhancement practices through periodic accreditation and audit.
18) To coordinate between Higher Educational Institution and the Commission for various qualities related initiatives or guidelines.
19) To obtain information from other Higher Educational Institutions on various qualitybenchmarks or parameters and best practices.
20) To record activities undertaken on quality assurance in the form of an annual report ofCentre for Internal Quality Assurance.
21) It will be mandatory for Centre for Internal Quality Assurance to submit Annual Reports to the Statutory Authorities or Bodies of the Higher Educational Institutionabout its activities at the end of each academic session. A copy of report in the formatas specified by the Commission,

duly approved by the statutory authorities of theHigher Educational Institution shall be submitted annually to the Commission.

After enrolling in M.Sc. (Physics) programme of Mangalayatan University in ODL mode, student will exhibit knowledge, skill and general competence with scientific aptitude and innovation. After completion of M.Sc. (Physics) programme, student will pursue further studies in physics for roles in academia, research, industry, finance, technology and government.

# MANGALAYATAN UNIVERSITY, ALIGARH

# CENTRE FOR DISTANCE AND ONLINE EDUCATION

## PROGRAMME PROJECT REPORT

## MASTER OF SCIENCE (CHEMISTRY)

## M.Sc. (Chemistry)

## 2023-24

## Introduction

Master of Science in Chemistry (M.Sc. Chemistry) is a postgraduate program that delves into advanced chemical concepts and theories. This program is meticulously crafted to empower students with a profound comprehension of various chemical principles and their wide-ranging applications across various domains, including pharmaceuticals, materials science, environmental science, and chemical engineering. The comprehensive curriculum encompasses advanced topics such as quantum chemistry, chemical thermodynamics, spectroscopy, organic synthesis, and chemical kinetics, among others. Through M.Sc. Chemistry program, students not only acquire theoretical knowledge but also gain practical laboratory skills, enabling them to conduct cutting-edge research and contribute to advancements in the field of chemistry.

M.Sc. Chemistry students are encouraged to engage in independent research projects and collaborative endeavours, fostering the development of vital teamwork and communication abilities. They are introduced to state-of-the-art laboratory techniques and modern analytical instruments, which further bolster their problem-solving prowess. Moreover, this program emphasizes the application of chemical knowledge in real-world scenarios, fostering the development of innovative solutions to complex challenges. Graduates of M.Sc. Chemistry program emerge as highly skilled chemists, well-prepared to pursue careers in academia, research and development, pharmaceuticals, chemical manufacturing, and various other sectors where a profound understanding of chemistry is indispensable. This rigorous and fulfilling program offers students a solid foundation in chemistry, positioning them for a diverse array of exciting career prospects in the dynamic field of chemistry.

## A. Programme's Mission and Objectives

### Mission

- To cater and ensure excellent theoretical and practical training through teaching, counseling, and mentoring with a view to achieve professional and academic excellence.
- To connect with industry and incorporating knowledge for research enhancement.
- To generate, disseminate and preserve knowledge for the benefit and betterment of society.

### Objectives

M.Sc. in Chemistry programme has a comprehensive set of objectives aimed at providing students with a deep and advanced understanding of the field. It seeks to instill a strong foundation in core chemical principles and theories while promoting critical thinking and analytical skills. Additionally, the programme aims to cultivate students' ability to conduct independent research, including honing skills in literature review, experimental design, data analysis, and effective scientific communication. It aligns its curriculum with the evolving needs of industries and academia to ensure graduates are well-prepared for diverse career opportunities, spanning academia, research, pharmaceuticals, environmental science, and various other sectors. Ultimately, the programme contributes to the advancement of scientific knowledge and innovation within the realm of chemistry.

## B. Relevance of the Programme with HEI's Mission and Goals

The vision and mission of HEI, Mangalayatan University, Aligarh are:

### Vision:

To be an institution where the most formative years of a young mind are spent in the guided pursuit of excellence while developing a spirit of inquisitive questioning, an ability to excel in the pressure of a fast-changing professional world, and a desire to grow into a personality rather than a person, in an environment that fosters strong moral and ethical values, teamwork, community service and environment consciousness.

### Mission:

- To be the enablers of the confluence of academic rigor and professional practicality.

- To bring global best practices to students through widespread use of technology.
- To empower our faculty to constantly develop new skills and excel professionally.
- To provide the best campus environment to students and faculty with all facilities to nurture their interest.

M.Sc. (Chemistry) programme of the University strives to realize its vision and mission by rectifying student centric issues on priority and also to empower local community with the help of various social clubs running in University like NSS, KADAM and Alumni association. The University promotes multidisciplinary and allied research in various fields that supports and harnesses joyful learning environment. The goals of ODL (Open Distance Learning) program is to provide educational facilities to all qualified and willing persons who are unable to join regular courses due to personal or professional reasons. There are many potential learners who cannot afford to join regular courses due to professional responsibilities and personal commitments. For such cases M.Sc. (Chemistry) through ODL mode can be helpful in increasing knowledge base and skill up-gradation.

The programme aims to provide alternative path to wider potential learners who are in need of refresher courses to update their skills.

**C. Nature of Prospective Target Group of Learners**

Distance Education of Mangalayatan University (MU) shall target the working professional's executives as well as those who cannot attend a full-time program due to prior occupation or other assignments. The candidates desirous of taking admission in M.Sc. (Chemistry) programme shall have to meet the eligibility norms as follows-

*1. To obtain admission in M.Sc. (Chemistry) programme offered through ODL mode.*
*2. The learner must have completed graduation in science stream (PCM/PCMB).*

**D. Appropriateness of Programme to be conducted in ODL mode to acquire specific skills and competence**

The University has identified the following **Programme Outcomes** and **Programme Specific Outcomes** as acquisition of specific skills and competence in M.Sc. (Chemistry) Programme.

**Programme Outcomes (PO's)**

After completing the M.Sc. (Chemistry) programme through ODL Mode, students will be able to:

a. PO1: Knowledge outcomes: Acquire knowledge and ability to develop creative solutions, and better understanding of the future developments of the subject. Also evolve analytical and logical thinking abilities.
b. PO2: Skill Outcomes: Learn and understand the new concepts and get prepared for placement by developing scientific skills. Further ability to communicate scientific information in a clear and concise manner.
c. PO3: General Competence: Be able to understand the role of science in solving real life problems and get an ability to participate in debates and discussions constructively.
d. PO4: Scientific Aptitude and Innovation: Know the recent developments, future possibilities and able to gather, assess, and make use of new information and applying this knowledge to find creative solutions.

**Programme Specific Outcomes:**

After completing the M.Sc. (Chemistry) programme through ODL Mode, students will be able to:

a. PSO1: Students will understand the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevancies in the day-to-day life. They will also be

able to acquire knowledge about the fundamentals and applications of chemical and scientific theories.

b. PSO2: Helps in understanding the causes of environmental pollution and can open up new methods for environmental pollution control.
c. PSO3: Students will become familiar with the different branches of chemistry like analytical, organic, inorganic, physical, environmental, polymer and biochemistry. They will also learn to apply appropriate techniques for the qualitative and quantitative analysis of chemicals in laboratories and in industries.
d. PSO4: Provide a systematic understanding of the concepts and theories of chemistry and their application in the real world – to an advanced level, and enhance career prospects in a huge array of fields.

**E. Instructional Design**

The programme is divided into four semesters and minimum credit requirement is 80 to get M.Sc. (Chemistry) degree in ODL mode from Mangalayatan University. Minimum time period for acquiring M.Sc. (Chemistry) degree will be two years and maximum time period to acquire is 4 years.

**Evaluation Scheme**

| **Semester-I** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | **Course Code** | **Course Name** | **Category** | **Credit** | **Continuous Assessment Marks** | **Term End Exam Marks** | **Grand Total** |
| | | | | | **Max. Marks** | **Max. Marks** | |
| 1 | CHL-6111 | Instrumental Chemistry of Analysis | DCC | 4 | 30 | 70 | 100 |
| 2 | CHL-6112 | Stereo Chemistry and Organic Reaction Mechanism | DCC | 4 | 30 | 70 | 100 |
| 3 | CHL-6113 | Quantum Chemistry | DCC | 4 | 30 | 70 | 100 |
| 4 | CHL-6114 | Photochemistry and Pericyclic Reactions | DCC | 4 | 30 | 70 | 100 |
| 5 | CHL-6115 | Main Group of Chemistry | DCC | 4 | 30 | 70 | 100 |
| 6 | CHP-6111 | Chemistry Lab-I | DCC | 2 | 0 | 100 | 100 |
| 7 | CHP-6112 | Chemistry Lab-II | DCC | 2 | 0 | 100 | 100 |
| **Total** | | | | 24 | 150 | 550 | 700 |

| **Semester-II** |
|---|

| S. No. | Course Code | Course Name | Category | Credit | Continuous Assessment Marks | Term End Exam Marks | Grand Total |
|---|---|---|---|---|---|---|---|
| | | | | | Max. Marks | Max. Marks | |
| 1 | CHL-6211 | Molecular Thermodynamics | DCC | 4 | 30 | 70 | 100 |
| 2 | CHL-6212 | Organic Synthesis | DCC | 4 | 30 | 70 | 100 |
| 3 | CHL-6213 | Transition and Inner Transition Metal Chemistry | DCC | 4 | 30 | 70 | 100 |
| 4 | CHL-6214 | Basic Organometalic Chemistry | DCC | 4 | 30 | 70 | 100 |
| 5 | CHL-6221 | Supramolecular Chemistry | DCC | 3 | 30 | 70 | 100 |
| 6 | CHP-6211 | Chemistry Lab-III | DCC | 2 | 0 | 100 | 100 |
| 7 | CHP-6212 | Chemistry Lab-IV | DCC | 2 | 0 | 100 | 100 |
| **Total** | | | | 23 | 150 | 550 | 700 |

| **Semester-III** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | **Course Code** | **Course Name** | **Category** | **Credit** | **Continuous Assessment Marks** | **Term End Exam Marks** | **Grand Total** |
| | | | | | **Max. Marks** | **Max. Marks** | |
| 1 | CHL-7111 | Bioinorganic and Biophysical Chemistry | DCC | 4 | 30 | 70 | 100 |
| 2 | CHL-7112 | Analytical Techniques | DCC | 4 | 30 | 70 | 100 |
| 3 | CHL-7113 | Organic Photochemistry | DCC | 4 | 30 | 70 | 100 |
| 4 | CHL-7121 | Solid State Chemistry | DCC | 3 | 30 | 70 | 100 |
| 5 | CHD-7111 | Project-I | DCC | 4 | 0 | 100 | 100 |
| **Total** | | | | 19 | 120 | 380 | 500 |

| **Semester-IV** |
|---|

| S. No. | Course Code | Course Name | Category | Credit | Continuous Assessment Marks | Term End Exam Marks | Grand Total |
|---|---|---|---|---|---|---|---|
| | | | | | Max. Marks | Max. Marks | |
| 1 | CHL-7211 | Inorganic Polymers | DCC | 4 | 30 | 70 | 100 |
| 2 | CHL-7221 | Statistical Thermodynamics | DCC | 3 | 30 | 70 | 100 |
| 3 | CHL-7222 | Chemistry of Natural Product | DCC | 3 | 30 | 70 | 100 |
| 4 | CHD-7211 | Project-II | DCC | 4 | 0 | 100 | 100 |
| **Total** | | | | 14 | 60 | 310 | 400 |

**MOOCs**

The University shall give flexibility in opting for MOOCs (Massive Online Open Courses) by the students pertaining to the prescribed curriculum and also the credits earned in the MOOCs may be dealt as part of the evaluation scheme as per UGC (Open and Distance Learning Programmes and Online Programmes) Regulations, 2020.

**Syllabi and Course Materials**

Syllabi, PPR and self-learning materials are developed mostly by experienced faculty members of Mangalayatan University in consultation with contents experts and the same will be forwarded to CIQA and BoS/Academic Council/ Executive Council for further suggestions and approval.

**Semester: I**

**Course Name: Instrumental chemistry of analysis** **Code: CHL-6111**
**Credits: 4**

**Course Objectives:**

The objective of the course is to explain the general concept of analytical techniques and related methods. The interpretation of data using various types of spectroscopy such as atomic absorption spectroscopy, emission spectroscopy, Nuclear magnetic spectroscopy, mass spectroscopy and x-ray spectroscopy, and their applications in different fields is also the mail goal of this course.

**Block I: General Introduction to Analytical Methods**
**Units 1:** Measurement Basics and Data Analysis, Classification and Selection of Analytical Methods, Types and Calibration of Instruments, Signals and Noise, Linear and Nonlinear Regression Analysis.
**Unit 2:** Introduction to Spectrometric Methods: General properties of electromagnetic radiation
**Unit 3:** Basic elements of spectroscopy and its advantages, einstein coefficients.

**Block II: Spectroscopic Analysis**
**Unit 4:** Atomic Absorption, Spectrometry: Sample Atomization Techniques, Atomic Absorption Instrumentation, Interferences in Atomic Absorption Spectroscopy, Atomic Absorption Analytical Techniques,

**Unit 5:** Fluorescence, Emission Spectroscopy: Atomic Fluorescence Spectroscopy, Emission Spectroscopy Based on Plasma Sources, Emission Spectroscopy Based on Arc and Spark Sources.
**Unit 6:** Mass, and X-Ray Spectroscopy: Introduction to Atomic Mass and X-Ray Spectrometry.

**Block III: UV-VIS and Raman Spectroscopy**
**Unit 7:** UV-VIS Molecular Absorption Spectrometry: Measurement of Transmittance and Absorbance, Beer's Law, The Effects of Instrumental Noise on Spectrophotometric Analyses, Instrumentation, The Magnitude of Molar Absorptivity's, Absorbing Species.
**Unit 8:** Application of Absorption Measurement to Qualitative Analysis, Quantitative Analysis by Absorption Measurements, Photometric Titrations.
**Unit 9:** Raman Spectroscopy: Theory of Raman Spectroscopy, Instrumentation, Applications of Raman Spectroscopy, Types of Raman Spectroscopy.

**Block IV: Infrared Spectrometry and thermogravimetric analysis**
**Unit 10:** Theory of Infrared Absorption Spectrometry, Infrared Sources and Transducers, Infrared Instruments.
**Unit 11:** Application of Infrared spectroscopy, Photoacoustic Infrared Spectroscopy, Near-Infrared Spectroscopy.
**Unit 12:** Thermogravimetric (TG) analysis

**Block V: NMR and Mass Spectroscopy**
**Unit 13:** Nuclear Magnetic Resonance Spectroscopy: Theory of Nuclear Magnetic Resonance (NMR), Environmental Effects on NMR Spectra, NMR Spectrometers, Applications of Proton NMR.
**Unit 14:** Carbon13 NMR, Application of NMR to Other Nuclei, Two-Dimensional Fourier Transform NMR, Magnetic Resonance Imaging.
**Unit 15: Mass Spectrometry:** Molecular Mass Spectra, Ion Sources, Mass Spectrometers, Applications of Molecular Mass Spectrometry, Quantitative Applications of Mass Spectrometry.

***Books Recommended/Suggested Reading:***


1. *Skoog, D. A.; Holler, F. J.; Nieman, T. A. Principles of Instrumental Analysis, 5th Ed., Thomson Brooks/Cole, 1998.*
2. *Strobel, H. A.; Heineman, W. R. Chemical Instrumentation: A Systematic Approach, 3rd Ed., John Wiley and Sons, 1989.*
3. *Willard, H. H.; Merritt, Jr., L. L.; Dean, J. A.; Settle, Jr., F. A. Instrumental Methods of Analysis, 7th Ed., Wadsworth, 1988.*
4. *Rubinson, K. A.; Rubinson, J. F. Contemporary Instrumental Analysis , 1st Ed., Prentice Hall, 2000.*
5. *Rouessac, F.; Rouessac, A. Chemical Analysis: Modern Instrumentation Methods and Techniques, 4th Ed., John Wiley and Sons, 1998.*
6. *Settle, F. A. Handbook of Instrumental Techniques for Analytical Chemistry, 1st Ed., Prentice Hall, 1997.*
7. *Kaur, H. Instrumental Methods of Chemical Analysis, 1st Ed., Pragati Prakashan, 2001.*
8. *Ewing, G. W. Instrumental Methods of Chemical Analysis, 5th Ed., Mcgraw-Hill, 1985.*


**Course Outcomes:**
On successful completion of this course, students shall be able to:

1. Understand the basic concept of analytical methods.
2. Define emission and absorption spectroscopy and their applications.
3. Explain the absorption peaks using UV-Visible spectroscopy.

4. Identify infrared Spectrometry and thermogravimetric analysis.
5. Interpret NMR and Mass Group Spectrometry.

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**Course Name: Stereo Chemistry and Organic Reaction Mechanism** **Code: CHL-6112**
**Credit: 4**

**Course Objectives:**

Organic chemistry plays an important role in different streams of science. The study of structure of different organic isomers using isomerism is the important concept. Therefore, the aim of this course is to explain the concept of optical isomerism and stereochemistry of bridged, caged and cyclic compound. Any reaction is not possible without reaction mechanism and intermediates. Hence, the detail study of various intermediates as well related mechanism is also the goal of this study.

**Block I: Stereoisomerism: Optical Isomerism**

Unit 1: Stereoisomers, symmetry elements, chiral molecules with one stereogenic centre: optical activity, sequence rules, absolute configuration, enantiomeric excess.

Unit 2: Molecules with two (or more) stereogenic centres: diastereomers, Newman, Fischer and Sawhorse formulae.

Unit 3: Erythro/threo, syn/anti configurations, meso configuration.

**Block II: Stereochemistry: fused, bridged, and caged ring systems**

Unit 4: Stereochemistry of fused, bridged, and caged ring systems

Unit 5: Resolution of enantiomers.

Unit 6: Chirality without stereogenic carbon: allenes, biphenyls, cyclophanes, helicenes, atropisomerism.

**Block III: Steroisomerism: Cyclic structures**

**Unit 7: Steroisomerism in cyclic structures:** cyclopropane, cyclobutene, cyclopentane.

**Unit 8:** Cyclohexane, decalins, anomeric effect, conformational analysis.

**Unit 9:** Prochirality, enantiotopic and diasterotopic groups and faces.

**Block IV: Reaction Intermediates**

**Unit 10: Reactive intermediates:** carbocations, carbanions.

**Unit 11:** Enolates, Carbenes, nitrenes, benzyne.

**Unit 12:** Free radicals, Kinetic and Thermodynamic control of reactions.

**Block V: Reaction Mechanism**

**Unit 13:** Reaction mechanism: substitutions, eliminations reactions.

**Unit 14:** Additions, rearrangements.

**Unit 15:** The Hammett relationship, stereochemistry and mechanism.

***Books Recommended/Suggested Reading:***


1. *F. A. Carey and R. J. Sundberg, "Advanced Organic Chemistry, Part A", fifth edition, Springer.*
2. *E. L. Eliel, "Stereochemistry of Organic Compounds", John Wiley & Sons.*
3. *J. March, "Advanced Organic Chemistry", fifth edition, John Wiley & Sons.*
4. *J. Clayden, N. Greeves and S. Warren, "Organic Chemistry", Second Edition, Oxford University Press.*

**Course Outcomes:**
On successful completion of this course, students shall be able to:

1. Classify Stereoisomers.
2. Explain stereochemistry of fused, bridged, and caged ring systems.
3. Interpret Stereoisomerism in cyclic structures.
4. Define Reaction intermediates.
5. Identify reaction mechanism.

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**Course Name: Quantum Chemistry** **Code: CHL-6113**
**Credits: 4**

**Course Objectives:**

Quantum chemistry is an important branch of Chemistry which delas at the small systems. Various phenomenon such as black body radiations, photoelectric effect, Heisenberg's uncertainty principle etc. are some important concepts in quantum mechanism. The use of Schrodinger wave equation for one electron as well as multi electron system is the main objective of this study. Using the wave function, the molecular orbital diagram as well as Huckel's energy level diagram can also be explained for various acyclic and cyclic systems.

**Block I: Introduction to quantum mechanism**
**Unit 1:** Dawn of Quantum Mechanics: black-body radiation, heat capacities, photoelectric and Compton effects.
**Unit 2:** Atomic and molecular spectra, particle diffraction, wave-matter duality.
**Unit 3:** Foundation of Quantum Theory: Postulates of quantum mechanics, operators, specification and evolution of states.

**Block II: Schrodinger wave equation and its applications**
**Unit 4:** Schrodinger wave equation, physical significance of wave function
**Unit 5:** Translational Motion: Particle-in-a-box, penetration into and through barriers.
**Unit 6:** Harmonic Oscillator Rotational Motion: Particle-on-a-ring, particle-on-a-sphere, motion in a coulombic field.

**Block III: Hydrogen atom**
**Unit 7:** Hydrogenic Atoms and Angular Momentum.
**Unit 8:** Many Electron Atoms.
**Unit 9:** Approximate Methods: Perturbation theory and variational methods.

**Block IV: Molecular structure**
**Unit 10:** Introduction to Molecular Structure: Born-Oppenheimer approximation, molecular orbital theory.
**Unit 11:** Valence bond theory.
**Unit 12:** Computational Chemistry: Semi-empirical and *ab initio* methods.

**Block V: Huckel Theory**
**Unit 13:** Huckel's theory, resonance integral, energy level diagram for ethene, cyclobutadiene, allyl system, butadiene, benzene.

**Unit 14:** Delocalization energy of ethene, cyclobutadiene, benzene, allyl cation, allyl radical, allyl anion, cyclopropyl anion, cyclopropyl radical and cyclopropyl cation.
**Unit 15:** Huckel's molecular orbital wave function for ethene, allyl cation, cyclobutadiene, benzene. Electron density and bond order.

***Books Recommended/Suggested Reading:***


1. *Quantum Chemistry, Donald A. McQuarrie, Viva Books.*
2. *Modern Quantum Chemistry, Attila Szabo & Neil S. Ostlund, Dover Publications.*
3. *Quantum Chemistry, Ira N. Levine, PHI Learning.*
4. *Quantum Chemistry and Molecular Interactions, Andrew Cooksy, Pearson Press.*
5. *Quantum Chemistry & Spectroscopy, Thomas Engel, Pearson Education.*
6. *Molecular Quantum Mechanics, Peter Atkins & Ronald Friedman, Oxford Press.*
7. *Elementary Quantum Mechanics, Frank L. Pilar, Dover Publications.*
8. *Fundamentals of Quantum Chemistry, James E. House, Elsevier/Academic Press.*
9. *Quantum Chemistry, John P. Lowe & Kirk A. Peterson, Elsevier/Academic Press.*
10. *Introduction to Quantum Chemistry, A. K. Chandra, Tata-McGraw Hill*


**Course Outcomes:**
On successful completion of this course, students shall be able to:

1. Explain origin of quantum chemistry.
2. Define the concepts and postulates of quantum mechanics.
3. Illustrate Schrodinger wave equation and its application to particle in a box and harmonic oscillator.
4. Interpret molecular orbital theory and valence bond theory.
5. Solve Huckel theory.

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**Course Name: Photochemistry and Pericyclic Reactions** **Code: CHL-6114**
**Credits: 4**

**Course Objectives:**
The effect of light on the reaction mechanism and possible rearrangements is important concept in photochemistry. The photochemical laws and reactions using different conditions can be explained in various electron system. Therefore, the objective of this study is to explain the photochemistry and pericyclic reactions in 4n and 4n+2 electron systems.

**Block I: Photochemistry: mechanism and rearrangements**
**Unit 1:** Photochemical activation and potential energy surfaces. Geometry, dipole moments, acid-base and redox properties of excited states.
**Unit 2:** Uni- and bimolecular deactivations. Quenching mechanisms. Electronic energy transfer mechanisms.
**Unit 3:** Intramolecular (isomerizations, rearrangements and dissociation) and intermolecular (additions) photochemical processes.

**Block II: Inorganic photochemistry**
**Unit 4:** Introduction to inorganic photochemistry. Photochemical laws and photochemical kinetics.
**Unit 5:** Photophysical processes. The electronic absorption spectra of inorganic compounds. Characteristics of the electronically excited states of inorganic compounds.
**Unit 6:** Photo electro chemistry of excited state redox reactions. Photosensitization.

**Block III: Photochemical reactions**

**Unit 7:** Photochemical reactions; substitution, decomposition reactions, fragmentation, rearrangement, and redox reactions.

**Unit 8**: Selective inorganic photochemistry using laser beams.

**Unit 9:** Inorganic photochemistry in biological processes and their model studies.

**Block IV: Molecular orbital approach and pericyclic reactions**

**Unit 10:** Molecular orbital symmetry, Frontier orbitals of ethylene, 1,3-butadiene, 1,3,5-hexatriene and allyl system.

**Unit 11:** Classificaiton of pericyclic reactions. Woodward -Hoffmann correlation diagrams. FMO and PMO approach.

**Unit 12:** Electrocyclic reactions- conrotatory and disrotatory motions, 4n, 4n+2 and allyl systems.

**Block V: Cycloaddition reactions**

**Unit 13:** Cycloadditions - antarafacial and suprafacial additions, 4n and 4n+2 systems, 2 + 2 addition of ketenes, 1,3-dipolar cycloadditions and cheleotropic reactions.

**Unit 14:** Sigmatropic rearrangements - suprafacial and antarafacial shifts of H, sigmatropic shifts involving carbon moieties, 3,3- and 5,5 - sigmatropic rearrangements.

**Unit 15:** Claisen, Cope and aza-Cope rearrangements. Fluxional tautomerism. Ene reaction.

***Books Recommended/Suggested Reading:***


1. *Fundamental of Photochemistry, K.K. Rohtagi- Mukherji, Wily- Eastern.*
2. *Essentials of Molecular Photochemistry, A.Gilbert and J.Baggott, Blackwell Scientific Publication.*
3. *Molecular Photochemistry, N.J. Turro, W.A. Benjamin. R. B. Woodward and R. Hoffmann, "The Conservation of Orbital Symmetry", Academic Press, New York.*
4. *Introductory Photochemistry, A. Cox and T. CAMP, Mc Graw-Hill,*
5. *Photochemistry, R.P. Kundall and A. Gilbert, Thomson Nelson.*
6. *Organic Photochemistry, J. Coxon and b. Halton, Cambridge University Press.*
7. *Pericyclic Reactions, S.M. Mukherji, Macmillan, India*


**Course Outcomes:**

On successful completion of this course, students shall be able to:

1. Explain Photochemical mechanisms and rearrangements.
2. Define Inorganic photochemistry.
3. Illustrate photochemical reactions.
4. Interpret molecular orbital approach and pericyclic reactions.
5. Describe cycloaddition reactions

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**Course Name: Main Group Chemistry** **Code: CHL-6115**

**Credits: 4**

**Course Objectives:**

In the periodic table elements are arranged according to their atomic number and the detailed study of these elements irrespective of the groups and periods is important. Therefore, this course aims to explain the general characteristics of s and p-block elements and their variation in the periodic table is

also explained in this course. The chemistry of phosphorous related compounds also discussed in this course.

**Block I: Non-transition elements**

**Unit 1:** Chemistry of non-transition elements, stereochemistry and bonding in non-transition elements and compounds.

**Unit 2:** Solvents, solutions, acids and bases, brief review of inorganic chains, rings and cages.

**Unit 3:** Organometallic compounds of non-transition elements, role of non-transition elements in biological processes.

**Block II: s and p-Block elements: Group 1, 2, 13, 14 and 15**

**Unit 4:** General properties of p block elements, bonding, historical landmarks, and periodic properties, Introduction to group theory.

**Unit 5:** Chemistry of alkali and alkaline earth metals.

**Unit 6:** Chemistry of group 13, 14, 15, and 16 elements. The nitrogen and oxygen groups: The nitrogen group with special emphasis on nitrogen and phosphorus chemistry; boron nitrogen compounds; nitrogen-metal complexes and bonding; phosphorus-metal bonds and complexes. The oxygen group with special emphasis on the chemistry of sulphur. p-block ring and cluster compounds.

**Block III: Halogen Family**

**Unit 7:** Chemistry of Halogen compounds

**Unit 8:** Polyhalogeno and interhalogen compounds

**Unit 9:** compounds of halogens and oxygen

**Block IV: Noble Gases**

**Unit 10**: Chemistry of rare gases.

**Unit 11:** Special topics and recent developments: Catenation between heavier elements, particularly, RE=ER (E = P, As, Sb, Bi), R2E=ER2 and R2E (E = Si, Ge, Sn, Pb) systems.

**Unit 12:** Multiple bonding between heavier elements

**Block IV: Phospha-alkynes and phospha-alkenes**

**Unit 13:** Phospha-alkynes and phospha-alkenes.

**Unit 14:** Chemistry of alkali and alkaline earth metals; their uses in homogeneous catalysis and material chemistry.

**Unit 15:** Main group organometallic chemistry. Unusual oxidation states of main group elements with special emphasis on recently developed Al(I) and Si(II)-silylene chemistry.

***Books Recommended/Suggested Reading:***


1. *Basic Inorganic Chemistry, F. A Cotton, G. Wilkinson, and Paul L. Gaus, 3rd Edition (1995), John Wiley & Sons, New York.*
2. *Concise Inorganic Chemistry, J. D. Lee, 5th Edition (1996), Chapman & Hall, London.*
3. *Douglas, B.E. and Mc Daniel, D.H., Concepts & Models of Inorganic Chemistry, Oxford, 1970*
4. *Day, M.C. and Selbin, J. Theoretical Inorganic Chemistry, ACS Publications 1962.*
5. *Cotton, F.A. & Wilkinson, G. Advanced Inorganic Chemistry, Wiley, VCH, 1999.*
6. *Miessler, G. L. & Donald, A. Tarr. Inorganic Chemistry 4th Ed., Pearson, 2010.*
7. *Shriver & Atkins, Inorganic Chemistry 5th Ed.*

**Course Outcomes:**

On successful completion of this course, students shall be able to:

1. Explain non-transition elements.
2. Define s and p block elements.
3. Interpret halogen compounds.
4. Illustrate Noble gases.
5. Identify Phospha-alkynes and phospha-alkenes

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**Course Name: Chemistry Lab-I** **Code: CHL-6111**

**Credits: 2**

**Course Objectives:**

The objective of the course is to study the analysis of mixture of rare earth metals, and preparation of some inorganic as well as organic compounds.

**1. Qualitative Analysis of Inorganic Mixture**

Identification of 07 radicals including insoluble residue and rare earth metal ions by semi-micro analysis.

***(i)*** Rare elements: Tl, W, Se, Mo, Ti, Zr, Ce, Th, V, U, Li

**2. Preparations of some Inorganic Complex Compounds**

***(i)*** Tetrammine Cupric Sulphate

***(ii)*** Prussian Blue (Potassium Ferric Ferro cyanide)

***(iii)*** Reineckes salt [Ammonium diammine tetra thio cyanato chromate (III)]

**3. Preparations**

***(i)*** To perform Bromination: 2, 4, 6-tribromoaniline from aniline

***(ii)*** To perform Oxidation: Benzil from benzoin by means of cupric salts

**4.** Separation of dyes using TLC method.

**5.** Perform pH-metric and potentiometric titration of phosphoric acid solution against standard NaOH solution. Compare the two results.

**SUGGESTED READINGS:**


- Ozin G.A., Arsenault A.C. and Cademartiri L.: NANOCHEMISTRY: A CHEMICAL APPROACH TO NANOMATERIALS (2009).
- Sergeev G.B.: NANOCHEMISTRY, Elsevier, B.V. (2006).
- Day R.A. and Underwood A.L.: QUANTITATIVE ANALYSIS, Prentice Hall India Pvt. Ltd., New Delhi, 3rd Ed., (1997).
- Yadav J.B.: ADVANCED PRACTICAL PHYSICAL CHEMISTRY, Krishna Prakashan Media (P) Ltd., Meerut (2016).
- Jeffery G.H., Bassett J., Mendham J. and Denney R.C.: VOGEL'S TEXTBOOK OF QUANTITATIVE CHEMICAL ANALYSIS, 5th Ed.,
- John Wiley & Sons, Inc., New York (1989).
- Sime R.J.: PHYSICAL CHEMISTRY: METHODS, TECHIQUES, AND EXPERIMENTS, Sounders College Publishing (1990).


**Course Outcomes:**

At the end of this course, students will be able to

1. Identify the rare earth metals from the mixtures.
2. Explain the preparation method of inorganic compounds.
3. Understand the reaction mechanism in the conversion of organic compounds.
4. Demonstrate the potentiometric titration as well as pH analysis.

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**Course Name: Molecular thermodynamics** **Code: CHL-6112**
**Credits: 2**

**Course Objectives:**

The objective of this course is to identify the various radicals and insoluble residues from the mixture and understand the various reaction mechanism. Analysis of the quality of water is also the goal of this course.

**Course Outcomes:**

At the end of this course, students will be able to:

1. Identify various rare earth metals as well as insoluble residues.
2. Explain the preparation of inorganic compounds.
3. Define the reaction mechanism in various reactions.
4. Evaluate the water quality parameters such as pH, BOD, COD etc.
5. Perform the transport number based experiments.

**1. Qualitative Analysis of Inorganic Mixture**

Identification of 07 radicals including insoluble residue and rare earth metal ions by semi-micro analysis.

***(ii)*** Rare elements: Tl, W, Se, Mo, Ti, Zr, Ce, Th, V, U, Li

***(iii)*** Insoluble Residue: $PbSO_4$, $SrSO_4$, $Al_2O_3$, $Cr_2O_3$, $Fe_2O_3$, $SnO_2$, AgX, $TiO_2$, $ThO_2$, $WO_2.xH_2O$

**2. Preaprationi of Inorganic Compounds:**

(i) trans-potassium di aqua bis(oxalato) chromate (III)

(ii) cis-potassium di aqua bis(oxalato) chromate (III)

**3. Reaction Mechanism**

(i) To perform Cannizaro reaction: Benzyl alcohol and benzoic acid from benzaldehyde

(ii) To perform Perkin reaction: Cinnamic acid from benzaldehyde

**4.** Analysis of water quality parameters: pH, conductance, dissolved oxygen, hardness, chloride and fluoride.

**5.** Determine the transport number of $Ag^+$ and $NO_{3^-}$ ions in solution using 0.1 M and 0.01 M $AgNO_3$ solutions (Given: Mean ionic activity coefficients of $AgNO_3$ in 0.01 M and 0.1 M solutions are 0.89 and 0.73, respectively).

**SUGGESTED READINGS:**


1. Yadav J.B.: ADVANCED PRACTICAL PHYSICAL CHEMISTRY, Krishna Prakashan Media (P) Ltd., Meerut (2016).
2. Jeffery G.H., Bassett J., Mendham J. and Denney R.C.: VOGEL'S TEXTBOOK OF QUANTITATIVE CHEMICAL ANALYSIS, 5th Ed.,
3. John Wiley & Sons, Inc., New York (1989).
4. Sime R.J.: PHYSICAL CHEMISTRY: METHODS, TECHIQUES, AND EXPERIMENTS, Sounders College Publishing (1990).

**Semester: II**

**Course Name: Molecular thermodynamics** **Code: CHL-6211**
**Credits: 4**

**Course Objectives:**
Thermodynamics which is an important branch of science and deals with the study of heat, work, temperature etc. and their relation to various types of energy and the physical properties of the matter. Their behaviour can be explained by laws of thermodynamics. Therefore, the objective of the study is to explain the concept of thermodynamics, their laws, states as well as path function and ideal and non-ideal solutions.

**Block I: Introduction to thermodynamics**

**Unit 1:** Basics concepts, Review of first, second, and third laws of thermodynamics, Gibb's free energy Extra work, Chemical potential, Ideal and non-ideal solution.
**Unit 2:** Phase rule, Phase diagram, Solutions, Chemical equilibrium.
**Unit 3:** Postulates of statistical thermodynamics, Ensembles, Monoatomic and polyatomic ideal gases, Molar heat capacities.

**Block II: Laws of thermodynamics**

**Unit 4:** Basic concepts (State function, mixed derivative, Equations of gases).
**Unit 5:** Review of First law of thermodynamics (internal energy, enthalpy, heat capacity, Joule Thomson experiment).
**Unit 6:** Review of Second and Third law of thermodynamics (entropy change, Clausius inequality, probability, absolute entropy).

**Block III: Statistical thermodynamics**

**Unit 7:** Chemical potential, Clausius equation.
**Unit 8:** Change of chemical potential with Temperature, pressure and addition of solute.
**Unit 9:** Statistical thermodynamics, ensembles, monoatomic and polyatomic ideal gases, molar heat capacities, Classical statistical mechanics.

**Block IV: Chemical and phase equilibrium**

**Unit 10:** Ideal and real gases, properties of fugacity, mixing and excess functions.
**Unit 11:** Chemical equilibrium, Le Chatelier's principle, partial molar quantities, standard states.
**Unit** 12: Phase equilibrium involving one, two and three components.

**Block V: Equilibrium in condensed phases**

**Unit 13:** Ideal solution and colligative properties, binary solutions and azeotropes.
**Unit 14:** Non-ideal systems, activity and activity coefficients. Thermodynamic formulation of surface phenomena.
**Unit 15:** Non-ideal systems, activity and activity coefficients. Thermodynamic formulation of surface phenomena.

***Books Recommended/Suggested Reading:***


1. *Physical Chemistry: Statistical Mechanics Kindle Editio by Horia Metiu Kindle Edition.*
2. *Physical Chemistry by Peter Atkins , Julio De Paula.*
3. *Physical Chemistry by Arun Bahal, B.S. Bahal.*


**Course Outcomes:**

On successful completion of this course, students shall be able to:

1. Explain the general concepts of thermodynamics.
2. Define the laws of thermodynamics.
3. Examine classical statistical mechanism.
4. Summarize Chemical equilibrium and phase Equilibrium.
5. Illustrate equilibrium in condensed phase.

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**Course Name: Organic Synthesis** **Code: CHL-6212**
**Credits: 4**

**Course Objectives:**
Organic chemistry is a separate branch in which carbon is the essential elements. The scope of organic chemistry in different fields are also important. Therefore, the objective of this study is to explain the synthesis of organic compounds, their derivative for various reaction mechanism.

**Block I: Organic Synthesis**
**Unit 1:** Formation of carbon-carbon bonds including organometallic reactions, Synthetic applications of organoboranes and organ silanes.
**Unit 2:** Reactions at inactivated C-H bonds, Oxidations, Reductions, Newer Reagents, Design of organic synthesis.
**Unit 3:** Retrosynthetic analysis, Selectivity in organic synthesis, Protection and deprotection of functional groups, Multistep synthesis of some representative molecules.

**Block II: Synthetic equivalents**
**Unit 4:** Strategy and design of organic synthesis: Introduction, scope and a brief history of organic synthesis, synthetic strategy, retro-synthesis, analysis and practice of total synthesis, linear and convergent synthesis.
**Unit 5:** Concepts of synthetic equivalents and Umpolung: benzoyl and acyl anion equivalents, dithianes, enol ethers and nitro compounds.
**Unit 6:** Carbon-Carbon bond formation: alkylation of enolates, enamines and hydra zones, alkylation of heteroatom stabilized anions, organometallic reagents.

**Block III: Carbon-Carbon double bond formation**
**Unit 7:** Carbon-Carbon double bond formation: aldol condensation, Wittig and related reactions.
**Unit 8:** Peterson olefination, Julia-Lythgoe olefination, carbonyl coupling reaction (McMurry reaction).
**Unit 9:** Tebbe reagent, Shapiro and related reactions

**Block IV: Cross coupling reaction and Carbon-Carbon triple bond formations**
**Unit 10:** Elimination and dehydration, from diols and epoxides, from acetylenes, from other alkenes (olefin metathesis and transition metal catalysed cross coupling reactions).
**Unit 11:** Carbon-Carbon triple bond formations: from other acetylenes, from carbonyls,
**Unit 12:** Carbon-Carbon triple bond formations from olefins, from strained rings, Eschenmoser fragmentation, allenes etc.

**Block V: Ring Compounds**
**Unit 13:** 3-Membered rings: Epoxides- using peracids, hydroperoxides and dioxiranes; transition metal catalysed epoxidation, halohydrins, Darzen's condensation, sulphur ylides, Cyclopropanes-

Simmons Smith reaction, diazo compounds, sulphur ylides and SN2 displacements. Aziridines-nitrenes and SN2 displacements.

**Unit 14:** 4-Membered rings: Various methods of forming cyclobutanes, cyclobutene's and oxetanes

**Unit 15:** 5-Membered rings: intramolecular SN2 reactions, intramolecular Michael and aldol condensation reactions, intramolecular Wittig olefination, ring expansion and contraction reactions, 1,3-dipolar cycloaddition reactions.

***Books Recommended/Suggested Reading:***


1. *David J. Hart "Organic Synthesis via Examination of Selected Natural Products" World Scientific.*
2. *S. Warren, "Designing Organic Syntheses", John Wiley & Sons.*
3. *"Modern Organic Synthesis-An Introduction", G. S. Zweifel and M. H. NantzW. H. Freeman and Company, 2006.*
4. *"Principles of Organic Synthesis", R. O. C. Norman and J. M. Coxon.*


**Course Outcomes:**

On successful completion of this course, students shall be able to:

1. Examine the organic synthetic analysis.
2. Outline synthetic equivalents.
3. Interpret Carbon-Carbon double bond formation.
4. Illustrate Cross coupling reaction and Carbon-Carbon triple bond formations.
5. Explain the ring compounds.

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**Course Name: Transition and Inner Transition Metal Chemistry** **Code: CHL-6213** **Credit: 4**

**Course Objectives:**

Transition elements which are also known as d-block elements are important constituents in co-ordination chemistry. Their binding with strong and weak filed ligands, tendency to form complexes and related theory etc. are some important concepts which are explained in this course. The objective of this unit is to explain the properties of transition metals in terms of formation of octahedral, square planar complex and various theory related to the coordination chemistry.

**Block I: Coordination chemistry: General Introduction**

**Unit 1:** Introduction to coordination chemistry, Crystal field theory

**Unit 2:** Ligand field theory, Molecular orbital theory

**Unit 3:** Magnetic and spectral characteristics of inner transition metal complexes, Substitution.

**Block II: Electron transfer reaction**

**Unit 4:** Electron transfer and photochemical reactions of transition metal complexes.

**Unit 5:** Physical, spectroscopic properties of transition metal complexes

**Unit 6:** Electrochemical methods used in the study of transition metal complexes.

**Block III: Metal-Metal bonded compounds and Bioinorganic chemistry**

**Unit 7:** Metal-metal bonded compounds and transition metal cluster compounds.

**Unit 8:** Uses of lanthanide complexes: as shift reagents, as strong magnets, and in fluorescence,

**Unit 9:** Bioinorganic chemistry: introduction, Bioinorganic chemistry of iron: haemoglobin, myoglobin, cytochromes, Bioinorganic chemistry of zinc, cobalt, and copper.

**Block IV: Transition elements**

**Unit 10:** Introductory survey of transition elements with reference to electronic configuration, oxidation states, complex compounds.

**Unit 11:** Introductory concepts of molecular symmetry.

**Unit 12:** Spectral and magnetic properties.

**Block V: Chemistry of some elements**

**Unit 13**: Introduction to theories of metal-ligand bonding and stereochemistry.

**Unit 14:** Chemistry of titanium, vanadium, chromium, manganese sub-group elements, group III, IV, V, VI, VII and rare gases with reference to isolation, properties, uses and important compounds.

**Unit 15:** Chemistry of Iron, cobalt, nickel, platinum metals, copper and zinc sub-group elements, group III, IV, V, VI, VII and rare gases with reference to isolation, properties, uses and important compounds.

***Books Recommended/Suggested Reading:***


1. *Basic Inorganic Chemistry, F. A. Cotton and G. Wilkinson, Wiley Easter.*
2. *Inorganic Chemistry, R.A. Plane.*
3. *Chemical Principles and Properties, McGraw Hill, J. D. Lee, Concise, Van Nostrand Reinhold.*
4. *Organometallics and catalysis An introduction. Bochmann, M, 1st edn, Oxford, 2014.*


**Course Outcomes:**

On successful completion of this course, students shall be able to:

1. Explain general introduction of coordination chemistry.
2. Define electron transfer reactions.
3. Interpret metal-metal bonding and bioinorganic compounds.
4. Illustrate transition elements.
5. Evaluate the chemistry of some elements.

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**Course Name: Basic Organometallic Chemistry** **Code: CHL-6214**

**Credits: 4**

**Course Objectives:**

The objective of this course is to understand the compounds and reactions involving metal-carbon bonds. To explain the structure of organometallic compounds, role of electron donor as well acceptor, applications of organometallic compounds and the concept of hapticity is also the goal of this research.

**Block I: metal-carbon bond**

**Unit 1:** Introduction; factors guiding metal-carbon bond formation; general synthetic methods for Main Group organometallics

**Unit 2:** Structure and bonding of alkali, alkaline-earth organometallics. EAN rule.

**Unit 3:** Classification of carbon-based ligands by donor atoms and no of electrons donated by the ligand, sigma-donor and pi-acceptor-; transition metal organometallics; reactivity studies.

**Block II: Organometallic compounds as homogeneous catalysis**

**Unit 4:** Applications of organometallic compounds in homogenous catalysis; hydrogenation, carbonylation, metal-mediated C-X (X = C, heteroatom) bond formations.
**Unit 5:** Olefin metathesis and Ziegler-Natta polymerization
**Unit 6:** Stereochemistry, applications in asymmetric synthesis.

**Block III: Organometallic chemistry of main group elements**
**Unit 7:** Organometallic chemistry of main group, transition and inner transition metals.
**Unit 8:** Synthesis and applications of Buli, Grignard, organo aluminum and organozinc reagents.
**Unit 9:** 18 electron rule.

**Block IV: Metal Carbonyls**
**Unit 10:** Metal carbonyls- bonding and infrared spectra, phosphines and NHC's.
**Unit 11:** Alkenes and alkynes, carbenes and carbines, Hapto ligands with hapticity from 2- 8.
**Unit 12:** Oxidative addition and reductive elimination, 1,1 and 1,2-migratory insertions and beta hydrogen elimination, mechanism of substitution reactions.

**Block V: Organometallic cluster and cross coupling reactions**
**Unit 13:** Fluxionality and hapticity change, organometallic clusters, C-H activationagostic and anagostic interactions.
**Unit 14:** Homogeneous catalysis: hydrogenation, hydroformylation, methanol to acetic acid processes, Wacker oxidation.
**Unit 15:** Introduction to cross coupling and olefin metathesis reactions. Olefin oligomerization and polymerization.

***Books Recommended/Suggested Reading:***

1. *G. O. Spessard, G. L. Miessler, Organometallic Chemistry, Prentice Hall*
2. *F. A. Cotton, G. Wilkinson, C. A. Murillo and M. Bochmann, Advanced Inorganic Chemistry*
3. *The organometallic chemistry of the transition metals, Crabtree R H*
4. *Gupta, B.D, Elias, A J; Basic Organometallic Chemistry, Concepts, syntheses and applications, 2nd edn, Universities Press, 2013.*
5. *Organometallics, Elschenbroich, Ch, 3rd edn, Wiley VCH, 1989.*


**Course Outcomes:**
On successful completion of this course, students shall be able to:

1. Define metal-carbon bond.
2. Explain organometallic compounds as homogeneous catalysis.
3. Interpret Organometallic chemistry of main group elements.
4. Understand metal carbonyls.
5. Illustrate Organometallic cluster and cross coupling reactions

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**Semester II: Program Elective**

**Course Name:** Supramolecular Chemistry **Code: CHL-6221**
**Credits: 3**

**Course Objectives:**
The objective of this study is to explain the host-guest interaction, reactivity and physical method used for the determination of supramolecular chemistry.

**Block I: Host-guest Chemistry**

**Unit I:** Host-Guest Chemistry: Definition, classifications of host guest compounds.

**Unit 2:** Hydrodynamics and kinetic stability, role of weak interactions in supramolecules, Complementarity and cooperativity.

**Unit 3:** Hydride sponge and related clathrates. Different macromolecular hosts: host design, preorganised hosts, cyclodextrins, calixarenes, cucurbiturils etc.

**Block II: Recognition and reactivity**

**Unit 4:** Recognition and reactivity: molecular and Ion recognition, enatioselectivity, proton pumps and basis of supramolecular catalysis.

**Unit 5:** Inorganic host design: Metal directed assemblies, confinement, container molecules.

**Unit 6:** Molecular flasks, layered solids, channel structures, Intra-cavity complexes of neutral molecules.

**Block III: Physical Methods**

**Unit 7:** Physical methods in understanding supramolecular chemistry: Determination of binding constant.

**Unit 8:** Isothermal titration calorimetry.

**Unit 9:** Rheology, SEM, TEM etc.

**Block IV: Supramolecular polymers and gel**

**Unit 10:** Co-ordination polymers, hydrogen bond-based polymers, guest included polymers examples and applications.

**Unit 11:** Supramolecular gels: hydrogel and organogel and their applications.

**Unit 12:** Transient gels, and their applications.

**Block V: Molecular machines**

**Unit 13:** Molecular machines: interlocked dynamic systems, molecular motors, switch, and shuttles.

**Unit 14**: Amphiphiles and their self-aggregation: micelle, vesicles, liposomes, microemulsions.

**Unit 15:** H and J aggregates, aggregation induced emission and quenching. Natural processes: Peptide self-assembly, Protein and DNA aggregation, amyloid and cell membrane.

**Books Recommended/Suggested Reading:**

1. Core Concepts in Supramolecular Chemistry and Nanochemistry, J. W. Steed, D. R. Turner, K. Wallace, 1st Edition, Wiley, 2007.
2. Supramolecular Chemistry: Concepts and Perspectives, J. M. Lehn, 1st Edition, VCH, 1995.
3. H. Dodziuk, Introduction to Supramolecular Chemistry, 1st Edition, Springer, 2001.
4. Supramolecular Chemistry: Fundamentals and Applications, Katsuhiko, 1st Edition Springer, 2006.

**Course Outcomes:**

On successful completion of this course, students shall be able to:

1. Define host-guest chemistry.
2. Explain Recognition and reactivity.
3. Interpret physical methods.
4. Illustrate supramolecular polymers and gel.
5. Understand molecular machines.

**Course Name: Chemistry Lab-III** **Code: CHL-6211**
**Credits: 2**

**Course Objectives:**

The objective of the course is to understand standard method used for the analysis of elements. To understand the preparation of inorganic compounds, physical analysis and estimation of various ions present in the water sample is also discussed in this course.

**1. Inorganic analysis**

(i) Estimation of chromium using certified standard materials colorimetrically.

(ii) Morphological analysis of metal oxides nano particles by Scanning Electron Microscopy.

**2. Preparation of some inorganic Compounds**

(i) Potassium tri oxalato ferrate (III) trihrdrate.

(ii) Sodium hexa nitrito cobaltate (III)

**3. Organic Analysis**

(i) Separation of organic compounds (phenol, catechol, resorcinol and pyrogallol) using TLC method

(ii) Paper chromatographic separation of $Cu^{2+}$ and $Cd^{2+}$

**4. Physical Analysis**

(i) Determine the activity coefficient of $Ag^{+}$ ions in $AgNO_3$ solution, potentiometrically, using a concentration cell with a salt bridge.

(ii) Study spectrophotometrically the kinetics of the reaction between potassium per sulphate and potassium iodide and determine the order and rate constant of the reaction.

(iii) A kinetic study of a solvolysis reaction-solvolysis of t-butyl chloride in acetone-water mixture.

**5. Environmental Analysis**

(i) Analysis of major anions (F, Cl, $NO_3$, $SO_4$) and major cations (Na, Ca, K, Mg, $NH_4$) in water by ion-exchange chromatography.

(ii) Determination of Cu/ Cd/Fe in water samples by Atomic Absorption Spectrophotometer.

**SUGGESTED READINGS:**


- Khosla B.D., Gulati A. and Garg V.C.: SENIOR PRACTICAL CHEMISTRY, R. Chand & Co., (2008).
- Shoemaker D.P., Garland C.W. and Nibler J.W.: EXPERIMENTS IN PHYSICAL CHEMISTRY, McGraw Hill, New York (1996).
- Yadav J.B.: ADVANCED PRACTICAL PHYSICAL CHEMISTRY, Goel Publishing House (2000).
- Lewitt B.P.: FINDLEY'S PRACTICAL PHYSICAL CHEMISTRY, Longman (1990).
- Furniss B.S., Hannaford A.J., Smith P.W.G. and Tatchell A.R.: VOGEL: PRACTICAL ORGANIC CHEMISTRY, (1989).


**Course Outcomes:**

On successful completion of this course, students shall be able to:

1. Evaluate the morphology and amount of metal ions in the given msample.
2. Explain general preparation method of inorganic compounds.
3. Interpret organic analysis
4. Illustrate physical analysis.
5. Define environmental analysis.

**Course Name: Chemistry Lab-IV** **Code: CHL-6212**

**Credits: 2**

**Course Objectives:**

The objective of the course is to explain the qualitative mixture analysis and topological analysis using AFM. The determination of rate constant, water quality parameters and pesticides determination in water sample is also the objective of this study.

**1. Inorganic Analysis**

(i) Semi-micro qualitative mixture analysis including less common metal ions, such as, TI, Mo, W, Ti, Zr, Th, V and U (two metal ions in cationic/anionic forms).

(ii) Topological analysis of nanostructured metal oxides using Atomic Force Microscope

**2. Organic Analysis**

(i) To perform Aldol condensation: Dibenzal acetone from Benzaldehyde
(ii) To perform Reduction: 1-amino-2-hydroxynaphthalene hydrochloride from phenylazo-2-naphthol
(iii) Isolation and chromatographic separation of lycopene from tomatoes.
(iv) Green synthesis of p- bromo acetanilide.

**3. Physical Analysis**

(i) Determination of pKa of an indicator (methyl red) in aqueous media

(ii) Determination of rate constant for hydrolysis/inversion of sugar using polarimeter

**(iii)** Determine the equilibrium constant of the reaction $Ag(NH)_2^+ \leftrightarrow Ag^+ + 2NH_3$ potentiometrically.

**4. Environmental Analysis**

(i) Analysis of water quality parameters: pH, conductance, dissolved oxygen, hardness, chloride and fluoride.

(ii) Determination of Pesticides by Gas chromatography in drinking water samples.

(iii) Analysis of $SO_2$, $NH_3$, $NO_2$ and $O_3$ with real time value from online analyzers.

**SUGGESTED BOOKS**


- Burns D.T. and Rattenbury E.M.: INTRODUCTORY PRACTICAL PHYSICAL CHEMISTRY, Pergamon Press (1966).
- Daniels F., Williams J.W., Bender P., Alberty R.A., Cornwell C.D. and Harriman J.E.: EXPERIMENTAL PHYSICAL CHEMISTRY, McGraw Hill (1962).
- Day R.A. and Underwood A.L.: QUANTITATIVE ANALYSIS, Prentice Hall India Pvt. Ltd., New Delhi, 3rd Ed., (199
- EwingG.W.: INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS, McGraw Hills (1989).
- Yadav J.B.: ADVANCED PRACTICAL PHYSICAL CHEMISTRY, Goel Publishing House (2000).


**Course Outcomes:**

On successful completion of this course, students shall be able to:

1. Evaluate the topology and qualitative analysis of some elements.
2. Explain organic analysis.
3. Interpret physical analysis
4. Define environmental analysis.

**Semester: III**

**Course Name: Bioinorganic and Biophysical Chemistry** **Code: CHL-7111**
**Credits: 4**

**Course Objectives:**
The bioinorganic elements play an important role in the biological systems. Therefore, the object of this course is to explain the role of essential metal ions, metalloenzymes, biopolymer and biomolecular simulation in biological systems.

**Block I: Essential and trace metal ions**
**Unit 1:** Essential and trace metal ions in biological system.
**Unit 2:** Deficiency/excess of Mn, Co, and Zn metal ions.
**Unit 3:** Structure of chlorophyll, Photosynthesis, Photo system I and Photo system II.

**Block II: Metalloenzymes**
**Unit 4:** Cytochromes and iron-sulphur proteins, nitrogen fixation.
**Unit 5**: Zinc enzymes; carboxypeptidase, carbonic anhydrase.
**Unit 6:** Iron enzymes-catalase and peroxidase. Copper enzyme –superoxide dismutase. Cobalt enzyme; cyanocobalamin.

**Block III: Biopolymer interactions and Thermodynamics of Macromolecular solutions**
**Unit 7:** Non-covalent interaction, Electrostatic: dipole-dipole interaction, Dispersion force interaction, Hydrophobic interaction.
**Unit 8:** Multiple Equilibria and various types of binding processes in biological systems. Thermodynamics of biopolymer solutions.
**Unit 9:** Flory-Huggins model of macromolecular solvation, Osmotic pressure and Donnean membrane equilibriums.

**Block IV: Statistical Mechanics and Biomolecular simulations**
**Unit 10:** Chain configuration of macromolecule, Random walk model.
**Unit 11:** statistical distribution of end to end dimension.
**Unit 12:** Calculation of average dimension of various chain structures.

**Block V: Conformational transitions**
**Unit 13:** Helix-coil transition, Protein folding problem.
**Unit 14:** Molecular mechanics and dynamics: Basic principles – molecular representations – force fields – atom-atom pair potentials – bond length and bond angle and torsion angle potential
**Unit 15:** Van der Waals and electrostatic potential concepts of molecular dynamics – introduction to time-step integration algorithms and force fields.

***Books Recommended/Suggested Reading:***

1. *Principles of Bioinorganic Chemistry, S.J. Lippard and J.M. Berg, University Science Books.*
2. *Bioinorganic Chemistry, I. Bertini, H.B. Gray, S.J. Lippard and J.S. Valentine, University Science Books.*
3. *Inorganic Biochemistry, vols I and II. ed., G.L. Eichhorn, Elsevier.*
4. *Progress in Inorganic Chemistry, Vols. 18 and 38 ed. J.J. Lippard, Wiley*

**Course Outcomes:**
On successful completion of this course, students shall be able to:

1. Define essential and trace metal ions.
2. Outline Metalloenzymes.
3. Interpret Biopolymer interactions and Thermodynamics of Macromolecular solutions.
4. Explain Statistical Mechanics and Biomolecular simulations.
5. Interpret conformational transitions

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**Course Name: Analytical Techniques** **Code: CHL-7112**
**Credits: 4**

**Course Objectives:**
Spectroscopy is that branch of chemistry that deals with the interaction of electromagnetic radiations with matter. Different spectroscopy is used for different purposes. Therefore, the objective of the course is to explain the basic concept of electron spectroscopy, microscopy and particle size determination method.

**Block I: Electron spectroscopy**
**Unit 1:** Electron Spectroscopy Definition of a solid surface, Types of surface measurements;
**Unit 2:** X-Ray photoelectron spectroscopy (XPS/ESCA): Introduction, principle, chemical shifts as a function of oxidation states, instrumentation, applications;
**Unit 3:** Auger electron spectroscopy: principle, instrumentation- radiation source, energy analyser, detector, auxiliary system; applications- quantitative analysis.

**Block II: Electron Microscopy**
**Unit 4:** Scanning electron microscopy (SEM): basics, instrumentation, applications.
**Unit 5:** Transmission electron microscopy (TEM): Introduction, Basic theory, Electron gun, Electromagnetic lenses, Imaging, Operating parameters- magnification, resolution, depth of field.
**Unit 6:** Sample preparation, Specimen orientation and manipulation; Applications; Selected Area Electron Diffraction.

**Block III: Particle Size Determination**
**Unit 7:** Introduction to Particle Size Analysis, Selection criteria for choosing appropriate analytical techniques.
**Unit 8:** Low Angle Laser Light Scattering (LALLS): Instrumentation, Theoretical models, Particle size distribution analysis, Applications.
**Unit 9:** Dynamic Light Scattering (DLS): Principles, Instrumentation - sample cell & its handling, photodetector.

**Block IV: Automations**
**Unit 10:** Photo sedimentation: Setting velocity & particle size, The Stokes equations, Instrumentation, Applications.
**Unit 11:** Automated Methods of Analysis Principles of automation
**Unit 12:** Advantages and disadvantages of automatic analysis.

**Block V: Unit Operation**
**Unit 13:** operations in chemical analysis, Process control, Types of automatic analytical systems
**Unit 14:** Flow Injection Analysis (FIA)- principles, instrumentation- sample and reagent transport system, sample injectors and detectors

**Unit 15:** Sequential injection analysis; Applications.

***Books Recommended/Suggested Reading:***


1. *Instrumental Analysis, 2nd Ed., Bauer, Christian, O'Reilly, Allyn and Bacon.*
2. *Instrumental Methods of Analysis, 7th Ed., Willard, Merritt, Dean and Settle, CBS Publishers.*
3. *Principles of Instrumental Analysis, 5th Ed- Indian Reprint, Skoog, Holler, Nieman, Harcourt Asia.*
4. *Instrumental Analysis, 1/e, Skoog, Holler, Crouch, Brooks Cole- Cenage Learning*
5. *Analytical Chemistry, 6th Ed., G.D. Christian, John Wiley & Sons (Asia) Pte. Ltd, New Delhi*


**Course Outcomes:**

On successful completion of this course, students shall be able to:

1. Explain electron spectroscopy.
2. Define electron microscopy.
3. Evaluate particle size.
4. Illustrate automations
5. Choose unit operation

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**Course Name: Organic Photochemistry** **Code: CHL-7113**

**Credits: 4**

**Course Objectives:**

Organic photochemistry is special branch of chemistry that involves organic reaction induced by the action of light. The action of light causes several reactions such as absorption, emission, fluorescence, phosphorescence etc. Therefore, the objective of this course is to explain the photochemistry of organic molecules and corresponding reactions as well as rearrangements.

**Block I: Fundamentals of photochemistry**

**Unit 1:** Absorption of light by molecules: direct and indirect excitation, electronically excited states, types of excitation, and laws of photochemistry.

**Unit 2:** Properties of excited states: decay of electronically excited states, spin allowed and spin forbidden transitions.

**Unit 3:** Photophysical processes: radiative (fluorescence, phosphorescence), nonradiative (state-to-state crossing, vibrational relaxation), combination of radiative and non-radiative processes, Jablonski diagram.

**Block II: Photochemistry of excited state and carbonyl compounds**

**Unit 4:** Transfer of excitation energy photosensitization and quenching. Excited-state complex formation: excimer and exciplex. Photoinduced electron transfer: homogeneous and heterogeneous photoelectron transfer reactions.

**Unit 5:** Photochemistry of Carbonyl Compounds: Intramolecular reactions of carbonyl compounds: saturated, cyclic and acyclic, β, λ- Unsaturated and α, β- unsaturated compounds, and Cyclohexadienone.

**Unit 6:** Intramolecular cycloaddition reactions-dimerization's and oxetane formation.

**Block III: photochemistry of aromatic compounds**

**Unit 7:** Photochemistry of Aromatic Compounds: Photoinduced isomerisations of benzene and its alkyl derivatives.

**Unit 8**: 1, 2; 1, 3 and 1, 4-photocycloaddition reactions of benzene.
**Unit 9:** Nucleophilic photosubstitution reactions in aromatic compounds.

**Block IV: Miscellaneous Reactions**
**Unit 10:** Barton reaction
**Unit 11:** Hoffmann-Loeffler-Freytag reaction.
**Unit 12:** Singlet molecular oxygen reactions. Photo-Bergman cyclisation.

**Block V: Rearrangement reactions**
**Unit 13:** Photo-Fries rearrangement.
**Unit 14:** Photochemical Nazarov cyclisation. Photo-Favorskii rearrangement.
**Unit 15:** Bicycle rearrangement. Photochemical Wolff rearrangement.

***Books Recommended/Suggested Reading:***


1. *Fundamental of Photochemistry, K.K.Rohtagi- Mukherji, Wily- Eastern.*
2. *Essentials of Molecular Photochemistry, A.Gilbert and J.Baggott, Blackwell Scientific Publication.*
3. *Molecular Photochemistry, N.J. Turro, W.A. Benjamin.*
4. *Introductory Photochemistry, A. Cox and T. CAMP, Mc Graw-Hill.*


**Course Outcomes:**
On successful completion of this course, students shall be able to:

1. Analyze Fundamental Principles of Photochemistry.
2. Examine Photochemistry of excited state and Carbonyl Compounds.
3. Explain Photochemistry of Aromatic Compounds.
4. Evaluate Miscellaneous Photochemical Reactions.
5. Interpret rearrangement reactions.

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**Semester III: Program Elective**

**Course Name: Solid State Chemistry** **Code: CHL-7121**
**Credits: 3**

**Course Objectives:**
Solid is one of the most fundamental units of matter. The constituents particles in solids are closed packed together and form a complete unit cell. The arrangement of atoms in unit cell, and their diffraction through various crystal lattice planes are also discussed in this course. Therefore, the objective of this course is to study the arrangement of atoms in unit cell, presence of impurities which creates several defect and the synthesis of novel materials as well as identification and chemical composition of the molecule.

**Block I: Solid state**

**Unit 1:** Types of solids, isomorphism and polymorphism, laws of crystallography, lattice types.
**Unit 2:** X-ray diffraction, Bragg's equation, Miller indices.
**Unit 3:** Bragg Method, Debye-Sherrer method of X-ray structure analysis of crystals.

**Block II: Structure Factor**

**Unit 4:** Indexing of reflections, identification of unit cells from systematic absence in diffraction pattern.
**Unit 5:** Structure of simple lattice and X-Ray intensities.
**Unit 6:** Structure factor and its relation to intensity and electron density, phase problem, procedure for an X-ray structure determination.

**Block III: Solid state reactions**
**Unit 7:** General principle, types of reactions: Additive, structure sensitive, decomposition and phase transition reactions.
**Unit 8:** Tarnish reactions, kinetics of solid state reactions.
**Unit 9:** factors affecting the reactivity of solid state reactions.

**Block IV: Electronic Properties and Band Theory**
**Unit 10:** Metals, insulators and semi-conductors, free electron theory and its applications.
**Unit 11:** Electronic structure of solids, band theory, band structure of metals, insulator, and semiconductors, doping in semiconductors.
**Unit 12:** p- n junction, super conductors, optical properties, photoconduction and photoelectric effects.

**Block V: Preparation method**
**Unit 13:** laser action, solid state laser and their applications, Preparation of materials: Purification and crystal growth
**Unit 14:** Zone refining, growth from solution, growth from melt
**Unit 15:** Preparation of organic semiconductors for device applications.

**Books Recommended/Suggested Reading:**
1. Principals of solid state, H. V. Keer, Wiley Eastern.
2. Solid state chemistry, N. B. Hannay.
3. Solid state chemistry , D. K. Chakrabarty , New Age International.
4. An Introduction to Crystallography : F. G. Philips.
5. Crystal Structure Analysis: M. J. Buerger.
6. Electronic processes in materials : L. U. Azroff and J. J. Brophy.
7. Chemistry of imperfect crystal : F. A. Krogen.

**Course Outcomes:**
On successful completion of this course, students shall be able to:
1. Explain solid state.
2. Interpret structure factor.
3. Define solid state reactions.
4. Evaluate electronic properties and band theory.
5. Analyse preparation methods.

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**Course Name: Project** **Code: CHD-7211**
**Credits: 4**

**Course Objectives:** The objective of the course is to work with students to identify mathematical problem. The course also focuses to find out probable solution of that mathematical problem.

**Syllabus**

Every student shall, in the Fourth (final) Semester, submit a Dissertation reporting the results of original research on a topic assigned at the beginning of the semester by the concerned research guide (faculty member) in consultation with the student, in his/her area(s) of special interest. The research guide shall be chosen by the student according to his/her interest and the faculty member's area of expertise. No faculty member shall guide more than five students.

The topic of the Dissertation shall be approved by the Head of the Department. For this purpose the candidate shall submit to the Head an application stating the topic for the dissertation along with a synopsis within three weeks of the commencement of classes of the Fourth Semester. Once approved, the topic of dissertation shall not be altered without a fresh proposal from the student accompanied by a written request stating the reason for change. No such request shall be entertained after five weeks of the commencement of classes of the Semester in question.

**Course Outcomes:**

On successful completion of this course, students shall be able to:

1. Identify and Define appropriate research problems.
2. Explain appropriate research approaches for solving problems.
3. Apply various tools and techniques to complete research.
4. Analyse research report and make robust conclusion.

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**Semester: IV**

**Course Name: Inorganic polymers** **Code: CHL-7211**
**Credits: 4**

**Course Objectives:**

Polymers are the substances made up of large number of molecules called the macromolecules and are the important constituents of many materials. On the other hand inorganic polymers also made up of large number of molecules but does not include carbon atoms in the backbone. The detailed study of inorganic polymers, their classification, structure, and advanced applications are the objectives of this course.

**Block I: Inorganic polymer: Introduction**

**Unit 1:** Introduction, Properties and classification of Inorganic Polymers.
**Unit 2:** Phosphorous, Sulphur, Boren and Silicon based polymers.
**Unit 3:** Polyphosphazenes, polycarboanes, polyboron.

**Block II: Coordination Polymers**

**Unit 4:** Nitride and silicones.
**Unit 5:** Natural, Chain polymers
**Unit 6:** 2D and 3D coordination polymers.

**Block III: Polymer reaction and mechanism**

**Unit 7:** Isopoly and heteropoly acids and anions.
**Unit 8:** Polymerization of chromate, and vanadates, Keggin structure.
**Unit 9:** Reactions of iso and heteropoly anions.

**Block IV: Inorganic polymers in nanotechnology**

**Unit 10:** Basic, nanotechnology science and chemistry concepts.
**Unit 11:** Basic Inorganic nanostructures
**Unit 12:** Nano composites, thin films, nano foam.

**Block V: Advanced Inorganic Materials**
**Unit 13:** Nanotechnology and its industrial applications.
**Unit 14:** Introduction to nano scale
**Unit 15:** Potential applications of Inorganic nano materials.

***Books Recommended/Suggested Reading:***


1. *Fundamentals of Inorganic Chemistry by Puri-Sharma and Kalia*
2. *Inorganic Chemistry by Cotton & Wilkinsen*
3. *Teraoka, Polymer Solutions: An Introduction to Physical Properties, John Wiley & Sons, 2002.*
4. *J.E. Mark, H.R. Allcock, R. West, Inorganic Polymers, 2nd Edn., Oxford University Press, 2005.*
5. *V. Chandrasekhar, Inorganic and Organometallic Polymers, Springer, 2005.*


**Course Outcomes:**
On successful completion of this course, students shall be able to:

1. Define Inorganic Polymers.
2. Explain coordination polymer.
3. Summarize polymer reaction and mechanism.
4. Interpret Inorganic polymers in nanotechnology.
5. Understand Advanced Inorganic Materials

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**Semester IV: Program Elective**

**Course Name: Statistical Thermodynamics** **Code: CHL-7221**
**Credits: 3**

**Course Objectives:**
The properties of the bulk material can be studied with the help of statistical thermodynamics. Therefore, the objective of this course is to explain the properties of the microscopic particles and the behaviour of bulk materials. The mechanics and equilibrium, thermodynamic functions and different types of ensembles as well as distribution is another important topics which are covered in this course.

**Block I: Statistical thermodynamics: Introduction**
**Unit 1:** Systems of Independent Particles Concept of a distribution, number of wave functions for a distribution: for Fermi-Dirac and Bose Einstein cases.
**Unit 2:** Distinguishable particles, corrected Bolton's, fundamental distribution law, parameters $\alpha$ and $\beta$, perfect gas and $\beta$.
**Unit 3:** Statistical expression for heat change, heat change statistical mechanical entropy.

**Block II: Thermodynamic functions**
**Unit 4:** Thermodynamic functions for a system of corrected Bolton's, comments on the Boltzmann distribution and corrected Boltzmann statistics,
**Unit 5:** Fermi-Dirac and Bose-Einstein statistics.
**Unit 6:** Conditions for the applicability of Boltzmann statistics.

**Block III: Statistical Mechanics and Chemical equilibrium**

**Unit 7:** Statistical Mechanics and Chemical Equilibrium, Equilibrium constant in terms of partition functions.

**Unit 8:** Change in the zero of energy, partition functions for translational and internal degrees of freedom, free energy and q/N for different standard states.

**Unit 9:** Distribution laws, Partition Functions and Thermodynamic Functions for Atoms and Diatomic molecules.

**Block IV: Canonical Ensembles**

**Unit 10:** Canonical and Grand Canonical Ensembles Canonical ensemble and ensemble average.

**Unit 11:** Perfect gas in canonical ensemble, entropy and free energy, grand canonical ensemble.

**Unit 12:** Entropy and other thermodynamic functions in grand canonical ensemble.

**Block V: Fluctuations in ensemble**

**Unit 13:** Fluctuations Mean of the distribution and the mean-square deviation, fluctuation in energy in a canonical ensemble.

**Unit 14:** density fluctuations in grand ensemble: one component systems, energy fluctuations in grand ensemble.

**Unit 15:** Real Gases Virial Expansions, configuration Integral and the canonical partition function, the second virial coefficient.

***Books Recommended/Suggested Reading:***


1. *Norman Davidson, Statistical Mechanics, McGraw-Hill, New York.*
2. *R.P.H. Gasser and W.G. Richards, Introduction of Statistical Thermodynamics, World Scientific.*
3. *T.L. Hill, An Introduction to Statistical Thermodynamics, Dover, New York.*
4. *Elements of statistical thermodynamics - L. K. Nash, Addison Wesley.*
5. *Statistical thermodynamics by B. J. McCelland, Chapman and Hall.*
6. *An Introduction to Statistical Thermodynamics by T. L. Hall Addison - Wesley.*


**Course Outcomes:**

On successful completion of this course, students shall be able to:

1. Explain general introduction of statistical thermodynamics.
2. Define thermodynamic functions.
3. Summarize Statistical Mechanics and Chemical equilibrium.
4. Understand Canonical Ensembles.
5. Interpret Fluctuations in ensemble

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**Semester IV: Program Elective**

**Course Name: Chemistry of Natural Products** **Code: CHL-7222**

**Credits: 3**

**Course Objectives:**

Natural products are mostly present in the nature and produced by a living organism. The chemistry of natural products is mainly focused on the study of small organic molecules, especially secondary metabolites, produced by natural organism such as bacteria, fungi and plants. The detailed study of isoprene, steroids, alkoxides and their derivatives are the objective of this course.

**Block I: Terpenoids**

**Unit 1:** Structure and synthesis of abietic acid.

**Unit 2:** zingiberene, santonin.

**Unit 3:** Cuparenonne and caryophyllene.

**Block II: Alkaloids**

**Unit 4:** Structure, stereochemistry, synthesis.

**Unit 5:** Biosynthesis of the following Structure of morphine, reserpine

**Unit 6:** Ephedrine, (+) Conin.

**Block III: Steroids**

**Unit 7:** Occurrence, nomenclature, basic skeleton.

**Unit 8:** Diels hydrocarbon and study of the following hormones, Androsterone, Testosterone, Estrone, Progesterone.

**Unit 9:** Aldosterone and cartisone. Biosynthesis of steroids.

**Block IV: Prostaglandins**

**Unit 10:** Occurrence, nomenclature, classification.

**Unit 11:** Biogenesis and physiological effects

**Unit 12:** Synthesis of PGE2 and PGF2.

**Block V: Biogenesis**

**Unit 13:** Alkaloids (pyridine, morphine and indole type) terpenoids of classes with examples, cholesterol, flavones, coumarins, carbohydrates and proteins.

**Unit 14:** Vitamins: Synthesis and structure of biotin and vitamin B2, synthesis of vitamin B1.

**Unit 15:** Biological functions of B6, B12, folic acid and thiamin.

***Books Recommended/Suggested Reading:***


1. *Apsimon: The total synthesis of natural products.*
2. *A.A. Newmen: Chemistry of Terpenes.*
3. *P. D B.Mayo: The chemistry of natural products.*
4. *T.W. Goddwin: Aspects of terpenoid chemistry and biochemistry.*
5. *Woguer: Vitamins and Co enzymes.*
6. *I. Finar: Organic chemistry Vol. II and I.*
7. *J.B. Hendrickson, The molecules of nature.*


**Course Outcomes:**

On successful completion of this course, students shall be able to:

1. Define terpenoids.
2. Explain alkaloids.
3. Understand steroids.
4. Analyse prostaglandins.
5. Interpret biogenesis

**Course Name: Project** **Code: CHD-7211**

**Credits: 4**

**Course Objectives:**

The objective of the course is to work with students to identify mathematical problem. The course also focuses to find out probable solution of that mathematical problem.

**Syllabus**

Every student shall, in the Fourth (final) Semester, submit a Dissertation reporting the results of original research on a topic assigned at the beginning of the semester by the concerned research guide (faculty member) in consultation with the student, in his/her area(s) of special interest. The research guide shall be chosen by the student according to his/her interest and the faculty member's area of expertise. No faculty member shall guide more than five students.

The topic of the Dissertation shall be approved by the Head of the Department. For this purpose the candidate shall submit to the Head an application stating the topic for the dissertation along with a synopsis within three weeks of the commencement of classes of the Fourth Semester. Once approved, the topic of dissertation shall not be altered without a fresh proposal from the student accompanied by a written request stating the reason for change. No such request shall be entertained after five weeks of the commencement of classes of the Semester in question.

**Course Outcomes:**

On successful completion of this course, students shall be able to:

5. Identify and Define appropriate research problems.
6. Explain appropriate research approaches for solving problems.
7. Apply various tools and techniques to complete research.
8. Analyse research report and make robust conclusion.

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**Faculty and Support Staff**

The University has identified the requisite faculty and support staff as mandated by UGC and formally they shall be allocated the required positions from amongst the existing faculty exclusively for ODL mode or fresh appointments as required so, shall be initiated for which Letter of Intent have been issued to the prospective faculty and staff. The course material prepared by this university will be on par with any open university/Distance education centre in the country.

List of Faculty associated with MSc- Chemistry program is as follows:-

| S. No. | Name of Faculty | Designation | Nature of Appointment | Qualification | Subject |
|---|---|---|---|---|---|
| 1 | Prof. Ravi Kant | Professor | Full Time | Ph.D | Chemistry |
| 2 | Dr. Monika Singh | Associate Professor | Full Time | Ph.D | Chemistry |

**Delivery Mechanism**

The ODL of MU follows a modern ICT (Information & Communication Technology) enabled approach for instruction. The methodology of instruction in ODL of MU is different from that of the conventional/regular programs. Our ODL system is more learner-oriented and the learner is an active participant in the teaching-learning process. ODL of MU academic delivery system comprises:

**A. Print Material**
The printed material of the programme supplied to the students will be unit wise for every course.

**B. Counselling Sessions**
Normally, counselling sessions are held as per a schedule drawn beforehand by the Subject Coordinator. There will be 6 counselling/ contact classes for 4 credit course will be held on the campus on Saturday and on Sunday of 2 hour duration for each course in face to face mode (In case of 2 credit course contact hours are required 6 hours and in case of 6 credit course contact hours required 18 hours ). Contact classes will be held in the campus on Saturdays and on Sundays.

*C. Medium of Instruction*

Medium of Course Instruction: English
Medium of Examination: English

**Student Support Systems**
Universities Study Centres or Learner Support Centre shall be headed by a coordinator, not below the rank of Assistant professor and shall be augmented with academic and non-academic staff depending on the learner.
The university has made appropriate arrangements for various support services including counselling schedule and resource-oriented services evaluation methods and dates both online and offline modes for easy and smooth services to the students of distance mode.

At present the university have only one study centre on the campus. The institution is not promoting any study centres outside the campus. All student support services will be provided to the student through a single window method/mode onsite and online.

## F. Procedure for Admissions, Curriculum, Transaction and Evaluation

**Admission Process**

Admission to the M.Sc. (Chemistry) Programme will be done on the basis of screening of candidate's eligibility on first come first serve basis. The University will follow the reservation policy as per norms of the Government. Admission shall not be a right to the students and MU, CDOE shall retain the right to cancel any admission at any point of time if any irregularity is found in the admission process, eligibility etc..

**Maximum Duration**

A. The maximum duration of the M.Sc. (Chemistry) Programme is four years. Thereafter, students seeking completion of the left-over course(s) will be required to seek fresh admission.
B. The student can complete his programme within a period of 4 years failing which he/she shall seek fresh admission to complete the programme.

**Eligibility**

Science (PCM/PCMB) Graduate from a recognised University is eligible for admission into M.Sc. (Chemistry) programme.

**Fee Structure**

| Name of the Program | Degree | Duration | Year | Tuition Fee/Year | Exam Fee/Year | Total (in Rs.) |
|---|---|---|---|---|---|---|
| Master of Science (Chemistry) | PG | 2 to 4 Years | 1 | 15000 | 2000 | 17000 |
| | | | 2 | 13500 | 2000 | 15500 |
| **Total** | | | | | | 32500 |

**Activity Schedule**

| S. No. | Name of the Activity | Tentative months schedule (specify months) during year | | | |
|---|---|---|---|---|---|
| | | From | To | From | To |
| 1 | Admission | Jul | Sep | Jan | Mar |
| 2 | Assignment submission (if any) | Sep | Oct | Mar | Apr |
| 3 | Evaluation of Assignment | Oct | Nov | Apr | May |
| 4 | Examination | Dec | | Jun | |
| 5 | Declaration of Result | Jan | | Jul | |
| 6 | Re-registration | Jul | | Jan | |
| 7 | Distribution of SLM | Jul | Sep | Jan | Mar |
| 8 | Contact Programmes (counseling, Practicals.etc.) | Sep | Nov | Mar | May |

**Credit System**

MU, CDOE proposes to follow the 'Credit System' for most of its programs. Each credit amounts to 30 hours of study comprising all learning activities. Thus, a 8 credit course requires 240 hours, 6 credit course requires 180 hours , 4 credit course requires 120 hours and 2 credit course requires 60 hours of study. This helps the student to understand the academic effort to complete a course. Completion of an academic programme requires successful clearing of both, the assignments and the term-end examination of each course in a programme.

| Duration of programme | Credits | Name of programme | Level of programme |
|---|---|---|---|
| 2 to 4 Yrs. | 80 | M.Sc. (Chemistry) | Master's Degree |

**Assignments**

Distance Education learners have to depend much on self study. In order to ascertain the writing skill and level of comprehension of the learner, assignment work is compulsory for all learners. Each assignment shall consist of a number of questions, case studies and practical related tasks. The Assignment Question Papers will be uploaded to the website within a scheduled time and the learners shall be required to respond them within a specified period of time. The response of the learner is examined by a faculty member.

**Evaluation:** The evaluation system of the programme is based on two components:

**A. Continuous Evaluation in the form of assignments (weightage 30%):** This Component carries a weightage of 30%. There will be at least one graded assignment and test per course. These

assignments are to be submitted to the Co-ordinator of the CDOE/Study Centre to which the student is assigned or attached with.

**B. Term-end examination (weightage 70%):** This will be held twice every year in the months of June and December. The students are at liberty to appear in any of the examinations conducted by the University during the year. A student will be allowed to appear in the Term-End Examination only after she/he has registered for that course and submitted the assignment. For appearing in the Examination, every student has to submit an Examination form through online (www.mangalayatan.in)/ or offline before the due dates as given in the schedule of operations. If a student misses any term-end examination of a course for any reason, s/he may appear for any of them or all the courses subject to the maximum of 8 courses in the subsequent term-end examinations. This facility will be available until a student secures the minimum pass grade in the courses but up to a maximum period of four semesters, since the date of registration of the course is valid for four semesters. Beyond this period s/he may continue for another four semesters by getting Re-registration by paying fee again. In that case, the score of qualified assignments and/or term-end examination will be retained and the student will be required to complete the left out requirements of such re-registered courses. Minimum requirement for passing a course will be 40% marks.

## G. Laboratory Support and Library Resources

The library of Mangalayatan University aims to empower the teaching mission and intellectual culture of the community through availability through an organized collection of information as well as instruction in its access, relevance and evaluation. The University Library enriches advance learning and discovery by providing access to a broad array of resources for education, research and creative work to ensure the rich interchange of ideas in the pursuit of knowledge.

The Centre of Distance Education of Mangalayatan University has initiated the process of setting up a dedicated Library for ODL program and acquiring printed books and e-books for this purpose. The required International and National subject journals are also provided. We have a full functioning community radio service onboard (90.4 FM). We already have annual journal subscriptions and the capacity can be enlarged at later stages as the University lines up with more online journals.

The collection of the Library is rich and diverse especially in terms of the breadth and depth of coverage. Collection encompasses subjects in Management, Commerce, Information Technology, Computer Applications, and other allied areas. This collection further includes Books, Research Journals, Project Reports/Dissertations and online Journals.

The Chemistry laboratory is well equipped with chemicals, reagents as well as instruments which are necessary for practical analysis.

The University has well equipped Computer Laboratories, Lecture Capturing Systems, Audio Video facilities, ICT enabled class rooms, Wi-Fi facilities etc.

## H. Cost estimate of the programme and the provisions

Initial expenses have been done by the University in terms of provision of infrastructure, manpower, printing of Self Study Material etc. The University intends to allocate expenses out of the total fee collection as per following details:

a) SLM Development and Distribution : 20%
b) Postal and ICT Expenses : 10%
c) Salary and other Administrative expenses : 60%
d) Future Research development reserve : 10%

Once programmes are operational, the programme budget from fee receipts will be planned as per the guidelines of University Grants Commission.

## I. Quality Assurance

The University has established the Centre for Internal Quality Assurance (CIQA) in the University campus. The CIQA will monitor and maintain the quality of the ODL programmes. It has the following objectives in making the compliances of quality implementations.

**Objectives**

The objective of Centre for Internal Quality Assurance is to develop and put in place a comprehensive and dynamic internal quality assurance system to ensure that programmes of higher education in the Open and Distance Learning mode and Online mode being implemented by the Higher Educational Institution are of acceptable quality and further improved on continuous basis.

**Functions of CIQA**

The functions of Centre for Internal Quality Assurance would be following:

1) To maintain quality in the services provided to the learners.
2) To undertake self-evaluative and reflective exercises for continual quality improvement in all the systems and processes of the Higher Educational Institution.
3) To contribute in the identification of the key areas in which Higher Educational Institution should maintain quality.
4) To devise mechanism to ensure that the quality of Open and Distance Learning programmes and Online programmes matches with the quality of relevant programmes in conventional mode.
5) To devise mechanisms for interaction with and obtaining feedback from all stakeholders namely, learners, teachers, staff, parents, society, employers, and Government for quality improvement.
6) To suggest measures to the authorities of Higher Educational Institution for qualitative improvement.
7) To facilitate the implementation of its recommendations through periodic reviews.
8) To organize workshops/seminars/symposium on quality related themes, ensure participation of all stakeholders, and disseminate the reports of such activities among all the stakeholders in Higher Educational Institution.
9) To develop and collate best practices in all areas leading to quality enhancement in services to the learners and disseminate the same all concerned in Higher Educational Institution.
10) To collect, collate and disseminate accurate, complete and reliable statistics about the quality of the programme(s).
11) To ensure that Programme Project Report for each programme is according to the norms and guidelines prescribed by the Commission and wherever necessary by the appropriate regulatory authority having control over the programme;
12) To put in place a mechanism to ensure the proper implementation of Programme Project Reports.
13) To maintain a record of Annual Plans and Annual Reports of Higher Educational Institution, review them periodically and generate actionable reports.
14) To provide inputs to the Higher Educational Institution for restructuring of programmes in order to make them relevant to the job market.
15) To facilitate system based research on ways of creating learner centric environment and to bring about qualitative change in the entire system.
16) To act as a nodal coordinating unit for seeking assessment and accreditation from a designated body for accreditation such as NAAC etc.
17) To adopt measures to ensure internalization and institutionalization of quality enhancement practices through periodic accreditation and audit.
18) To coordinate between Higher Educational Institution and the Commission for various qualities related initiatives or guidelines.
19) To obtain information from other Higher Educational Institutions on various quality benchmarks or parameters and best practices.
20) To record activities undertaken on quality assurance in the form of an annual report of Centre for Internal Quality Assurance.

21) It will be mandatory for Centre for Internal Quality Assurance to submit Annual Reports to the Statutory Authorities or Bodies of the Higher Educational Institution about its activities at the end of each academic session. A copy of report in the format as specified by the Commission, duly approved by the statutory authorities of the Higher Educational Institution shall be submitted annually to the Commission.

After enrolling in M.Sc. (Chemistry) programme of Mangalayatan University in ODL mode, student will exhibit knowledge, skill and general competence with scientific aptitude and innovation. After completion of M.Sc. (Chemistry) programme, student will pursue further studies in Chemistry for roles in academia, research, industry, laboratory, technology and government.