Ref: MU/RO/AC/2023/3/27 Dated: 16 January 2024

# NOTIFICATION

**Subject: Approval of Programme Project Reports (PPRs) of ODL / OL Programmes**

Consequent to the approval of the Centre for Internal Quality Assurance, the Academic Council of the University vide Agenda Item No. 27 dated 30 December 2023, has considered and approved the revised Programme Project Reports of following Programmes to be offered through Open and Distance Learning and Online mode of study as per University Grant Commission (Open and Distance Learning Programmes and Online Programme) Regulation, 2020:

1. Bachelor of Arts (BA – FYUGP – English, Hindi, History. Sociology, Political Science. Economics, Value Added Courses, Skill Enhancement Courses, Ability Enhancement Courses as per NEP 2020 Guidelines) – ODL & OL Mode
2. Bachelor of Commerce (BCOM – FYUGP) – ODL Mode
3. Bachelor of Business Administration (BBA - FYUGP) – ODL & OL Mode
4. Bachelor of Computer Applications (BCA – FYUGP) – OL Mode
5. Master of Business Administration (MBA – Marketing Management, Financial Management, Human Resource Management, Operations Management) – ODL & OL Mode
6. Master of Computer Applications (MCA) – OL Mode
7. Master of Science in Physics (MSc Physics) – ODL Mode
8. Master of Science in Chemistry (MSc. Chemistry) – ODL Mode
9. Master of Arts in Psychology (MA Psychology) – OL Mode

Registrar
Mangalayatan University
Beswan, Aligarh

CC.:

- P.A. to Hon'ble Vice Chancellor for his kind information
- P.A. to Hon'ble Pro Vice Chancellor for his kind information
- Controller of Examinations
- Director, Centre for Distance and Online Education (CDOE)
- Director, Centre for Internal Quality Assurance (CIQA)
- All concerned

# MANGALAYATAN UNIVERSITY
# BESWAN, ALIGARH-202146

## MINUTES OF THE MEETING OF THE ACADEMIC COUNCIL

| | |
|---|---|
| **VENUE** | **: V.C. CONFERENCE HALL** |
| **DATE** | **: 30 DECEMBER 2023** |
| **TIME** | **: 11:00 AM** |

Director
Centre for Distance and Online Education
Mangalayatan University, Beswan, Aligarh-202146 (U.P.)

| | |
|---|---|
| 26 | **To report the semester results of academic session 2022-23.**<br>The Controller of Examinations presented the exam results of the session 2022-23. Deliberations were held on the status of results and pass percentage. The Academic Council noted the same.<br><br>**(Annexure-26)**<br>**Kind Attn.: COE/Concerned HAU** |
| 27 | **To consider and approve the revised Program Project Reports of following programs to be offered by the University:**<br>**1. Bachelor of Arts (BA – FYUGP – English, Hindi, History, Sociology, Political Science, Economics, Value Added Courses, Skill Enhancement Courses, Ability Enhancement Courses as per NEP 2020 Guidelines) – ODL & OL Mode**<br>**2. Bachelor of Commerce (BCOM – FYUGP) – ODL Mode**<br>**3. Bachelor of Business Administration (BBA - FYUGP) – ODL & OL Mode**<br>**4. Bachelor of Computer Applications (BCA – FYUGP) –ODL &OL Mode**<br>**5. Master of Business Administration (MBA – Marketing Management, Financial Management, Human Resource Management, Operations Management) – ODL & OL Mode**<br>**6. Master of Computer Applications (MCA) – OL Mode**<br>**7. Master of Science in Physics (MSc Physics) – ODL Mode**<br>**8. Master of Science in Chemistry (MSc Chemistry) – ODL Mode**<br>**9. Master of Arts in Psychology (MA Psychology) – OL Mode**<br><br>Consequent to the approval of CIQA, the Academic Council considered and approved the same.<br><br>**(Annexure-27)**<br>**Action: Director-CDOE/Director-CIQA** |
| 28 | **To consider and approve the revised Self Learning Material (SLM) of the following programs to be offered by the University:**<br>**1. Bachelor of Arts (BA – FYUGP – English, Hindi, History, Sociology, Political Science, Economics, Value Added Courses, Skill Enhancement Courses, Ability Enhancement Courses as per NEP 2020 Guidelines) – ODL & OL Mode**<br>**2. Bachelor of Commerce (BCOM – FYUGP) – ODL Mode**<br>**3. Bachelor of Business Administration (BBA - FYUGP) – ODL & OL Mode**<br>**4. Bachelor of Computer Applications (BCA – FYUGP) –ODL & OL Mode**<br>**5. Master of Business Administration (MBA – Marketing Management, Financial Management, Human Resource Management, Operations Management) – ODL & OL Mode**<br>**6. Master of Computer Applications (MCA) – OL Mode .**<br>**7. Master of Science in Physics (MSc Physics) – ODL Mode**<br>**8. Master of Science in Chemistry (MSc. Chemistry) – ODL Mode**<br>**9. Master of Arts in Psychology (MA Psychology) – OL Mode**<br>Consequent to the approval of CIQA, the Academic Council considered and approved the same.<br><br>**(Annexure-28)**<br>**Action: Director-CDOE/Director-CIQA** |

| | |
|---|---|
| 29 | **Other item with the permission of Chair:**<br>Dr. Dinesh Sharma, the Controller of Examinations, suggested a proposal for the University to establish Memorandums of Understanding (MOUs) with academic partners, for 20 percent coverage of courses. Additionally, another 20 percent of courses will be offered as Massive Open Online Courses (MOOCs) from the current semester, aligning seamlessly with our curriculum. The evaluation of these courses will be carried out by our in-house faculty members. The Council carefully considered this proposal and decided to make a decision after thoroughly reviewing the detailed proposal.<br><br>Prof. Arif Suhail, an external expert, expressed appreciation for the approval of programs under ODL and MIPER.<br>**Action: Registrar/Joint Registrar-Compliance/CoE** |

The meeting concluded with a vote of thanks to the Chair.

Registrar

Registrar
Mangalayatan University
Beswan, Aligarh

CC:
1. P.A. to the Chancellor for kind information
2. P.A. to the Vice Chancellor for kind information
3. Executive Council for approval
4. All the members of the Academic Council

# MANGALAYATAN UNIVERSITY, ALIGARH

# CENTRE FOR DISTANCE AND ONLINE EDUCATION


## PROGRAMME PROJECT REPORT

## MASTER OF BUSINESS ADMINISTRATION
## (Marketing Management, Human Resource Management/Finance Management/Operations Management)

**2024-25**



Director
Centre for Distance and Online Education
Mangalayatan University, Beswan, Aligarh-202146 (U.P.)

Registrar
Mangalayatan University
Beswan, Aligarh

## Introduction

Masters of Business Administration – generally abbreviated as MBA is a highly valued post graduate degree designed specifically while keeping in mind to focus the essential skills required for careers in businesses, establishing ventures, imbibing entrepreneurial skills and managing organizations across globe. With the help of this program, the University teachers and real time projects in close alignment with holistic learning approach help the students to define their hidden personality traits and develops managerial style that transforms students in to a variety of strategic thinkers, future leaders, economists and entrepreneurs.

MBA program helps students to expand their knowledge of management theories and allows the student to specialise in their chosen sector(s). The students are motivated to expand and swim in vast networking opportunities provided during the tenure of the course that further enhances their own prospects. This program helps students to become a change agent, ready to tackle a range of business issues and develop innovative solutions for the benefit of their own career.

## A. Programme's Mission and Objectives

### Mission

To develop reached and unreached students into a new generation of leaders through updated quality education and carrier assistance by open and distance learning.

### Objectives

The MBA program of Mangalayatan University is designed after acknowledging essential quality inputs received from Students, Alumni, Parents, Academicians/Teachers and also incorporating the contribution of Industries' demands which enable a learner to get out of their comfort zones and make them understand how to deal with the latest domestic and international business issues. The Program uses latest management techniques to solve/rectify strategic problems effectively and efficiently. The MBA programme will help students in acquiring specialised knowledge for quality business management practise in globalised India.

## 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 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 the students and faculty with all facilities to nurture their interest.

MBA 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 MBA 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

Distance Education at Mangalayatan University (MU) shall target the working professional's executives as well as those who cannot attend a full-time program due to constraints. The candidates desirous of taking admission in MBA program shall have to meet the eligibility norms as follows-

***To obtain admission in MBA program offered through ODL mode, the learner must have completed graduation in any stream.***

The ODL-MBA program offered by Mangalayatan University aims specially for working class people, people from Industry, business executives people who are designated at various government positions, academicians who seek to gain MBA degree to amplify their credentials, medical practitioners, medical executives (hospital administration) Business owners/Entrepreneurs, women/housewives. 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 program outcomes and program specific outcomes as acquisition of specific skills and competence for MBA Program.

**Programme Outcomes (PO's)**

PO 1: Apply knowledge of management theories and practices to solve business problems.
PO2: Foster Analytical and critical thinking abilities for data-based decision making.
PO3: Ability to develop Value based Leadership ability.
PO4: Ability to understand, analyze and communicate global, economic, legal, and ethical aspects of business.
PO5: Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment.

**Programme Specific Outcomes**

PSO1: To understand various forms of business organizations and their functioning.

PSO2: To inculcate in student's the ability to gain multidisciplinary knowledge.
PSO3: To develop ability to adapt to dynamic changes in environment.

The University has managed care to introduce MBA program taking into consideration, 1, and 2, to maintain the quality and to face the competition at the National/International level.

## E. Instructional Design

The program is divided into four semesters and minimum credit requirement is 84 to get MBA degree through ODL mode from Mangalayatan University. Minimum time period for acquiring MBA degree will be two years and maximum time (extended) period is four years. Students can select one elective.

**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 | MGO-6101 | Principles and Practices of Management | 4 | 30 | 70 | 100 |
| 2 | MGO-6102 | Managerial Economics | 4 | 30 | 70 | 100 |
| 3 | MGO-6103 | Accounting for Managers | 4 | 30 | 70 | 100 |
| 4 | MGO-6104 | Business Statistics | 4 | 30 | 70 | 100 |
| 5 | MGO-6105 | Communication for Management | 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 | MGO-6201 | Entrepreneurship & SMEs Management | 4 | 30 | 70 | 100 |
| 2 | MGO-6202 | Business Environment | 4 | 30 | 70 | 100 |
| 3 | MGO-6203 | Research Methodology | 4 | 30 | 70 | 100 |
| 4 | MGO-6204 | Business Laws | 4 | 30 | 70 | 100 |
| 5 | MGO-6205 | Human Resource Management | 4 | 30 | 70 | 100 |
| Total | | | 20 | 150 | 350 | 500 |

| Semester-III | | | | | | |
|---|---|---|---|---|---|---|
| **S.N.** | **Course Code** | **Course Name** | **Credit** | **Continuous Assessment Marks** | **Term End Exam Marks** | **Grand Total** |
| | | | | **Max.Marks** | **Max.Marks** | |
| 1 | MGO-7101 | Strategic Management | 4 | 30 | 70 | 100 |
| 2 | MGO-7102 | Organizational Behavior | 4 | 30 | 70 | 100 |
| 3 | Three courses from any one area of the specialization and specialization area will remain same in IIIrd and IV th Semester | | 4 | 30 | 70 | 100 |
| 4 | | | 4 | 30 | 70 | 100 |
| 5 | | | 4 | 30 | 70 | 100 |
| Total | | | 20 | 150 | 350 | 500 |

| **Any one specialization area to be opted in the IIIrd semester** | |
|---|---|
| Marketing | |
| MGO-7111 | Marketing Management |
| MGO-7112 | E-Marketing |
| MGO-7113 | Retail Management |
| Finance | |
| MGO-7121 | Financial Management |
| MGO-7122 | Security Analysis & Portfolio Management |
| MGO-7123 | Management of Financial Institutions & Services |
| Human Resource Management | |
| MGO-7131 | Industrial Relations & Labour Enactments |
| MGO-7132 | Global HRM |
| MGO-7133 | Negotiation & Counseling |
| Operations Management | |
| MGO-7141 | Project Management |
| MGO-7142 | Logistics and Supply Chain Management |
| MGO-7143 | Advanced Production and Operations Management |
| | |

| Semester-IV | | | | | | |
|---|---|---|---|---|---|---|
| **S.N.** | **Course Code** | **Course Name** | **Credit** | **Continuous Assessment Marks** | **Term End Exam Marks** | **Grand Total** |
| | | | | **Max.Marks** | **Max.Marks** | |
| 1 | MGO-7201 | Business Ethics and Corporate Governance | 4 | 30 | 70 | 100 |
| 2 | MGO-7202 | Global Business Management | 4 | 30 | 70 | 100 |
| 3 | Three courses from any one area of the specialization and specialization area will remain same in IIIrd and IV th Semester | | 4 | 30 | 70 | 100 |
| 4 | | | 4 | 30 | 70 | 100 |
| 5 | | | 4 | 30 | 70 | 100 |
| 6 | MGD-7200 | Dissertation | 4 | 0 | 100 | 100 |
| Total | | | 24 | 150 | 450 | 600 |

| **Any one specialization area to be opted in the IV Semester** | |
|---|---|
| Marketing | |
| MGO-7211 | Consumer Behavior & Marketing Communication |
| MGO-7212 | Marketing of Services |
| MGO-7213 | Sales and Distribution Management |
| Finance | |
| MGO-7221 | Corporate Financial Restructuring |
| MGO-7222 | Strategic Corporate Finance |
| MGO-7223 | Management of Working Capital |
| Human Resource Management | |
| MGO-7231 | Organization Development |
| MGO-7232 | Group and Team in Organization |
| MGO-7233 | Training and Development |
| Operations Management | |
| MGO-7241 | Total Quality Management |
| MGO-7242 | Service operation management |
| MGO-7243 | Management of Technology |

**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: Principles and Practices of Management

**Course Code: MGO-6101** **Credits: 4**

**Course Objective:** The main objective is to teach the students the main functions of management as they need a variety of skills to understand human behavior, communicate with people, motivate employees, adapt to changes, manage new technologies, etc.

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

| S. No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1. | Extrapolate basics of management theory and its practices. | Understand |
| 2. | Associate the functions of management. | Apply |
| 3. | Identify individual, group and organizational components of organizational behaviour. | Remember |
| 4. | Demonstrate skills related to work motivation and leadership. | Apply |
| 5. | Visualize importance of group management in changing work environment. | Understand |

**Block:I Introduction**
**Unit: 1** Introduction: Meaning, Nature and Scope of Management, Management Approaches, Processes and Functions,
**Unit: 2** Managerial Skills, Tasks and Responsibilities of a Professional Manager;
**Unit: 3** Evolution of Management Thought, Taylor and Fayol' contribution to Management, Bureaucracy, Hawthorne Studies; Management thinkers,

**Block:II Planning**
**Unit: 4** The Nature and Purpose of Planning, Management by Objectives, Strategies, Policies and Planning Premises. Forecasting.
**Unit: 5**Decision Making; Organizing: Nature & Purpose of Organizing. Span of Management,
**Unit: 6**Departmentation, Line/ Staff Authority & Responsibility, Effective Organizing & Organizational Culture, Organization Charts and Manuals.

**Block: III Staffing**
**Unit: 7** Staffing: Definition, Nature and Purpose of Staffing
**Unit: 8** Human Resource Management and Selection, Performance Appraisal and Career Strategy
**Unit: 9** Manager and Organization Development: Managing Change, Organizational Conflicts.

**Block: IV Leadership**
**Unit: 10** Leading: Managing and the Human Factor.
**Unit: 11**Motivation: Meaning, Scope and Importance, Approaches, Motivation and Performance, Approaches for Improving Motivation, Quality of Work Life;
**Unit: 12** Leadership: Definition, Ingredients, Approaches;
**Unit: 13** Communication: Function, Process and Barriers to Communication;
**Unit 14:**Directing- Meaning, Nature and Scope, Direction and Supervision.

**Block: V Controlling**

**Unit: 15** Controlling: Concept, the System and Process of Control, Control Techniques and IT, Productivity and Operations Control;

**Unit: 16**Controlling Methods: Budgetary and non- budgetary, Overall and Preventive Control.

**Unit: 17**The Quality Concept Factors affecting Quality, Developing a Quality Control System, Total Quality Control;

**Unit 18:**International Management: Towards a unified, global Management Theory.

**Text and Reference Books**

1. Essentials of Management: An International Perspective by Koontz &Weihrich, Tata McGraw Hill Education Private Limited, New Delhi.
2. Management (Text and Cases) by V.S.P. Rao and V Hari Krishna, Excel Books, New Delhi.
3. Principles and Practice of Management, L. M. Prasad, Sultan Chand & Sons, New Delhi.
4. Contemporary Management, Gareth R. Jones and Jennifer M. George, fifth Edition, Tata McGraw-Hill Education Private Limited, New Delhi.

## Course Name: MANAGERIAL ECONOMICS
## Course Code: MGO-6102 Credits: 4

**Course Objective:** The objective of this course is to enable the student to understand the different forms of markets. It is hoped that by the end of the course the student will be able to appreciate the subtle and the most fundamental issues involved in running the business.

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

| S.No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1. | Elaborate various theories and laws of Managerial Economics. | Understand |
| 2. | Visualizeconcepts related to demand, supply & revenue analysis. | Apply |
| 3. | Examine pricing decisions for various markets. | Apply |
| 4. | Identifyvarious market structures and plan business accordingly. | Apply |
| 5. | Demonstrate understanding of macroeconomic indicators and their impact on business. | Understand |

**Block I: Introduction to Managerial Economics**
**Unit 1:**Basic concepts and principles of Economics,
**Unit 2:** Introduction to Managerial Economics: Nature, Scope,
**Unit3:** Importance and Significance in decision making, Managerial Economist-Role, responsibilities and functions.

**Block II: Demand, Supply and Revenue Analysis**
**Unit 4:** Demand & supply analysis,
**Unit 5:** Consumer Preferences and choices.
**Unit 6:**Demand Elasticity;
**Unit 7:** Types & its relevance, demand forecasting, revenue analysis.

**Block III: Production & Cost Analysis**
**Unit 8:** Cost: Concepts, measurement & analysis,
**Unit 9:** Production Function & its managerial applications,
**Unit 10:** Cost curves: traditional & modern approach,
**Unit 11:**Production Function; Laws of returns.

**Block IV: Pricing Decisions & Profit Planning**
**Unit 12:** Market Structures, pricing under different market structures,
**Unit 13:** Perfect, imperfect and monopoly,
**Unit 14:**Break Even Analysis; Profit Planning;
**Unit 15:** Oligopoly (Cournot's model, kinked demand curve model, prisoner's dilemma).

**Block V: Macro Economics**
**Unit 16:**Concepts of national Income and methods of its measurement,
**Unit 17:** Inflation: Theories,
**Unit 18**: Introduction to business cycles

**Books Recommended/Suggested Readings:**

1. Geetika,PiyaliGhosh,Purba Roy Choudhury (Mc Graw Hill)
2. Mehta PL- Managerial Economics (Sultan Chand)

3. Dwivedi- Managerial Economics (Vikas)
4. Gupta- Managerial Economics (Tata McGraw-Hill)

## Course Name: ACCOUNTING FOR MANAGERS
## Course Code: MGO-6103 Credits: 4

**Course Objective:** The main objective of this course is to make the students familiar with fundamental concepts and process of accounting, significant tools & techniques of financial analysis which form an important part of management planning & financial control system and help the management in resolving problems effectively.

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

| S.No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1. | Elaborate various concepts related to Indian and International accounting. | Understand |
| 2. | Apply costing techniques for computing cost of products or services. | Apply |
| 3. | Demonstratevarious costing methods used in manufacturing and non-manufacturing concerns. | Understand |
| 4. | Analyze decisions related to make or buy for a particular input. | Analyze |
| 5. | Examine budgetary and financial statements. | Apply |

**Block I: Accounting Framework I (Introduction to Accounting)**
**Unit 1:** Introduction, Nature, scope and importance of Accounting, Book Keeping,
**Unit 2:** Accounting Process, Users of an Accounting information and their needs,
**Unit 3:** Accounting Equation, Role and Responsibilities of an Accountant; GAAP and Accounting Standards-Indian and international.

**Block II: Accounting Framework II (Accounting Books and Final Accounts)**
**Unit 4:** Preparation of Journal, Ledger, Trial balance,
**Unit 5:**Cash book & other subsidiary books,
**Unit 6:** Preparation of Trading, Profit & Loss A/c and balance Sheet (with adjustments),
**Unit 7:** Depreciation Accounting and
**Unit 8:**Preparation of BRS.

**Block III: Cost Accounting**
**Unit 9:** Meaning, importance of Cost Accounting,
**Unit 10:** Elements and classification of costs and Preparation cost sheet,
**Unit 11:** Inventory valuation.

**Block IV: Management Accounting**
**Unit 12:** Meaning, importance of Management Accounting,
**Unit 13:** Budgeting & Budgetary Control;
**Unit 14:** Preparation of Fixed & Flexible budget, Zero Based Budgeting.

**Block V**: **Financial Statements Analysis**
**Unit 15:** Meaning, importance of financial statement,
**Unit 16:** Ratio Analysis,
**Unit 17:**Preparation and Analysis of Fund Flow
**Unit18:** Cash Flow Statements according to AS-3.

**Books Recommended/Suggested Reading:**


1. Gupta, Shashi K. and Sharma R.K. (2008)- Accounting for Managerial Decisions, Kalyani Publications (Ludhiana)
2. Tulsian, P.C. (2009)- Financial Accounting, Tata McGraw Hill Publication, New Delhi
3. Shukla, S.M. (2009)- Advanced Accounting, SahityaBhawan Publication, Agra
4. Ramachandran, N. and Kakani, R.K. (2008)- Financial Accounting for Management, Tata McGraw Hill Publication, New Delhi

## Course Name: BUSINESS STATISTICS
## Course Code: MGO-6104 Credits: 4

**Course Objective:** To a greater extent, modern management is adopting and applying quantitative techniques to aid in the process of decision-making. An intelligent use of appropriate tools reduces highly complex problem to one of manageable dimensions. The course has been designed to develop familiarity with the application of statistical methods in managerial problem solving and decision-making.

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

| S.No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1. | Demonstrate an understanding of decision making process under uncertainty using statistical tools. | Understand |
| 2. | Explain correlation and regression analysis and their importance in decision making. | Understand |
| 3. | Visualize the concept of time series in business decision making. | Apply |
| 4. | Demonstrate an understanding of probability and probability distributions. | Understand |
| 5. | Explore application of Estimation Theory and Hypothesis Testing in business decision making. | Understand |

**Block I: Introduction**

**Unit 1:** Meaning, definitions of Statistical Data and Applications of Statistics in Managerial decision making

**Unit 2:** Frequency Distributions and Measures of Central Tendency: Mean, Median, Mode and their implications

**Unit 3:** Measures of Dispersion: Range, Quartile Deviation, Mean Deviation and Standard Deviation.

**Block II: Correlation and Regression**

**Unit 4:** Meaning and uses of correlation

**Unit 5:** Meaning and uses of regression.

**Unit 6:** Various methods of calculation of Coefficient of correlation and their analysis (Two Variable)

**Unit 7:** Regression analysis.

**Block III: Analysis of Time Series**

**Unit 8:** Concept of Time Series analysis, Additive and Multiplication model

**Unit 9:** Seasonal variation and Cyclical Variation

**Unit 10:** Various methods of Time Series Analysis and their applications in business.

**Block IV: Probability**

**Unit 11:** Concept of probability and its uses in business decision-making

**Unit 12:** Addition, multiplication theorem of probability and Binomial theorem

**Unit 13:** Probability Distribution: Concept and applications of Binomial, Poisson and Normal Distribution.

**Block-V: Estimation Theory and Hypothesis Testing**

**Unit 14:** Sampling theory

**Unit 15:** Estimation Theory and Hypothesis Testing

**Unit 16:** t-test and Z-test

**Unit 17:** F-test and ANOVA

**Unit 18:** Chi-Square test

**Text and Reference Books**

1. Business Statistics, 3 rd Edition, JP Sharma, Pearson Publishing

2. Statistics for Management - Richard Levin, Pearson Publishing

1. 3. Statistics for Management - G.C. Beri, Tata McGraw-Hill Education, 2010 4. Statistical Methods - Gupta S. P, Sultan Chand & Sons, 2002.

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## Course Name: COMMUNICATION FOR MANAGEMENT

## Course Code: MGO-6105 Credits: 4

**Course Objective:** The objective of this course is to equip students with the written and technical communication skills they need to communicate effectively in a complex and ever-changing contemporary work environment.

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

| S.No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1. | Elaborate basic forms of communication & various communication models. | Understand |
| 2. | Demonstrate verbal and non-verbal communication ability through presentations. | Understand |
| 3. | Explore various forms of modern communication in business communications. | Apply |
| 4. | Identify appropriate methods of report writing. | Apply |
| 5. | Demonstrate understanding of various tools of organizational communication. | Understand |

**Block I:Introducing Business Communication**

**Unit 1:** Basic forms of communication; Self Development and Communication Development of positive personal attitude
**Unit: 2** Communication models and processes; Self Development and Communication Development of positive personal attitude; Corporate
**Unit3:** Audience analysis Principles of effective communication, formal and informal communication networks, Grapevine, miscommunication (barriers).

**Block II: Effective listening**

**Unit 4:** Principles of effective listening; Factors affecting listening exercise;
**Unit 5:** Oral, written and video sessions.
**Unit 6:** Modern forms of communicating:
**Unit 7:** Fax: E-Mail; Video conferencing etc. nonverbal aspects of communication, Kinesics, Proxemics, Para language, sign language.

**Block III: Writing skills**

**Unit 8:** Planning business message; rewriting and editing; the first draft; reconstructing the final draft.
**Unit 9: Business** letters; Appearance of request letters; Good news and bad news letters; Persuasive letters;
**Unit 10:** Sales letters; Collection letters; Office memorandum, notice and circular.
**Unit 11:** Writing resume and letter of application.

**Block IV:Report writing**

**Unit 12:** Introduction to a proposal, short report and formal report, report preparation,
**Unit 13:** Sales presentation, training presentation,

**Unit 14:** Conducting surveys, speeches to motivate.

**Block V:Practices in business communication**

**Unit 15:** Group discussions; Mock interviews; Seminars; Effective listening exercises;
**Unit 16:** Individual and group presentations, Oral presentation:
**Unit 17:** Principles of oral presentation, Factors affecting presentation,
**Unit 18:** Interviewing skills: Appearing in interviews; conducting interviews

**Books Recommended/Suggested Reading:**


1. Bovee and Thill- Business communication today; Tata McGraw Hill
2. Ronald E. Dulek and John S.Fielder- Principles of business communication; McMillan
3. Randall E.Magors- Business communication :Harper and Row
4. Balasubramanyam- Business communications; Vikas Publishing House.

# Semester-II

## Course Name: Entrepreneurship and SMEs Management

**Course Code: MGO-6201** **Credits: 4**

**Course objectives:** The main objectives of the course are to familiarize students with various concepts used in understanding processes involved in entrepreneurship and business formation and development. Provide context to those processes in the form of differences between small and large firms, and the economic environment.

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

| S.No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1. | Elaborate fundamentals of entrepreneurship and entrepreneurial process. | Understand |
| 2. | Explain various theories of entrepreneurship. | Understand |
| 3. | Design business plans. | Apply |
| 4. | Describe MSME registration process and MSME promotional policies. | Apply |
| 5. | Explain various concepts related to International Business. | Understand |

**Block I: Entrepreneurship: A Conceptual Framework**

**Unit 1:** Introduction: Concept of Entrepreneurship; Role of entrepreneurship in economic Development;
**Unit 2:** Factors impacting emergence of entrepreneurship; Managerial vs. entrepreneurial approach; Intrapreneurship.
**Unit 3**: Types of Entrepreneurs. Characteristic of successful entrepreneurs; Entrepreneurship process;
**Unit 4:** Women Entrepreneurs; Social entrepreneurship; Entrepreneurial challenges.

**Block II: Entrepreneurial Growth:**

**Unit 5:**Role of Entrepreneurship in Economic Development, Entrepreneurial Theories; Factors affecting entrepreneurial growth
**Unit 6:** Entrepreneurial Challenges; New Product
**Unit 7**: Development and Growth Strategies for Entrepreneurial ventures.

**Block III: New Ventures Planning**

**Unit 7:** Ownership Structures; Acquisition; Franchising, Marketing plan,
**Unit 8:**Marketing research, Marketing Mix; Business Plan-benefits of drivers
**Unit 9:** Perspectives in business plan preparation, elements of a business plan.

**Block IV: MSME Registration and Promotion**

**Unit 10:** MSME registration, MUDRA Loan,Start-up India.
**Unit 11:**Make In India, Institutional Finance to Entrepreneurs
**Unit 12:**MSME and Economic Development,
**Unit 13:** Institutional Support for Small Enterprises.

**Block V: International Entrepreneurship:**

**Unit 14:** Export Business Registration, Intellectual Property Protection- Patents,
**Unit 15:** Trademarks and Copyrights – importance for start-ups,
**Unit 16:** Legal acts governing business in India;
**Unit 17:** International entrepreneurship- opportunities and challenges,
**Unit 18:** Export Documentation in India.

**Books Recommended/Suggested Reading:**


1. Drucker, Peter. Innovation and Entrepreneurship. East-West Press (P) Ltd
2. Holt, David H. Entrepreneurship-New Venture Creation. Prentice Hall
3. Hisrich, Robert D and Peters, Michael P. Entrepreneurship: Starting, Developing and Managing a New Enterprise, Prentice Hall
4. Desai, Vasant: Small Scale Industries and Entrepreneurship. Himalaya
5. Gupta,C.B. and Srinivasan. Entrepreneurial Development in India. Sultan Chand
6. Pareek, Udai and Venkateswara Rao, T. Developing Entrepreneurship- A Handbook on Learning Systems

# Course Name: Business Environment

## Course Code: MGO-6202 Credits: 4

**Course Objective:**
To analyze the overall business environment and evaluate its various components in business decision making.

**Course Outcome:** At the end of the course student would be able to;

| S. No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1 | Visualize various environmental factors that affect business. | Understand |
| 2 | Diagnose impact of various governmental policies on Business**.** | Analyze |
| 3 | Evaluate impact of socio-cultural environment on Business. | Analyze |
| 4 | Elaborateimpact of political-legal environment on Business. | Understand |
| 5 | Identify role of multilateral institutions in facilitating world trade. | Understand |

**Block I: Theoretical Framework of Business Environment**
**Unit 1:** Concept, Significance, of Business Environment
**Unit 2:** Nature, Elements & Dimensions;
**Unit 3:** Environmental Scanning and Monitoring.

**Block II: Economic Environment of Business**
**Unit 4:** Significance and Elements; Economic Systems; Economic planning in India; Government Policies- Industrial,
**Unit 5:** Fiscal, Monetary, EXIM; Public Sector and economic development; Development banks and its relevance to Indian business;
**Unit 6:** Economic Reforms, Liberalization and structural adjustment programmes;
**Unit 7:**Regulation of Financial Markets, SEBI.

**Block III: Political and Legal Environment of Business**
**Unit 8:** Critical elements; Government and business;
**Unit 9:** Changing dimensions of political and legal environment in India;
**Unit 10:** MRTP Act, Competition Act, FEMA and licensing policy
**Unit 11:**Consumer Protection Act.

**Block IV: Socio-cultural Environment**
**Unit 12:** Social institutions, systems, values, attitudes, groups, etc;
**Unit 13:** Dualism in Indian society and problems of uneven income distribution;
**Unit 14:** Rural sector in India; Social Responsibility of Business; Consumerism in India.

**Block V: International and Technological Environment**
**Unit 15:** Multinational Corporations; Foreign collaborations and Indian business; NRIs and Corporate sector
**Unit 16:** International Economic Institutions- WTO, World Bank, IMF and their importance to India;

Foreign trade Policies;

**Unit 17:** Impact of Rupee devaluation; Technological environment in India; Policy on research and development

**Unit 18:**Intellectual Property Rights; Technology transfer.

**Books Recommended/Suggested Reading:**


1. Adhikari, M- Economic Environment of Business, Sultan Chand & Sons
2. Alagh, Yoginder K- Indian Development, Planning and Policy, Vikas Publication
3. Aswathappa, K- Legal Environment of Business, Himalaya Publication
4. Chakravarty, S- Development Planning, Oxford University Press
5. Ghosh, Biswanath- Economic Environment of Business, Vikas Publication, New Delhi
6. Govt. of India- Economic Survey
7. Raj Agarwal and ParagDiwan, Business Environment; Excel Books
8. Cherunilam, Francis- Business Environment, Macmillan

## Course Name: Research Methodology
## Course Code: MGO-6203 Credits: 4

**Course Objectives:**The objectives of this course are-
To familiarize students with basic of research, research process and enable the participants in conducting research work and formulating research synopsis and report.

**Course Outcome:** At the end of the course student would be able to;

| S. No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1 | Elaborate various concepts related to Research. | Understand |
| 2 | Enumerate various kinds of research design & process | Apply |
| 3 | Developadequate knowledge on measurement & scaling techniques as well as the quantitative data analysis. | Apply |
| 4 | Demonstratevarious techniques of data analysis-and hypothesis testing procedures. | Understand |
| 5 | Articulate appropriate research ethics for doing meaningful research. | Understand |

**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,
**Unit 5:**Concept of sample, Sample size, Various types of sampling techniques.
**Unit 6:** Types of Data and Methods of its Collection**;** Questionnaire Design,
**Unit 7:** Precautions in preparation of questionnaire, Measurement scales.
**Block III: Data Analysis and Interpretation-1**

**Unit 8:** Processing and Analysis of Data by application of statistical tools,
**Unit 9:** Various kinds of charts and diagrams used in data analyses
**Unit 10:** Application of Data Analysis**.**

**Block IV: Data Analysis and Interpretation-2**

**Unit 11:** Hypothesis Testing (F-test, ANOVA, Chi –square test, t-test) ,
**Unit 12:** Multivariate Statistical techniques- Multiple regression,discriminate analysis,
**Unit 13:**Factor analysis, Multivariate analysis of variance,
**Unit 14:** 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 15:** Report Writing, Significance of report writing, Steps in report writing,
**Unit 16:** Layout of research report, Types of reports; Appendices;
**Unit 17:** Bibliography, Characteristics of a good report; Precautions for report writing

**Unit 18:**Ethics in business research.

**Books Recommended/Suggested Reading:**

1.Kothari CR- Research Methodology, New Age Publication
2.Panneerselvam R- Research Methodology (PHI)
3.Cooper, Donald, Schindler, Pamela- Business Research (TMH)
4.Bill Taylor, Gautam Sinha, TaposhGhoshal- Research Methodology (PHI)

## Course Name: Business Laws
## Course Code: MGO-6204 Credits: 4

**Course Objective:** To acquire knowledge and understanding of major business, commercial and economic laws. The aim of this course is not just to teach Legal Regulatory framework, but to develop students in such a way that they equip with appropriate skills in legal requirements for managing business.

**Course Outcome:** At the end of the course student would be able to;

| S. No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1 | Elaborate clear understanding for contracts and subsequently enter valid business propositions | Understand |
| 2 | Articulate legitimate rights and obligations under sale of goods Act, 1930. | Understand |
| 3 | Enumerate various legitimate rights and obligations under Negotiable Instrument Act | Analyze |
| 4 | Acquire skills to initiate entrepreneurial ventures as LLP or other new form of organisation which are widely used across the globe | Understand |
| 5 | Attain insights into various company proceedings through Companies Act-1956 & Company Act-2013 | Apply |

**Block I: Contract Act, 1872**

**Unit 1:** Definition & Classification of Contract, Essential elements of a Valid Contract,
**Unit 2:** Quasi Contract – Various Forms,
**Unit 3:** Contingent contract,
**Unit 4:** Discharge & Breach of Contract, Remedies of breach of contract.

**Block II: Sales of Goods Act, 1930**

**Unit 5:** Contract of sale of Goods-Meaning, Essentials, etc.
**Unit 6:** Provisions relating to Conditions and Warranties, Provisions relating to Transfer of Property
**Unit 7:** Ownership, Provisions relating to Performance of Contract of Sale- Rights and duties of Unpaid Seller and Buyer.

**Block III: The Negotiable Instruments Act, 1881**

**Unit 8:** Negotiable Instruments- Meaning, Characteristics, Types, Parties- Holder and Holder in Due Course;
**Unit 9:** Negotiation and types of endorsements, Dishonour of Negotiable Instruments and Overdue Instrument,
**Unit 10:** Banker and Customer- Crossing of Cheques, Obligations of a Banker & a Customer, Bouncing of Cheques, Liabilities of parties.

**Block IV: Partnership Act, 1932**

**Unit 11:** Definition, Formation, Types and Registration of Partnership,
**Unit 12:** Kinds, Rights and liabilities of Partners, Minor's Status in Partnership Firm,

**Unit 13:** Dissolution of Partnership Firm.

**Block V: The Companies Act, 1956 & 2013**

**Unit 14:** Company- Definition, Meaning, Features and Types,
**Unit 15:** Incorporation of a Company- Memorandum & Articles of Association and their Alteration;
**Unit 16:** Prospectus, Management of company- Directors and Meetings,
**Unit 17:**Share capital-Account and Audit,
**Unit 18:**Winding up of companies.

**Books Recommended/Suggested Reading:**


1. Kuchhal, M.C. (2007). Business Law,Vikas Publishing House, New Delhi.
2. Tulsian, P.C. (2007). Business Law, Tata McGraw-Hill Publications, New Delhi.
3. Kuchhal, M.C. (2007). Mercantile Law,Vikas Publishing House, New Delhi.
4. Singh Avtar (2008). Mercantile Law, Eastern Book Company, Lucknow.
5. Kapoor, N.D. (2008).**Elements**of Mercantile Law, Sultan Chand & Sons Educational Publishers, Delhi.

## Course Name: Human Resource Management
## Course Code: MGO-6205 Credits: 4

**Course Objective:** The objective of the course is to familiarize the students about the different aspects of managing people in the organizations from the stage of acquisition to development and retention.

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

| S. No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1 | Elaborate HRM and the role of HRM in effective business administration. | Understand |
| 2 | Identify the role that HRM has to play in manpower planning, job analysis and forecast the human resource requirements. | Apply |
| 3 | Explain role of recruitment and selection in relation to the organization's business and HRM objectives. | Understand |
| 4 | Identify job-based compensation scheme and performance management system and appraisals. | Apply |
| 5 | Visualize emerging horizons of HRM and also enduring international HRM, e-HRM, HRIS. | Understand |

**Block I: Introduction:**

**Unit 1:** Conceptual foundations; Human aspect of management; Human resource Management- concept, scope and importance;
**Unit 2:** Competencies of HR manager- employer branding and competency mapping;
**Unit 3:** Changing role of HRM- workforce diversity, Technological change, restructuring and rightsizing, empowerment; TQM.
**Unit 4:** Management of ethics.

**Block II: Human Resource Planning, Job Analysis, and Job Design:**

**Unit 5:** Assessing human resource requirements; Human resource forecasting;
**Unit 6:** Work load analysis; Job analysis; Job description and specifications;
**Unit 7:** Job design; Job characteristic approach to job design.

**Block III- Recruitment, Selection, Training, and Development:**

**Unit 8:** Factors affecting recruitment; Sources of recruitment (internal and external);
**Unit 9:** Basic selection model; Psychological tests for selection; Interviewing; Placement and induction;
**Unit 10:** Job changes- Transfers, Promotions, and Separations;
**Unit 11:** An overview of training and development; Emerging trends in recruitment, selection, and development.

**Block IV- Compensation Management, Performance Appraisal, and Audit:**

**Unit 12:** Compensation Management- Job evaluation, base compensation and supplementary compensation;
**Unit 13:** Innovations in compensation management- Pay band system, ESOP; Performance appraisal-

concept, traditional and modern methods-
**Unit 14:** MBO, 360degree appraisal, 720degree appraisal, behaviourally anchored rating scale, balanced scorecard; Potential appraisal.

**Block V- Emerging Horizons of HRM**

**Unit 15:** International HRM, challenges of international HR managers; Green HRM; E-HRM; HRIS (Human Resource Information System);
**Unit 16:** Human resource audit;
**Unit 17:** Contemporary issues in human resource management
**Unit 18:**Moonlighting phenomenon, employee engagement, flexi timing, psychological contract, managing protean career, layoffs.

**Books Recommended/Suggested Reading:**


1. John Storey- Human Resource Management, Thomson Learning
2. R.S. Dwivedi- Managing Human Resources, Galgotia Publishing Company
3. Gary Dessler- Human Resource Management, Pearson Education
4. Aswathapa- Human Resource & Personnel Management, Tata McGraw Hill
5. Randy. L. Desimone, Jon & David Harris- Human Resource Development, Thomson.

# Semester-III
# Course Name: Strategic Management

## Course Code: MGO-7101 Credits: 4

**Course Objective:** To expose students to various perspectives and concepts in the field of Strategic Management. The course would enable the students to understand the principles of strategy, formulation, implementation and control in organizations.

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

| S. No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1 | Elaborate the basic concepts and principles of strategic. | Understand |
| 2 | Identify organizational strategies that will be effective in dynamic business environment. | Apply |
| 3 | Demonstrate effective application of concepts, tools & techniques to practical situations for diagnosing and solving organisational problems. | Understand |
| 4 | Acquirecapability of making own decisions in dynamic business landscape | Apply |
| 5 | Visualize various strategies for managing global competition. | Understand |

**Block I: Strategy-Introduction**

**Unit 1:** Concept, Levels at which strategy operates; Approaches to strategic decision making; Mission and Purpose,

**Unit 2:** Objectives and Goals; Strategic Business Units (SBUs);

**Unit 3**: Environmental Analysis & Diagnosis**:** Environment and its components;

**Unit 4:** Environmental Scanning & Appraisal; Organizational Appraisal; Strategic Advantage Analysis and Diagnosis.

**Block II: Strategy and Structure**

**Unit 5:** Structural considerations, Structures for strategies; Organizational design and change.

**Unit 6:** Functional Strategies-Marketing, Production& Operations, Personnel,

**Unit 7:** Financial, R&D plans and policies.

**Block III: Strategy Formulation and Choice of Alternatives**

**Unit 8:** Strategies- modernization, diversification, integration;

**Unit 9 :** Merger, take-over and joint strategies;

**Unit 10:** Turnaround, divestment and liquidation strategies;

**Unit 11:** Process of strategic choice, competitor and SWOT analysis;

**Unit 12:** Factors affecting; Generic competitive strategies- cost leadership, differentiation, focus, value chain analysis.

**Block IV: Strategy Implementation**

**Unit 13:** Inter-relationship between formulation and implementation,

**Unit 14:** Issues in strategy implementation; Resource allocation,

**Unit 15:** Strategy Evaluation & Control: Overview and Techniques.

**Block V: Global Issues in Strategic Management**

**Unit 16:** Global challenges, Advantages & Disadvantages of international operations,

**Unit 17:** Communication differences across countries, worldwide tax rates & their impact,

**Unit 18:** Participation of international institutions for international business.

**Books Recommended/Suggested Reading:**


1. Bhattacharya, S.K. and N. Venkataraman- Managing Business Enterprises: Strategies, Structures and Systems, Vikas Publishing House
2. Budhiraja, S.B. and M.B. Athreya- Cases in Strategic Management, Tata McGraw Hill
3. Coulter, Mary K- Strategic Management in Action, Prentice Hall
4. David, Fred R- Strategic Management, Prentice Hall

# Course Name: Organizational Behavior

## Course Code: MGO-7102 Credits: 4

**Course Objective:** The objective of the course is to enable students to develop a theoretical understanding about organization structure and its behavior over time. The course will also make them capable of realizing the competitiveness for firms.

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

| Course Outcome | **Cognitive level** |
|---|---|
| **CO1:** Understand the concepts of organizational behaviour and its relation with business management. | Understand |
| **CO2:** Explain concepts of individual behaviour i.e. perception, attitude etc. | Explain |
| **CO3:** Demonstrate process involved in group behaviour i.e. group dynamics, group decision making etc. | Demonstrate |
| **CO4:** Describe the methods of leadership of a successful business owner/ manager. | Describe |
| **CO5:** Explain the organization system and process for smooth business operations. | Explain |

**Block- I- Introduction:**

**Unit-1:** Emergence of organizational behavior;

**Unit-2:** Management and OB; Hawthorne studies and human relations school;

**Unit-3:** Challenges and opportunities for organizational behavior;

**Unit 4 :** Positive organizational behaviour.

**Block- II- Individual Behavior:**

**Unit-5:** Foundations of individual behavior; Perception; Attribution;

**Unit-6:** Personality; Attitude; Learning and Values;

**Unit-7:** Motivation – theoretical and practical dimension.

**Unit-8 :** Various theories of motivation

**Block- III- Group Behavior:**

**Unit-9:** Group dynamics; Cohesiveness and productivity;

**Unit-10:** Group decision making; managing organizational conflict;

**Unit-11:** Managing misbehavior at work.

**Block- IV- Leadership:**

**Unit-12:**Influence, Power and Politics;

**Unit-13:** Leadership

**Unit-14:** Theoretical and practical dimension.

**Unit-15:** Various theories of Leadrship

**Block- V- Organization System & Processes:**

**Unit-16:** Organization Structure – foundation and types;

**Unit-17:** Climate and Ethos;

**Unit-18:** Communication; Organizational effectiveness & performance, managing change.

**Books Recommended/Suggested Reading:**

1. Robbins, Stephen P. and Timothy A. Judge, Organizational Behaviour, Prentice -Hall, New Delhi.
2. Robins S.P., and Mathew, M, Organisational Theory: Structure, Design and Application, Prentice Hall of India Pvt. Ltd.
3. Luthans, Fred, Organizational Behaviour, McGraw-Hill, New York.
4. Sekaran, Uma, Organisational Behaviour: Text and Cases, Tata McGraw-Hill Publishing Co. Ltd.

## Course Name: Marketing Management
## Course Code: MGO-7111 Credits: 4

**Course Objective:**
The objective of this course is to train participants to apply concepts and techniques in marketing so that they become acquainted with the duties of a marketing manager. More specifically, they will be exposed to the development, evaluation, and implementation of marketing management in a variety of business environments.

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

| S.No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1. | Elaborate various concepts related to marketing. | Understand |
| 2. | Explain concepts related to Marketing Mix. | Apply |
| 3. | Demonstrate process involved with product planning and price determination. | Apply |
| 4. | Describe process involved with promotion and distribution strategy. | Analyze |
| 5. | Explore contemporary issues in marketing. | Understand |

**Block I: Introduction**

**Unit 1:** Nature & Scope of Marketing, evolution of Marketing,

**Unit 2:** Marketing Environment. Segmentation,

**Unit-3**: Targeting and Positioning & Differentiation Strategies,

**Unit 4:** Marketing Organizations, Marketing Research

**Block II: Product Management**

**Unit 5:** Product, product levels, classifying products,

**Unit 6:** New Product Development, Product Differentiation,

**Unit 7:** Product Life Cycle, Branding, types of branding,

**Unit-8:** Packaging & labelling

**Block III: Pricing and Distribution**

**Unit 9:** Concept of Pricing, Relationship between pricing and product cost,

**Unit 10:** Pricing objectives Pricing Policies and Methods,

**Unit 11:** Distribution Channel Management, Intermediaries,

**Unit-12:** channel structure, managing relationships in the channel.

**Block IV: Promotion Mix decision**

**Unit 13:** Marketing Communication, Advertising;

**Unit 14:** Sales Promotion, Publicity & Personal Selling,

**Unit 15:** Public Relations and Direct Marketing.

**Block V: Emerging Trends in Marketing**

**Unit 16:** Marketing Ethics, (e-) marketing; (e-) services; (e-) Customer Relationship

**Unit 17:** Management; viral marketing,

**Unit 18:** Ambush marketing, green marketing.

**Books Recommended/Suggested Reading:**


1. Baines, Fill Page and Sinha; Marketing 2013
2. Marketing Management – Philip Kotler (Pearson)
3. Fundamentals of Marketing – Stanton
4. Marketing Management – V S Ramaswamy and S Namakumari (Macmillan)

## Course Name: E-Marketing
## Course Code: MGO-7112 Credits: 4

**Course Objective:** This course is designed to impart the students with the knowledge, concepts and skills needed in marketing through digital channels. The course seeks to familiarize the participants with the concepts and techniques applicable to digital marketing. The aim of this course is not just to teach E-Marketing but to develop students in such a way that they equip with adequate skills in E-Marketing for managing business.

**Course Outcomes:** The successful completion of this courseshall enable the student to:

| S. No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1 | Enumerate basic difference and similarities between non-digital and digital marketing | Understand |
| 2 | Examine consumer behaviour towards digital media. | Apply |
| 3 | Identify and develop digital strategies for Digital Market | Apply |
| 4 | Explain basic concepts of social media marketing. | Understand |
| 5 | Identify various tools for social media, web analytics | Understand |

**Block I: Internet penetration and E-marketing**

**Unit 1:** Characteristics of Internet: Web 1.0, Web 2.0 and Web 3.0; Social media;

**Unit 2:**Similarities and differences between online and offline marketing;

**Unit-3:** Internet Marketing in India;

**Unit 4:**Business response to emerging digital revolution; Digital devices, platforms, media, data and technology.

**Block II**: **Digital marketing strategy; Digital conversion funnel:**

**Unit 5:** Customer acquisition, conversion and retention;

**Unit 6:** Acquisition: search engine optimization; paid advertising, search advertising, display advertising,

**Unit 7:** Social media marketing, email marketing; measuring success of search engine optimization,

**Unit-8:** Mapping search engine journey; on page and off page search engine optimization.

**Block III: Online consumer behaviour: decision making process;**

**Unit 9:** Problem recognition, information search, evaluation, choice and post purchase behaviour;

**Unit 10:** Online consumer segmentation; online marketing mix;

**Unit 11:**Consumer segments and targeting; User experience.

**Block IV:Social Medial analytics: data type and collection**,

**Unit 12:** Structured and semi-structured data, social media metrics, social medial ROI,

**Unit 13:** Social networks and social network analysis; Social media analytics with unstructured data: text mining,

**Unit 14:** Social customer relationship management,

**Unit-15:** Text mining for communication and reputation management; Big data, Internet of things.

**Block V: Mobile Marketing, E-marketing; Internet marketing strategy: content marketing**

**Unit 16:** Mobile Marketing,

**Unit 17:** E-marketing;

**Unit 18:** Internet marketing strategy: content marketing.

**Suggested Readings:**

1. Aslam K (2017). The 7 Critical Principles of Effective Digital Marketing. Arizona: Scottsdale, The Stone Soup Hustler Publication.
2. Bly R.W. (2018). The Digital Marketing Handbook. Entrepreneur Press.
3. Giovannoni, E (2018). The Digital Marketing Planning. Brisbane: Chasefive.com.
4. Maity, M (2017). Internet Marketing. New Delhi: Oxford University Press
5. Rayan D and Russ, H (2017). Digital Marketing for Dummies. NJ: John Wiley.

## Course Name: Retail Management
## Course Code: MGO-7113 Credits: 4

**Course Objective:** The main objective of course is to providing insights on retail operations. This will enable the students to become good retail planners and decision makers and help focus on change and adaption to change.

**Course Outcomes:** The successful completion of this course shall enable the student to:

| S. No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1 | Identify the basic concepts related to functioning of retail sector in India | Understand |
| 2 | Elaborate main drivers of growth in retail industry of India | Understand |
| 3 | Analyse issues relating to situational analysis in retail industry in India. . | Apply |
| 4 | Explain various strategies of managing retail business in India. | Understand |
| 5 | Visualize various issues emerging in international retailing. | Analyze |

**Block I: Introduction**

**Unit 1:** Overview, Evolution of Retailing, cycle of Retailing, Functions of retailing;

**Unit 2:** Building and sustaining relationships, Structural change, Retailing Market structure,

**Unit 3:** Planning and development, process, Drivers for growth in retail.

**Block II: Situational analysis**

**Unit 4:** Types of retail outlets: Retail institutions by ownership,

**Unit-5:** Store-based strategy mix; non-store-based, and other forms of nontraditional retailing,

**Unit 6:** Targeting customers and gathering information; Communicating with customers; Promotional strategies,

**Unit 7:** Affecting factors in communication for growth, Choosing a store

location:

**Unit-8:** Trading-area analysis; Site selection; Store design and layout-Objectives.

**Block III: Managing retail business**

**Unit 9:** Importance of HRM in retailing,

**Unit 10**: Retail organization and HRM; Operations management: financial and operations dimensions;

**Unit 11**: Managing retail services; Service characteristics;

**Unit-12:** Value and lifestyle profiles of Indian shoppers.

**Block IV: Delivering the product**

**Unit 13:** Retail Information Systems; Merchandise management, developing and implementing plans,

**Unit 14:** People in retailing, Merchandise plans for basic stock,

**Unit 15:** Negotiation in retail, display of merchandise, pricing, Factor affecting in price setting, Bases of pricing.

**Block V: International retailing**

**Unit 16:** Internationalization and Globalization; Shopping at World stores; Going International;

**Unit 17:** The Internationalization process; Culture, business and international management, FDI in retails,

**Unit 18:** Retailing in US and India, Importance of culture for retailing at global level.

**Books Recommended/Suggested Reading:**


1. Berman B and Evans J R- Retail Management (Pearson Education)
2. Michael Lervy M and Weitz B W- Retailing Management (Tata McGraw-Hill)
3. Newman A J and Cullen P- Retailing: Environment and Operations (Vikas)
4. Varley R and Rafiq M- Principles of Retail Management (Palgrave)
5. LaMBA- The Art of Retailing (Tata McGraw-Hill)

## Course Name: Financial Management
## Course Code: MGO-7121 Credits: 4

**Course Objectives:**
To help the students to develop cognizance of the importance of Financial Management in corporate valuation.

**Course Outcome:** At the end of the course student would be able to;

| S. No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1 | Elaborate the core concepts and techniques of financial management. | Understand |
| 2 | Enumerate various techniques related to valuation of assets. | Apply |
| 3 | Demonstrate ability to conduct discounted cash flow analysis and estimate a company's cost of capital. | Understand |
| 4 | Evaluate various Capital Structure Theories and Policies for business decisions. | Understand |
| 5 | Analysis of working capital needs of the company | Analyze |

**Block I: Nature of Financial Management**

**Unit 1:** Scope of Finance; Finance Function; Finance Manager's role;

**Unit 2:** Role of Finance Manager; Financial Goal:

**Unit 3:** Profit Maximization V/s Wealth Maximization;

**Unit-4:** Agency Problem; Emerging role of Finance Manager

**Block II: Valuation**

**Unit 5:** Time Preference for money; Future Value; Sinking Fund; Present Value;

**Unit 6:** Valuation of Bonds and Shares: Basics of Bond Valuation,

**Unit 7:** Valuation of ordinary Shares, Valuation of Preference Share;

**Unit-8:** Linkages between Share Price, Earning and Dividends.

**Block III: Cost of Capital, Operating, Financial Leverage and CoMBIed Leverage**

**Unit 7:** The concept of opportunity cost of capital; Cost of Debt,

**Unit-8:** Preference Capital and Equity Capital;

**Unit 9:** The weighted Average Cost of Capital; CAPM V/s Dividend Growth Model;

**Unit 10:** Financial, operating and CoMBIed Leverage- Concept and Measurement.

**Block IV: Capital Structure Theories and Policy**

**Unit 11:** Relevance of Capital Structure: NI and Traditional approach;

**Unit 12:** Irrelevance of Capital Structure: NOI Approach and MM hypothesis without taxes;

**Unit 13:** The trade off theory; Determinants of an appropriate Capital structure,

**Unit-14:** Dividend Theory and Policy.

**Block V: Management of Working Capital & Inventory Management**

**Unit 15:** Meaning, significance and types; Methods of assessing Working Capital requirements;

**Unit-16:** Classification of working capital

**Unit 17:** Norms of Bank Finance; Sources of Working Capital and factors affecting it;

**Unit 18:** ABC Analysis, EOQ Model, Safety Stock, Lead Time, etc.

**Books Recommended/Suggested Reading:**


1. Pandey, I.M ; Financial Management, Vikas Publishing House, New Delhi
2. Tulsian, P.C ; Financial Management, S. Chand & Co, Delhi
3. Chandra, Prasanna (2008)- Financial Management, Tata McGraw Hill, New Delhi
4. Khan & Jain: Financial Management, Tata McGraw Hill, New Delhi
5. Brealey, Richard A and Steward C. Myers (2006)- Corporate Finance, McGraw Hill


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## Course Name: Security Analysis & Portfolio Management

**Course Code: MGO-7122** **Credits: 4**

**Course objectives:** To provide insight about the relationship of the risk and return and how risk should be measured to bring about a return according to the expectations of the investors and Portfolio management practices in India. Also, to familiarize the students with the fundamental and technical analysis of the diverse investment avenues.

**Course Outcome:** After completing the course, the student shall be able to:

| Course Outcome | Cognitive level |
|---|---|
| 1: Describe the Investment concept. | Understand |
| 2: Discuss the Fixed Income Securities | Analyze |
| 3: Describe the fundamental analysis | Understand |
| 4: Explain the technical analysis. | Evaluate |
| 5: Know the basic concepts of Portfolio Analysis and Selection | Understand |

**Block-I Investment Concepts**

**Unit-1:** Investment Styles- Active and Passive Investment Styles; Momentum, Growth and Value

**Unit-2:** Speculation; Gambling; Shorting; Trading; Hedging; Diversification;

**Unit-3:** Immunization; Arbitrage; Leveraging; margin Trading; ethical Investment

**Block-II Fixed Income Securities**

**Unit-4:** Bond Prices and Yields- Present Value Model of bond valuation,

**Unit-5:** Different bond- yield and return measures, The yield curve- Types,

**Unit-6:** Interpretation and factors affecting it,

**Unit-7:** Theories related to yield curve, Duration and fixed income derivatives

**Block-III Fundamental Analysis**

**Unit-8:** Perfect Capital Markets; Efficient Market Hypothesis;

**Unit-9:** Top- down V/s Bottom- up approach of fundamental analysis,

**Unit-10:** Economic Analysis- Main Macro Economic Variables, business cycles, Inter- Industry and Inter- Firm analysis; Industry Analysis- Industry Life Cycle,

**Unit-11:** Effect of business cycles on industries, Role of external factors, Demand- Supply

analysis,

**Unit-12:** Role of Pricing practices, Key factors of success, major types of risk faced by business

**Block-IV Technical Analysis**

**Unit-13:** Basic Philosophy, The Dow Theory, Select major chart patterns- Japanese Candlestick Charting,

**Unit-14:** Reversal Pattern in Japanese Candlestick Charting, Head and Shoulder Pattern, Double Top Formation, Rounding Top Formation,

**Unit-15:** Bar Charts, Points and Figure Charts, Relative Strength Index, Bollinger Bonds, Elliot Wave Theory, Candlestick analysis

**Block-V Portfolio Analysis and Selection**

**Unit-16:** Portfolio Possibilities Curve, Efficient Frontier, Single Index Model, Multi Index Model,

**Unit-17:** Constructing the optimal portfolio using single index model, single index with shorting and constant correlation model,

**Unit-18:** Role of skewness, Beta (β), Capital Asset Pricing Model- Efficient Portfolios, other portfolios, CAPM assumptions, Arbitrage pricing model

**Books Recommended/Suggested Reading:**


1. Amling: Fundamentals of Investment Analysis, Prentice Hall
2. Bhalla: Investment Analysis, S. Chand & Co
3. Chandratre, K.R. Capital Issue, SEBI & Listing, Bharat Publishing House
4. Fabozzi, Frank J: Investment Management, Prentice Hall, International Edition
5. MachiRaju, H.R.: Merchant Banking; Viley Eastern Ltd
6. MachiRaju, H.R.: Working of Stock Exchanges in India; Wiley Eastern Ltd


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# Course Name: Management of Financial Institutions & Services

## Course Code: MGO-7123 Credits: 4

**Course Objective:** To encourage the acquisition of knowledge and skills relating to application of accounting concepts and techniques for business decisions, short-term and long-term/strategic decision-

making models, cost management ideas along with budgeting and associated performance measurement practices.

**Course Outcomes: After** completing the course, the student shall be able to:

| Course Outcome | Cognitive level |
|---|---|
| CO1 - Describe the meaning and scope of financial markets as well as institutions in India. | Understand |
| CO2 – Discuss the concepts of Money Market and Capital Market | Understand |
| CO3 - Detail the Commercial Banking and its Current developments. | Understand |
| CO4 - Explain concept of Non-Banking Financial Companies (NBFC's) | Understand |
| CO5 - Examine the Financial Services Industry | Analyze |

**Block-I Introduction**

**Unit-1:** An Introduction to Financial System, Components, Financial System and Economic Development,

**Unit-2:** Financial Inter-mediation, An overview of Indian Financial System since 1951,

**Unit-3:** Financial Sector Reforms since liberalization 1990-91.

**Block-II: Financial Markets & Capital Markets**

**Unit-4:** Financial Markets: Money Market – functions, organisation and instruments.

**Unit-5:** Role of central bank in money market.

**Unit-6:** Indian Money Market – an overview. Capital Markets –Introduction, role and functions.

**Unit-7:** Components of Capital market. Cash markets- Equity and Debt, Depository (NSDL, CDSL).

**Unit-8:** Primary and Secondary Markets –NSE, BSE, NIFTY, SENSEX. Role of Stock Exchanges in India. SEBI and Investor Protection.

**Block-III: Financial Institutions I**

**Unit-9:** Financial Institutions: Commercial banking – introduction, classification, its role in financing

**Unit-10:** Commercial and consumer, recent developments like MUDRA financing,

**Unit-11:** Problem of NPAs, Bankruptcy and insolvency Act, Financial Inclusion.

**Block-IV: Financial Institutions II**

**Unit-12:** Life and non-life insurance companies in India:

**Unit-13:** Public and private. Mutual Funds – Introduction and their role in capital market development.

**Unit-14;** Types of mutual fund schemes (open ended vs close ended, Equity, Debt,

**Unit-15:** Hybrid schemes and ETFs. Non-banking financial companies (NBFCs).

**Block-V: Financial Services Industry**

**Unit-16:** Overview of financial services industry. Merchant Banking – pre and post issue management, underwriting. Regulatory framework relating to Merchant Banking in India.

**Unit-17:** Leasing and Hire Purchase, Consumer and Housing Finance, Venture Capital Finance, Factoring Services,

**Unit-18:** Credit Rating, Financial Advisory and Portfolio Management Services.

**Books Recommended/Suggested Readings:**

1. Bhole, L.M., Financial Markets and Institutions. Tata McGraw Hill Publishing Company.
2.Kumar, V., Gupta, K., Kaur, M., Financial Markets, Institutions and Financial Services, Taxmann's Publications.
3. Khan M.Y. and Jain, P.K Financial Services, Tata McGraw Hill.

## Course Name: Industrial Relations & Labour Enactments
## Course Code: MGO-7131 Credits: 4

**Course Objective:** This course is designed to impart the participants with the knowledge, concepts and skills needed in industrial relations management. Industrial relation aims at maintaining healthy, harmonious and cordial relationship between the employees and management and amongst the employees. The course seeks to familiarize the participants with the concepts and techniques of Industrial relations.

**Course Outcomes:** The successful completion of this course shall enable the student to:

| S. No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1 | Enumerate conceptual understanding of various constituents of Industrial Relations. | Understand |
| 2 | Elaborate role of trade unions in maintaining harmonious industrial relationship. | Identifying |
| 3 | Identify and develop understanding various labour problems and their solutions | Apply |
| 4 | Acquire knowledge of various labour legislatives | Understand |
| 5 | Identify various tools of human welfare in industrial climate. | Analyze |

**Block I: Overview of Industrial Relations**

**Unit 1:** Concept, Nature, Objectives of Industrial Relations;

**Unit 2:** Role of State; Employers' Organization; ILO in IR,

**Unit 3:** Central Organisations of Indian Trade unions: INTUC, AITUC, HMS and UTUC.

**Block II: Trade Unions**

**Unit 4:** Origin and growth, unions after independence, in the era of liberalisation;

**Unit 5:** Concept, objectives, functions and role of Trade Unions in collective bargaining;

**Unit 6:** Workers' participation in management;

**Unit-7:** Problems of Indian Trade Unions. Main provisions of the Trade unions Act, 1926

**Block III: Labour problems**

**Unit 8:** Discipline and misconduct; standing orders,

**Unit 9:** Grievance handling procedure; Labour turnover; Absenteeism;

**Unit 10:** Industrial accidents and Industrial unrest; Industrial Dispute Act, 1947;

**Unit-11:** Industrial Dispute Settlement Machinery in India.

**Block IV: Labour legislations**

**Unit 12:** National Wage Policy,

**Unit 13:** Minimum Wages Act 1948,

**Unit-14:** Payment of Bonus Act, 1965;

**Unit 15:** The Equal Remuneration Act, 1976

**Block V: Health, Safety, Security and Labour Welfare**

**Unit 16:** Industrial Health & Safety;

**Unit 17:** The Factories Act, 1948; Workmen's Compensation Act, 1923;

**Unit 18:** Employees' State Insurance Act, 1948; Payment of Gratuity Act, 1972; Employees Provident Fund Act.

**Books Recommended/Suggested Reading:**


1. Monappa A- Industrial Relations (Tata McGraw-Hill)
2. Sinha- Industrial Relations, Trade Unions, and Labour Legislation (Pearson Education)
3. Mamoria CB, Mamoria, Gankar- Dynamics of Industrial Relations (Himalayan Publication)
4. ND Kapoor, Industrial Relations and Labour Legislation

## Course Name: Global HRM
## Course Code: MGO-7132 Credits: 4

**Course Objective:** The objective of the course is to acquaint the students with the concepts and strategies of international human resource management and to enhance their skill to effectively manage human resource in international perspective.

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

| S. No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1 | Explain HRM issues in international contexts | Understand |
| 2 | Analyze role that international culture and diversity in managing business | Apply |
| 3 | Demonstratevarious issues related toselection process, expatriate management and repatriation. | Understand |
| 4 | Identify various concepts related to international training, compensation and appraisal. | Apply |
| 5 | Visualize emerging issues related to international mergers and industrial relations. | Analyze |

**Block I - Introduction:**

**Unit 1:** Introduction to Global Human resource management;

**Unit 2:** IHRM in International Firms -the framework; Cross national differences in personnel

**Unit-3:** organizations- cultural factor in human resource policies;

**Unit 4:** Complexities and issues in managing human resource across countries; International HRM department and functions; Models of Global HRM.

**Block II- International Cultural Environment**:

**Unit 5:** The concept of culture, comparison of cross-cultural behaviour,

**Unit 6:** managing diversity- causes of diversity, the paradox of diversity,

**Unit 7**: Cultural orientation in international business, emic vs. etic dilemma- cultural uniqueness vs. pan-culturalism.

**Block III-International Staffing:**

**Unit 8:** Hiring– sources of international human resource power;

**Unit-9:** Staffing for international operations; Selection strategies for overseas assignments;

**Unit: 10**: Hiring HCN‟s and TCN‟s; International transfers; Expatriate management-

**Unit 11**: Problems of repatriation of overseas expatriates and strategies to tackle these problems.

**Block IV-Training, Development and Compensation in International Perspective:**

**Unit 12**: Training and development for expatriates; Training and development for international staff

**Unit 13**: Compensation in international perspective- factors, package,

**Unit-14:** methods and trends; International reward system;

**Unit 15**: Motivation in cross-cultural context; Multinational performance appraisal – criteria and process, performance management.

**Block V- Industrial Relations and Other Issues in IHRM:**

**Unit 16:** A framework for international industrial relations; Employees participation – practices in various countries; Cross border ethics management;

**Unit 17**: Designing organizations for dynamic international environment; Comparative study of HRM practices in major global economies;

**Unit 18**: HRM in cross border mergers and acquisitions; Joint ventures, alliances and SMEs; IHRM trends- complexities, challenges, and choices in future.

**Books Recommended/Suggested Reading:**

1. Aswathappa, K. and Dash, S. (2008). *International human resource management*. India: Mc Graw Hill Education.
2. Barlett, Christopher and Sumantra, Ghoshal (1998). *Managing Across Borders: The Transnational Solution*. Harvard Business School Press.
3 .Dessler, G. &Varkkey, B. (2008). *Human resource management.* Delhi: Pearson Education
4. Dowling, Peter J., Festing M. & Engle, A.D. (2013). *International Human Resource Management*. Cengage Learning.

## Course Name: Negotiation & Counselling
## Course Code: MGO-7133 Credits: 4

**Course Objective:** The objective of this course is to provide insights into handling behavioral issues at work place by developing counselling skills. It is also intended to facilitate a Describing of the structure and dynamics of negotiation.

**Course Outcomes:** After completing the course, the student shall be able to:

| Course Outcome | Cognitive Level |
|---|---|
| CO1: Identifythe basic concept Counselling. | Apply |
| CO2: Describe Techniques of Counselling. | Understand |
| CO3: Evaluate the problems of Counselling. | Evaluate |
| CO4: Determine the nature and need for negotiation. | Evaluate |
| CO5: Cope the role of negotiation. | Evaluate |

**Block:I Introduction to Counselling**

**Unit 1:** Counselling: Introduction, Approaches to Counselling,

**Unit 2:**Goals and Process of Counselling; Counselling Procedures and Skills,

**Unit 3:** Organizational Application of Counselling Skills.

**Block II: Techniques of Counselling**

**Unit 4:** Changing Behaviours through Counselling;

**Unit 5:** Specific Techniques of Counselling;

**Unit-6:**Role conflicts of Managers and Counselling.

**Unit 7:** Application of Counselling in Specific

**Block III Organizational Situations**

**Unit 8:** Organizational Situations: Dealing with problem Subordinates;

**Unit 9:** Performance Management;

**Unit-10:**Alcoholism and Other Substance Abuse.

**Unit 11:** Ethics in Counselling.

**Block IV Introduction to Negotiation**

**Unit 12:** Negotiation: Introduction, Nature and need for negotiation, negotiation process,

**Unit 13:** Types and styles of negotiation; strategies and tactics;

**Unit-14:** barriers in effective negotiation,

**Unit 15:** Communication Style, Breaking Deadlocks.

**Block V Ethics in negotiation**

**Unit 16:** Role of trust in negotiations; negotiation and IT

**Unit 17:** Ethics in negotiation; cultural differences in negotiation styles

**Unit 18: Gender** in negotiations; context of mediation; negotiation as persuasion.

**Books Recommended/Suggested Readings:**

1. Singh Kavita - Counselling Skills for Managers (PHI)
2. Carroll, M.: Workplace counseling, Sage Publication.
3. Kottler, J. A., & Shepard, D. S.: Introduction to counselling: voices from the field, USA: Cengage Learning.
4. Moursund, J.: The Process of counselling and therapy, New Jersey: Prentice Hall.

# Course Name: Project management

## Course Code: MGO-7141 Credit 4

**Course Objective:** The objective of this course is to enable the student to understand and analyze the iterative processes of a project correctly. Identify and effectively communicate best practices within the framework of project management. Evaluate and describe the process of progressive elaboration independently. Identify how organizational culture impacts a project.

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

| S. No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1. | Extrapolate basics of project management theory | Understand |
| 2. | Associate the functions of project management. | Apply |
| 3. | Identify and effectively communicate best practices within the framework of project management | Remember |
| 4. | Demonstrate and describe the process of progressive elaboration independently | Apply |
| 5. | Visualize importance of how organizational culture impacts a project. | Understand |

**Block I: Introduction**

**Unit 1:** Introduction to project and projects. Characteristics and types of projects.
**Unit 2:** Gaining importance, project life cycle and its phases.
**Unit 3:** Project selection, non quantitative and scoring models, technical analysis and technology selection, market potential analysis and techniques of long term forecasting.

**Block II:**

**Unit 4:** Financial feasibility,
**Unit 5:** determinants of cost of project, its financing and deciding optimum capital structure.
**Unit 6:** Cash flows from project and owner's perspective.

**Block III:**

**Unit 7:** Project Appraisal.
**Unit 8:** Financial feasibility with risk. Types of risk, techniques of risk evaluation and its mitigation.
**Unit 9:** Sensitivity analysis, Hiller's model, scenario analysis, simulation.

**Block IV:**

**Unit 10:** Network analysis, construction of networks,
**Unit 11:** CPM, various types of floats and their application, PERT and its applications.
**Unit 12:** Time cost relationship, crashing for optimum cost and Optimum time. Resource leveling.

**Block V:**

**Unit 13:** Introduction to project software and applications of MS Project.
**Unit 14:** Human Aspects of Project management: project manager's skills and functions, matrix organization, Social Cost Benefit Analysis, UNIDO approach, shadow pricing.
**Unit 15:** Project monitoring, Earned Value Analysis, abandonment analysis, Ph 41S, Project Termination and Audit. Reasons for failure.

**Text and Reference Books**


1. "The Project Management Body of Knowledge (PMBOK Guide)" by the Project Management Institute (PMI),
2. "Project Management: A Systems Approach to Planning, Scheduling, and Controlling" by Harold Kerzner,
3. "Scrum: The Art of Doing Twice the Work in Half the Time" by Jeff Sutherland,
4. "Getting Things Done: The Art of Stress-Free Productivity" by David Allen,
5. "Crucial Conversations: Tools for Talking When Stakes Are High" by Kerry Patterson, Joseph Grenny, Ron McMillan, and Al Switzler,
6. "Drive: The Surprising Truth About What Motivates Us" by Daniel H. Pink.
7. “Project Management for The Unofficial Project Manager” by Kory Kogon, Suzette Blakemore, and James Wood

# Course Name: Logistics and Supply Chain Management

## Course Code: MGO-7242 Credit 4

**Course Objective:** The objective of this course is to enable the student to understand and introduce process and functions of physical distribution system. To introduce major building blocks, functions, business process, performance metrics and decision making in supply chain network, and to provide an insight into the role of Internet Technologies and electronic commerce in supply chain management

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

| S. No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1. | Elaborate and describe the increasing significance of logistics and its impact on both costs and service in business and commerce. | Understand |
| 2. | Visualize and incorporate and learn the critical elements of logistics and supply-chain management processes based on the most relevant application in forward-thinking companies | Apply |
| 3. | Examine and develop criteria and standards to achieve improved business performance by integrating and optimizing the total logistics and supply-chain process. | Apply |
| 4. | Identify and describe the ways to shift the business culture from functional work to overall process-driven results | Apply |
| 5. | Demonstrate and explain the rationale for statistical process control in minimizing or eliminating no value-added elements of the overall logistics process such as the cost of excess inventory driven by inaccurate forecasting. | Understand |

**Block I:**

**Unit 1:** Physical Distribution
**Unit 2:** Marketing Channels, Channel Members
**Unit3:** Market Segmentation

**Block II:**

**Unit 4:** Managing the Marketing Channel
**Unit 5:** Channel Members, Channel Flows
**Unit 6:** Product issues in channel management

**Block III:**

**Unit 7:** Building Blocks of Supply Chain Network
**Unit 8:** Performance Measurement and Controls
**Unit 9:** Models for Decision Making.

**Block IV:**

**Unit 10:** Supply Chain Inventory Management, Multichannel Inventory System,
**Unit 11:** Supply Chain Facility Layout, Capacity Planning
**Unit 12:** Inventory Optimisation, Routing and Scheduling

**Block V:**

**Unit 13:** E Business & Logistics,
**Unit 14:** Business Process Management
**Unit 15**: Customer Relationship Management

**Books Recommended/Suggested Readings:**


1. D.K. Agarwal, LOGISTICS & SUPPLY CHAIN MANAGEMENT, Macmillan India Pvt. Ltd. New Delhi, 2008
2. N. Chandrasekaran, SUPPLY CHAIN MANAGEMENT, Oxford University Press, 2010
3. Satish K. Kapoor & Purva Kansal, BASICA OF DISTRIBUTION MANAGEMENT - A LOGISTICAL APPROACH, Prentice – Hall India, 2003.
4. Sunil chopra, Meindl & Kalra, SUPPLY CHAIN MANAGEMENT, Pearson Education, India, 2009 Bowersox & Closs,
5. LOGISTICS MANAGEMENT, Tata McGraw Hill, New Delhi, 2008

# Course Name: Advanced Production and Operations Management

**Course Code: MGO-7143** **Credits: 4**

**Course Objectives:**
To familiarize the students with the role of operations and its interaction with other activities of a firm and their integration in a highly competitive global environment.
To enable the students to apply the understanding of production processes in quantitative analysis of problems arising in the management of operations.

**Learning Outcomes:**

- Understand the role of operations management in achieving organizational competitiveness.
- Appreciate the concepts of lean production and maintenance management in operations.
- Comprehend key decision areas of operations and analyze data for effective decision making in operations management.

## BLOCK 1 INTRODUCTION TO PRODUCTION MANAGEMENT

UNIT-1-Introduction; Production Management; Scope of Production Management;
UNIT-2:-Production System; Types of Production; Benefits of Production Management;
UNIT-3:-Responsibility of a Production Manager; Decisions of Production Management

## BLOCK 2:- PRODUCTION PLANNING AND CONTROL

UNIT-4:- Meaning, Characteristics and Objectives of Production Planning and Control,
UNIT-5: Stages of Production Planning and Control
UNIT-6:-Production Planning System

## BLOCK-3:-PROJECT MANAGEMENT

UNIT 7: -Meaning and Types of Project Management.
UNIT-8- Techniques of Project Management (CPM/PERT)
UNIT 9-Innovation Management

## BLOCK 4 SUPPLY CHAIN MANAGEMENT

UNIT-10:- Basics of MRP; MRP vs. ERP, JIT
UNIT-11:- Definition of Supply Chain Management, Information Technology and SCM
Unit-12:-Logistics Operations in Supply Chain management and Documentation in Supply Chain Management,
UNIT-13:-Aggregate Product Planning

## BLOCK 5 INVENTORY MANAGEMENT

Unit-14: -Introduction of Inventory and Evolution of inventory management
Unit-15: -Different Types of Inventories
Unit-16: -Independent and Dependent Demand Inventories
Unit-17:- Factors affecting Inventory Operations
Unit-18:- Inventory Planning and Inventory Management Techniques

**Suggested Readings:**

1. Production Management by Telsang Martand S Chand Publication
**2.** Project Management: Mr. Sanjiv Marwah- (Wiley Dreamtech)
**3.** Project- Preparation, Appraisal, Budgeting and Implementation: Chandra Prasanna - (TMH)
**4.** Project Management- A Managerial Approach: Jack R. Meredith Broyhill Samuel J. Mantel, Jr (John Wiley & Sons)

**Semester-IV**

# Course Name: Business Ethics and Corporate Governance

## Course Code: MGO-7201 Credits: 4

**Course Objective:**
The purpose of this course is to develop the understanding about the role of corporations in society and boards‟ role in keeping oversight on the functioning of the company, global developments in Governance and Corporate Citizenship.

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

| S. No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1 | Elaborate various concepts of Ethics, morals and values to Students. | Understand |
| 2 | Enumerate basic understanding of various ethical theories and approaches | Understand |
| 3 | Identify impact of corporate governance on Business | Apply |
| 4 | Examine role of various board committees, their composition and responsibilities. | Analyze |
| 5 | Visualize various ethical issues such as conflicts of interest and insider trading | Understand |

**Block I: Introduction**

**Unit 1:** Introduction to Ethics, Morals & Values,

**Unit 2:** Ethical Theories and Approaches– Teleological, Deontological,

**Unit 3:** Virtue and system development theories;

**Unit-4:** Conflict between moral demands and interest and Ethics in work.

**Block II: Ethics in Business**

**Unit 5:** Ethical Aspects in Marketing, Finance, HRM; Global Business Ethics.

**Unit 6**: Meaning of corporate philanthropy, CSR-an overlapping concept, corporate sustainability reporting,

**Unit 7**: CSR through triple bottom line, CSR and business ethics,

**Unit-8**: CSR and corporate governance, environmental aspect of CSR, CSR models; drivers of CSR, global reporting initiatives.

**Block III: Corporate Governance**

**Unit 9;** Terminology: Company, corporate governance, promoter, shareholders, directors, managers, chairman, CEO, stakeholders;

**Unit 10:** Type of Directors: Insider and outsider, executive and non-executive, independent, nominee; Ownership and Control;

**Unit-11:** Theories and development of corporate governance; Models: Types and basis of adoption;

**Unit 12:** Principals of corporate governance; Implications of corporate scams; Global corporate governance movement.

**Block IV: Role Players**

**Unit 13:** Role of Board of Direct Role of board; Board composition, independence, and committees; Board leadership: Splitting chairman and CEO, CEO succession, lead director;

**Unit 14**: Board processes and meetings, Building professional Boards – Directors selection, executive compensation and stock option, directors‟ training and competence, board diversity, board evaluation;

**Unit 15**: Boards oversight of CEO, Auditors, SEBI and Government; SEBI guidelines and clause 49; Growth of Corporate Governance in India.

**Block V: Business Ethics and Corporate Governance**

**Unit 16**: Introduction, Importance and need for Business Ethics in Indian Context,

**Unit 17:** Roots of unethical behaviour and issues,

**Unit 18**: Corporate governance ethics.

**Books Recommended/Suggested Reading:**


1. Fernando A.C - Corporate Governance: Principles, Policies and Practices – Pearson
2. Murthy CSV – Business Ethics: Himalaya
3. Velasquez – Business Ethics: Concepts and cases – Pearson/PHI

## Course Name: Global Business Management
## Course Code: MGO-7202 Credits: 4

**Course Objective:** To expose students to various perspectives and concepts in the field of Global Business Management.

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

| S. No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1 | Elaborate characteristics and components of Global business Management | Understand |
| 2 | Enumerate internationalization process and managerial implications of internationalization. | Understand |
| 3 | Assess economic, political, cultural, legal, technological and competitive environments and its influence on international markets. | Apply |
| 4 | Identify various concepts and theories of Foreign Direct Investment. | Analyze |
| 5 | Acquire knowledge of multilateral trade agreements and use it in decision making. | Understand |

**Block I: Globalization and International Management**

**Unit 1:** Introduction to Global Business, Concept of globalization and international Management,

**Unit 2:** Reasons for going International, Stages in the Internationalization of Business,

**Unit 3:** Global Challenges; Global Business Theories.

**Block II: International Marketing Environment and Marketing Strategy:**

**Unit 4:** An overview of International Business Environment:

**Unit 5:** Economic Environment; Political environment; Legal environment;

**Unit 6**: Demographic Environment; Socio-Cultural Environment in Global perspective

**Unit 7:** International Marketing & Intelligence system.

**Block III**: **Foreign Direct Investment-Theory and Application:**

**Unit 8:** Nature of FDI, Forms of FDI, Modes of FDI Entry, Theories of FDI,

**Unit 9:** FDI Theories for Emerging Market Firms,

**Unit 10:** Effects of Foreign Direct Investment,

**Unit-11:** Foreign Investment in India, Outbound Indian FDI.

**Block IV: Regional Economic Integration:**

**Unit 12:** Levels of Economic Integration: Free Trade Area;

**Unit 13**: The Customs Union; The Common Market;

**Unit-14:** The Economic Union;

**Unit 15:** The Political Union; Effects of Integration; Regional Trading Agreements.

**Block V: Trade and Investment Regulations:**

**Unit 16:** Basic principles of Multilateral Trade Negotiations;

**Unit 17:** General Agreement on Tariffs and Trade; GATT; WTO; TRIPS; TRIPS; GATS; GATT

**Unit 18:** WTO-Differences; WTO and India.

**Books Recommended/Suggested Reading:**


1. Justin Paul & Rajeev Aserkar: Export -Import Management; Oxford University Press, New Delhi.
2. Rakesh Mohan Joshi: International marketing, Oxford University.
3. Sumati Varma: International Business "Concept, Environment& Strategy", Ane Books Pvt. Ltd., New Delhi
4. Vyuptakesh Sharan: International Business "Concept, Environment and Strategy", Pearson Education.

## Course Name: Consumer Behaviour & Marketing Communication
## Course Code: MGO-7211 Credits: 4

**Course Objective:** Marketing involves decision making in areas like product, pricing, branding, distribution, and promotion. Consumers and customers subjected to these decisions with an aim to extract desired response. Marketing effectiveness can be significantly improved if these decisions based on consumer insights. Marketing success depends on a thorough understanding of why do consumers behave the way they do to marketing stimuli? The course aims to equip the participants to view marketing phenomena from a customer's perspective.
**Course Outcome**: After completing the course, the student shall be able to:

| Course Outcome | Cognitive Level |
|---|---|
| CO1 - Identify the key concepts and theories of consumer behaviour. | Remember |
| CO2 – Describe psychological theories relevant for describing consumer behaviour. | Understand |
| CO3 - Describe the group dynamics and consumer reference groups. | Understand |
| CO4 - Define Integrated Marketing Communication. | Understand |
| CO5 - Develop appropriate marketing strategies Advertising and Media Planning. | Apply |

**Block- 1: Introduction to consumer behavior**

**Unit-1:** Marketing success and failure and consumer behavior:

**Unit-2:** Manager and consumer perspectives, strategy consistency and inconsistency

**Unit-3:** Consumer behavior models: Mapping consumer's mind, deterministic and probabilistic approaches,

**Unit-4:** Howard and Sheth, Nicosia and Engle and Blackwell model.

**Block 2: Consumer involvement**

**Unit-5:** Consumer involvement: perceived risk, antecedents and consequences Consumer decision making:

**Unit-6:** Psychology of simplification, elaborate to routine buying Habit: loyalty,

**Unit-7:** inertia and strategic implications for incumbent and entrant.

**Unit 8:** Consumer perception and knowledge: categorization process and discrimination, Types of thresholds, consumer memory network,

**Unit-9:** Consumer learning: connectionist and non-connectionist approaches.

**Block- 3: Consumer Motivation**

**Unit-10:** Motivation and drive: theories and means and end chain, Hierarchical value mapping. Personality and self-concept influence:

**Unit-11:** Personality theories, Freud, Jung and Trait theories, consistency hypothesis, personality and image,

**Unit-12:** Measurement of personality and self-image, creating aspiration brand

**Block- IV: Integrated Marketing Communication**

**Unit-13:** Marketing Communication: Meaning and its objectives, Integrated Marketing Communication (IMC): concepts and process, IMC promotion Mix,

**Unit-14:** Advertising - Meaning, objectives its role and functions, Classification of advertising, economic, social and ethical issues in advertising,

**Unit-15:** DAGMAR approach, STP strategies in advertising, Advertising Agencies,

**Block 5: Advertising and Media Planning**

**Unit-16:** Process in Advertising

**Unit-17:** Advertising Creativity

**Unit-18:** Media Planning and Strategy

**Books Recommended/Suggested Reading:**


1. Berman B and Evans J R- Retail Management (Pearson Education)
2. Michael Lervy M and Weitz B W- Retailing Management (Tata McGraw-Hill)
3. Blackwell, R. D., Miniard, P. D., & Engle, J. F. (2009). Consumer behaviour. USA: Thomson-South Western.
4. Evans, M., Jamal, A., &Foxall, G. (2009). Consumer behaviour (2nd ed.). New Jersey: John Wiley & Sons.

# Course Name: Marketing of Services

**Course Code: MGO-7212** **Credits: 4**

**Course Objective:**

The purpose of this course is to familiarize the students with the role of Marketing of Services**.**

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

| S. No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1 | Explains the basic concepts about services. | Understand |
| 2 | Define the marketing mix in terms of service sector. | Understand |
| 3 | Expresses scales related service quality and productivity. | Apply |
| 4 | Identify various Strategies in services marketing | Analyze |
| 5 | Acquire knowledge of recent trends in marketing of services. | Understand |

**Block I: Introduction of Services Marketing**

**Unit 1: C**oncept, characteristics of services, service marketing triangle,

**Unit-2:**purchase process of service marketing, challenges of services.

**Unit 3:** Goods V/S services marketing

**Unit 4:** Consumer behaviour, positioning a service in Marketplace

**Block II: Service Delivery**

**Unit 5:** Service product price mix, promotion and communication mix,

**Unit-6:** Place/ distribution of services people, Physical evidence.

**Unit 7:** Branding of services problem and solutions

**Unit 8:** Options for Service Delivery

**Block III: Service quality and productivity**

**Unit 9:** Improving service quality and productivity

**Unit 10:** Service quality GAP model, Benchmarking,

**Unit-11:** Measuring service quality

**Unit 12:** Defining productivity improving productivity

**Block IV: Strategies in services marketing**

**Unit 13:** International and global strategies in services marketing

**Unit 14:** Factors favoring transactional strategy,

**Unit 15:** Elements of transactional strategy

**Block V: Recent trends in marketing of services**

**Unit 16:** Recent trends in marketing of services

**Unit 17:** Ethics in service marketing

**Unit 18:** Unethical practices in service sector

**Books Recommended/Suggested Reading:**


1. Verma H.V.: Marketing of Services, Global Business Press. New Delhi.
2. Nargundhar: Services Marketing Tata McGraw-Hill New Delhi
3. Rao: Services Marketing Pearson, New Delhi
4. Verma: Services Marketing Pearson, New Delhi


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## Course Name: Sales & Distribution Management
## Course Code: MGO-7213 Credits: 4

**Course Objective:**
The purpose of this course is to familiarize the students with the role of sales & Distribution Management.

**Course Outcomes:** After completing the course, the student shall be able to:

| Course Outcome | Cognitive Level |
|---|---|
| CO1 - Describe the objectives and Scope of Personal Selling. | Understand |
| CO2 – Detail market potential and sales forecasting methods. | Understand |
| CO3 - Evaluate sales Budget and distribution plans | Evaluate |
| CO4 - Explain distribution with other marketing variables. | Evaluate |
| CO5 - Explain diverse variables affecting the sales & distribution function. | Evaluate |

**Block I: Introduction to Sales Management**

**Unit 1:** Introduction to Sales Management: Concept,

**Unit 2:** Evolution of sales function, Objectives of sales management positions,

**Unit 3:** Functions of Sales manager and their relation with other executives..

**Block II: Salesmanship**

**Unit 4:** Salesmanship: Theories of personal selling,

**Unit 5:** Types of Sales executives, Qualities of sales executives,

**Unit 6:** Personal selling process, Showroom & exhibition,.

**Block III: Sales Organization and Relationship**

**Unit 7:** Sales Organization and Relationship: Purpose of sales organization,

**Unit-8:** Types of sales organization structures,

**Unit 9:** Sales department external relations, Distributive network relations.

**Unit 10:** Sales Force Management: Recruitment and Selection,

**Unit-11:** Sales Training, Sales Compensation...

**Block IV: Distribution channels**

**Unit 12:** Distribution Planning**,** Role and Function of Intermediaries;

**Unit 13:** Selection and Motivation of Intermediaries;

**Unit 14:** Vertical & Horizontal Marketing; Channel Conflict

**Block V: Distribution System and Logistics**

**Unit 15:** Distribution System and Logistics, Physical Distribution System;

**Unit-16:**Different Modes of Transport in India;

**Unit 17:** Logistics– Functional Areas; Distribution Costs,

**Unit 18:** Supply Chain Management.

**Books Recommended/Suggested Reading:**


1. Donaldson B- Sales Management: Theory and Practice (Palgrave)
2. Sahu P K and Raut K C- Salesmanship and Sales Management (Vikas)
3. Spiro- Sales Management (Tata McGraw-Hill)
4. Davar R S- Salesmanship and Publicity (Vikas)

# Course Name: Corporate Financial Restructuring

## Course Code: MGO-7221 Credits: 4

**Objectives:** The course aims to facilitate understanding of corporate merger and acquisition activity, restructurings.

**Course Outcomes:** After completing the course, the student shall be able to:

| Course Outcome | Cognitive Level |
|---|---|
| CO1 - Describe the Corporate Finance & Restructuring. | Understand |
| CO2 – Describe the dimensions of Mergers and Acquisitions | Understand |
| CO3 - Understand the valuation aspects of Corporate Restructuring | Understand |
| CO4 - Explain different approaches of valuation. | Evaluate |
| CO5 - Explain dimensions of Corporate Restructuring Financial Restructuring. | Evaluate |

**Block – I Introduction to Corporate Finance & Restructuring**

**Unit: 1** Overview of Corporate Finance & Restructuring Financial Strategy and Planning,

**Unit: 2** Risk Evaluation and Capital Budgeting, Dividend and Retention Policies,

**Unit-3:**Designing Capital Structure

**Unit: 4** Introduction to corporate restructuring, different forms,

**Unit-5:**motives & applications of corporate restructuring,

**Block – II Mergers and Acquisitions**

**Unit: 6** Dimensions of Mergers and Acquisitions Mergers & acquisitions concept,

**Unit-7:**Types and process, Accounting for Mergers & Demergers,

**Unit: 8** Regulatory frame work of mergers and acquisitions.

**Unit: 9** Cross-Border Mergers & Acquisitions.

**Block – III Valuation**

**Unit: 10** Valuation Aspects of Corporate Restructuring Methods of payment for M & A and Calculations of exchange ratio,

**Unit: 11** Fundamental and methods of business valuation,

**Unit: 12** Calculations of financial synergy and return,

**Block – IV Approaches of valuation**

**Unit: 13** Different approaches of valuation

**Unit: 14** Comparable Company & transaction analysis method,

**Unit: 15** DCF, Real Option method, Formula approach for valuation and other important methods of valuation

**Block – V Dimensions of Corporate Restructuring Financial Restructuring**

**Unit: 16** Dimensions of Corporate Restructuring Financial Restructuring & Divestiture,

**Unit: 17** Funding Options for M&A. Strategic Alliances & Joint Ventures,

**Unit: 18** Employee Stock Ownership, Going Private & Leveraged Buyouts

**Books Recommended/Suggested Readings:**

1. Corporate Restructuring, Bhagaban Das and Debdas Raskhit, Himalaya, Latest Edition
2. Financial Management, M Y Khan & P K Jain, TATA McGraw Hill, Latest Edition
3. Mergers& Acquisitions, B Rajesh Kumar, TATA McGraw Hill, Latest Edition
4. Mergers and Acquisitions, Aurora, Shetty and Kale, Oxford, Latest Publication

# Course Name: Strategic Corporate Finance

## Course Code: MGO-7222 Credits: 4

**Objectives:** The course aims to facilitate understanding of corporate merger and acquisition activity, restructurings.

**Course Outcomes:** After completing the course, the student shall be able to:

| Course Outcome | Cognitive Level |
|---|---|
| CO1 - Identify the key concepts Strategic Corporate Finance. | Remember |
| CO2 – Describe Management Buy-outs and Management Buy-ins. | Understand |
| CO3 - Describe the Restructuring of Firms. | Understand |
| CO4 - Develop appropriate understanding about potential purchaser. | Understand |
| CO5 - Explain the process of business and company valuation | Explain |

**Block – I Introduction to Strategic Corporate Finance:**

**Unit: 1** Introduction to Strategic Corporate Finance: Strategy Vs Planning, significance of strategy in financial decisions,

**Unit: 2**Strategic Cost Management: Traditional costing Vs Strategic

**Unit-3:**Costing, Relevant costs Vs Irrelevant costs, Different types of strategic costing and their relevance

**Unit: 4** Alternative sources of financing – Difference between traditional & alternative sources of finance, different types of alternative sources of financing.

**Block – II Management Buy-outs and Management Buy-ins**

**Unit: 5** Management Buy-outs: Establishing feasibility of the buy-out,

**Unit-6:**negotiating the main terms of the transaction with the vendor including price and structure,

**Unit:7** Developing the business plan and financial forecasts in conjunction with the buy-out team for submission to potential funders.

**Unit: 8** Management Buy-ins: Management Buy-in/Buy-outs ("BIMBOs"), Vendor initiated buyouts/buy-ins.

**Block – III Restructuring of Firms**

**Unit: 9** Financial Distress and Restructuring: Meaning of Bankruptcy, Factors leading tobankruptcy, symptoms and predictions (models) of bankruptcy,

**Unit: 10** Reorganization of distressed firms, liquidation of firms. Company disposals: retirement sale or the sale of a noncore subsidiary, planned exit, forceful retirement and other disposals.

**Unit: 11** Exit strategy most appropriate exit route, valuation, timing of sale and tax planning opportunities,

**Block – IV Potential purchasers**

**Unit: 12** Identification of potential purchasers, approaching the potential purchaser

**Unit: 13** Negotiate with potential acquirers and selection of a preferred purchaser, calculation of the various tax implications.

**Unit: 14** Fundraising: identification of different sources of development capital, determination of capital structure

**Unit-15:** factors affecting the capital structure, cost of capital and cost saving strategy,

**Block – V Business Valuation**

**Unit: 16** Company Valuation: an overview of valuation, valuation principles, methods, approaches and practices, Value enhancement tools & techniques

**Unit: 17** Valuing Real Assets in the Presence of Risk: tracking portfolios and Real Asset valuation, Different Approaches of Valuing Real Assets, Capital Budgeting and Strategic policy, Real options.

**Unit: 18** Other Strategic Issues: managing credit ratings, and setting dividend and share repurchase policy, problem of too much cash. The issues of stock liquidity and illiquidity, Strategic risk management,

**Books Recommended/Suggested Readings:**

1. AswathDamodaran: Corporate finance theory and practice; John Willey Sons, Inc
2. Jakhotia: Strategic Financial Management (Vikas Publication)

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# Course Name: Management of Working Capital

## Course Code: MGO-7223 Credits: 4

**Objectives:** The objective of the course is to acquaint the students with the importance of the working capital and techniques used for effective working capital management.

**Course Outcomes:** After completing the course, the student shall be able to:

| Course Outcome | Cognitive level |
|---|---|
| CO1: Describe the conceptual framework of working capital have an understanding the components of working capital. | Understand |
| CO2: Define cash management and Optimal Cash Balance | Demonstrate |
| CO3: Explain objectives of Receivables Management and credit policy. | Understand |
| CO4: Demonstrate Inventory Management and Inventory Control Systems | Understand |
| CO5: Identify sources of finance for Working Capital. | Apply |

**Block – I Introduction to Working Capital**

**Unit: 1** Concepts of Working Capital, Components of Current Assets,

**Unit-2:**Permanent and Variable Working Capital

**Unit: 3** Determinants of Working Capital, Estimating Working Capital Needs,

**Unit: 4** Currents Assets Financing Policy, Operating and Cash Conversion Cycle. Case Study

**Block – II Cash Management**

**Unit: 5** Facets of Cash Management, Motives for Holding Cash,

**Unit-6:**Factors Determining Cash Needs,

**Unit: 7** Cash Budgeting, long – term Cash Forecasting,

**Unit: 8** Managing Cash Collections and Disbursements, Optimal Cash Balance, Investment of Surplus Cash.

**Block – III Receivables Management**

**Unit: 9** Objectives, Credit Policy: Nature and Goals,

**Unit: 10** Optimum Credit Policy, Credit Policy Variables, Credit Evaluation,

**Unit: 11** Credit Granting Decisions, Collection Policy, Factoring.

**Block – IV Inventory Management**

**Unit: 10** Nature of Inventories, Need to Hold Inventories,

**Unit-12:**Objectives of Inventory Management,

**Unit: 13** Inventory Management Techniques,

**Unit: 14** Analysis of Investment in Inventory, Inventory Control Systems.

**Block – V Working Capital Finance**

**Unit: 15** Accruals, Trade Credit and other current liabilities,

**Unit-16:**Working Capital Advance by Commercial Banks,

**Unit: 17:** Regulation of Bank Finance, Public Deposits, Inter-corporate Deposits,

**Unit: 18** Short-term Loans from Financial Institutions, Commercial Paper.

**Books Recommended/Suggested Readings:**

1. V. K. Bhalla, Working Capital Management: Text and Cases, New Delhi: Anmol Publisher, 2008.
2. M .Y. Khan and P. K. Jain, Financial Management - Text, Problems and Cases, New Delhi: Tata McGraw Hill, 2009
3. Hrishikesh Bhattacharya, Working Capital Management: Strategies and Techniques, New Delhi: Prentice Hall of India Private Ltd, 2009.

# Course Name: Organizational Development

## Course Code: MGO-7231 Credits: 4

**Course Objectives:**
To familiarize the students with fundamentals of organizational development, essential interventions and effective methods in organization development.

**Course Outcomes:** After completing the course, the student shall be able to:

| Course Outcome | Cognitive Level |
|---|---|
| CO1 - Identify the basic concept organizational development. | Apply |
| CO2 – Describe Organizational Strategies for Change. | Understand |
| CO3 - Discuss the component of OD. | Analyze |
| CO4 - Explain the activities within an organization and recommend suitable OD interventions. | Evaluate |
| CO5 - Explain the Interpersonal and Team Development. | Evaluate |

**Block -I: Introduction of Organisational Development:**
**Unit: 1:** Organisational Development: Introduction, Meaning and Definition,
**Unit: 2:** History of OD, Relevance of Organisational
**Unit: 3:** Development for Managers, Assumptions of OD.

**Block -II: Change Process and Models:**
**Unit: 4:** Organisational Change, Strategies for Change,
**Unit: 5:** Theories of Planned Change (Lewin's change model, Action research model, Positive model),
**Unit: 6:** Action Research as a Process, Resistance to Change.

**Block-III: Process of OD**
**Unit: 7:** Process of OD, Components of OD program,
**Unit 8:** OD program phases, Making an Entry,
**Unit: 9:** Developing Contract, Launch, Situational Evaluation, Closure.OD Interventions: An overview;
**Unit: 10:** Classification of OD Interventions: Team Interventions, Inter group and third party peacemaking interventions,
**Unit 11:** Comprehensive OD interventions, Structural Interventions.

**Block-IV: OD Interventions:**
**Unit: 12:** Evaluating OD Interventions: Evaluation, Types of Evaluation,
**Unit: 13:** Methods of Evaluating Interventions.
**Unit: 14:** Future of OD: Organisational Development and Globalization,
**Unit 15:** Emerging Trends in OD.

**Block-V: Team Development**
**Unit: 16:** Interpersonal and Team Development,
**Unit: 17:** Intergroup and Work Team Development,
**Unit: 18:** Transforming Entire Systems and Strategic Change

**Books Recommended/Suggested Readings:**

1. French, W.L., Bell, C.H. and Vohra V, Organization Development: Behavioral Science Interventions for Organization Improvement, Revised 6th Ed., Pearson.
2. Hackman, J.R. and Suttle, J.L., Improving Life at Work: Behavioural science approach to organisational change, Goodyear, California.
3. Harvey, D.F. and Brown, D.R., An experimental approach to Organization Development, 7th Ed. Prentice-Hall, Englewood Cliffs, N.J.

# Course Name: Group and Team in Organization

## Course Code: MGO-7232 Credits: 4

**Course Objectives:**

The objective of the course to orient the students of management towards the art and science of influence and Leadership in organizations.

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

| S. No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1 | Elaborate art and science of leadership and attain new insights about the most suited leadership style | Understand |
| 2 | Enumerate understanding of how to develop younger leaders. | Apply |
| 3 | Explain how to adapt and lead teams more effectively | Understand |
| 4 | Identify various skills related to the Interpersonal Communication. | Apply |
| 5 | Discuss importance of interpersonal trustin group decision Making. | Understand |

**Block – I Introduction to Leadership**
**Unit: 1**: Leadership and management of team,
**Unit 2: A**pproaches to leadership,
**Unit 3:** Traits, Behavioral,
**Unit 4:** Sources of powers and influence
**Unit 5:** Leadership models, the SOAR Peak performance model.

**Block – II Leadership Styles**
**Unit: 6** Contingency approach: Fiedlen Model
**Unit 7: S**ituational leadership theory toeffective leadership
**Unit 8:** Situational and Transformational leadership
**Unit 9:** Leadership in decision-making process.

**Block – III Leadership in times of change**
**Unit 10:** Global implications
**Unit 11:** Global leaders in Indian context – Steel King: strategies approach of steel kings LaxmiNivas Mittal &Ratan Tata.
**Unit 12:** Group as a Medium of Learning: Developing and Change.

**Block – IV Group Cohesiveness**
**Unit 13:** Influence Processes
**Unit 14:** Interpersonal Communication
**Unit 15:** Interpersonal Awareness and Feedback Process.

**Block – V Interpersonal Trust**

**Unit 16:** Group Decision Making;

**Unit 17:** Group Synergy;

**Unit 18:** Team Building.

**Books Recommended/Suggested Reading:**

**Yukl-Leadership in Organisations, Pearson education**


1. Hersey P; Blanchard K and Johnson D- Management of OrganisationalBehaviour, Prentice-Hall
2. Bennis, W.G. Essay in Interpersonal Dynamics. U.S.A., Dorsey Press
3. Kolb, D. etc. Organizational Behaviour: An Experiential Approach. Englewood Cliffs, New Jersey, PHI

# Course Name: Training and Development

## Course Code: MGO-7233 Credits: 4

**Course Objective:** The objective of the course to orient the students of management towards the art and science of influence and Leadership in organizations.

**Course Outcomes:** After completing the course, the student shall be able to:

| Course Outcome | Cognitive level |
|---|---|
| CO1 - Describe the concept of training and development to companies. | Understand |
| CO2 – Explain the various methods of training and development. | Understand |
| CO3 - Describe the steps of executive development programs. | Understand |
| CO4 - Evaluate the effectiveness of training and development programmes. | Evaluate |
| CO5 - Evaluate the emerging trends in training and development field. | Evaluate |

**Block I: Introduction**

**Unit 1:** Training and Development- concept, rationale and nature; Training, Learning and Development interface;

**Unit 2:** Theories of management training and development and practical application of these theories in today's organisations;

**Unit 3:** Training needs assessment- meaning and purpose, different levels, various approaches, outputs, methods used in training needs assessment; Training and development as source of competitive advantage.

**Block II: Training and Development Methodologies**

**Unit 4:** Training– process and methods; human re-engineering; Principles of learning; Individual differences in learning, learning process.

**Unit 5:** Learning curves, workmen training, re-training, government initiatives, self-directed work teams; Use of audio-visual aids in training; Computer aided instructions- distance learning, open learning, e-Learning; Technologies convergence and multimedia environment;

**Unit 6:** Development techniques for enhancing decision–making and interpersonal skills- case-study, in-basket exercise, special projects, multiple management Programme learning, action learning,

**Unit 7:** Syndicate work, games, action maze, role play.

**Block III: Executive Development**

**Unit 8:** Importance of executive development, steps in organisation of a management development program/ executive development program, methods/ techniques of management development program;

**Unit 9:** Role of development officers, administrators, consultants, designers and instructors;

**Unit 10:** Trends towards performance management and its impact on training professionals.

**Block IV: Evaluation of Training and Development**

**Unit 11:** Reasons for evaluating training and development programs, problems in evaluation; Evaluation

planning and data collection- statistical methods;
**Unit 12: Use** of appropriate training and development software packages; Different evaluation frameworks, problems of measurement and evaluation, effective training follow-up;
**Unit 13:** Costing of training, measuring costs and benefits of training program, obtaining feedback of trainees; Kirkpatrick model of training effectiveness;
**Unit 14:** Training issues resulting from the external environment and internal needs of the company; L&D practices of 5 prominent corporations.

**Block V: Emerging Trends in Training and Development**
**Unit 15:** Career development and planning; Career development programmes and counseling; Group projects; Training for international assignments;
**Unit 16:** Gamification, team training and six sigma training; Electronic Enabled Training Systems (EETS)- concept and types, benefits and challenges in using EETS, concerns in implementation.
**Unit 17:** EETS- availability, incorporation, extension, and learning renewals for EETS, use of EETS and its up scalability, follow up activities;
**Unit 18:** Training and development initiatives of some selected companies from private and public sectors and MNCs.

**Books Recommended/Suggested Readings:**

1. Blanchard, P. N., Thacker, J. W., & Ram, V. A. Effective Training: Systems,Strategies, and Practices. Dorling Kindersley (India) Pvt. Ltd.
2. Kumar, M., &Talwar, P. Human Resource Development. APH Publishing Corporation.
3. Lynton, R., &Pareek, U. Training for Development. New Delhi: Vistaar.
4. Noe, R. A., &Kodwani, A. D. (2012). Employee Training and Development (5th Edition ed.). Tata McGraw Hill.

# Course Name: Total Quality Management

## Course Code: MGO-7241 Credit 4

**Course Objective:** To understand the basic concepts and theories of Total quality Management. To appreciate the importance of cost of quality. To be aware of the statistical process control. To develop basic understanding of requirements of TQM.

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

| S. No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1. | Demonstrate an understanding of the basic concepts and theories of Total quality Management. | Understand |
| 2. | Explain and appreciate the importance of cost of quality | Understand |
| 3. | Visualize and aware of the statistical process control. | Apply |
| 4. | Demonstrate and develop basic understanding of requirements of TQM | Understand |
| 5. | Explore application of TQM | Understand |

**Block I: Introduction**

**Unit 1:** Definition, Historical Review of TQM, TQM Basic Concepts, Barriers in TQM Implementation, Benefits of TQM, 5-S PRINCIPLES, QUALITY CIRCLE
**Unit 2:** Steps in implementing TQM
**Unit 3:** strategic tools for TQM

**Block II:**

**Unit 4:** Benchmarking, Business Process Re-engineering (BPR)
**Unit 5**: Various methods of calculation of Coefficients and their analysis:
**Unit 6**: JIT – Just in time, Quality function deployment (QFD)

**Block III:**

**Unit 7**: TAGICHI'S Quality Engineering, POKA YOKE
**Unit 8:** Quality education, Quality objectives and quality policy
**Unit 9**: Quality Planning, Quality information feedback

**Block IV:**

**Unit 10**: Service Quality
**Unit 11**: TQM Culture
**Unit 12**: Quality Audits

**Block V**:

**Unit 13**: The ISO 9000 Series, Need for ISO 9000- ISO 9000-2000, Quality system, Process of Obtaining ISO Certification
**Unit 14**: Essential steps to ISO Certification, Advantages of ISO Certification, New version of ISO Standards, documentation
**Unit 15**: ISO 14000, Concepts and Requirements of 14000, Benefits of ISO 14000

**Text and Reference Books**


1. Sherman, Clayton V. "Total Management, Not Total Quality Management." Journal For Healthcare Quality 13, no. 1 (January 1991): 26–31.Statistics for Management - Richard Levin, Pearson Publishing
2. Gupta, Dr Rakesh. "Role of Total Quality Management in Education." Global Journal For Research Analysis 3, no. 2 (June 15, 2012): 7–8
3. Borri, Fabio, and Giuliano Boccaletti. "From total quality management to total quality environmental management." TQM Magazine 7, no. 5 (October 1995):
4. Ziegel, Eric R., A. Tenner, and I. DeToro. "Total Quality Management." Technometrics 35, no. 4 (November 1993): 466.

# Course Name: Service operation management

**Course Code: MGO-7242** **Credit 4**

**Course Objective:** The objective of this course is to understand major concepts and tools used in the design and use of operations systems in organizations. It introduces the discipline and the role the function plays in a value-creating service organization. Emphasis is given both to familiarization of various production processes and service systems, and to quantitative analysis of problems/ issues arising in the management of operations.

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

| S. No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1. | Elaborate and understand major concepts and tools used in the design and use of operations systems in organizations | Understand |
| 2. | Demonstrate discipline and the role the function plays in a value-creating service organization | Understand |
| 3. | Emphasis is given both to familiarization of various production processes and service systems | Apply |
| 4. | Identify quantitative analysis of problems | Apply |
| 5. | Demonstrate issues arising in the management of service operations. | Understand |

**Block I: Introduction**

**Unit 1:** Definition and Perspectives of Services, Nature and characteristics of services
**Unit: 2** Classification of services and analyzing service operations, Strategic service vision, New service design and development
**Unit 3:** Service System Design and Delivery Process, Technology and automation, Service Encounter

**Block II:**

**Unit 4**: Human resource planning & employee selection, People management in services Work Measurement in services
**Unit 5**: Defining Service Quality, Quality Service by Design, Service Process Control
**Unit 6:** Quality Control Tools in services, Quality philosophy and performance excellence, Service recovery and service guarantee

**Block III:**

**Unit 7:** Process Analysis of Facility Layouts
Facility location Decision factors
Quantitative models for facility location, Service facility on a line or on a plane

**Unit 8:** Quantitative models for Facility Location, Based on different objective functions or optimization criteria, Quantitative models for multiple service facilities, Service facility design.
**Unit 9**: Forecasting demand in service, Smoothing customer demand in services, Service capacity management, Yield management

**Block IV:**

**Unit 10**: Resource and workforce scheduling in services, Introduction to Queuing system, Queuing system Characteristics
**Unit 11**: M/M/1Queuing Model, M/M/c QUEUING MODEL, M/M/1/N QUEUING MODEL
**Unit 12**: Service inventory management, Service supply chain, Processes of service supply chain

**Block V:**

**Unit 13:** Data Envelopment analysis – I
Data envelopment Analysis- II
**Unit 14**: Application of Simulation in Services Operations Management
**Unit 15**: Vehicle routing and scheduling

**Suggested Reading:**

1. Service Operations Management : Towards Excellence Paperback – 1 January 2019 by Nitin Joshi (Author)
2. Service Operations Management:Improving Service Delivery | Fourth Edition | By Pearson
3. Service Operations Management, Second Edition, 2nd edition David W. Parker

# Course Name: Management of Technology

## Course Code: MGO-7243 Credit 4

**Course objectives:**
The aim of this course is:
1. To describe the role of information technology and decision support systems in business and record the current issues with those of the firm to solve business problems.
2. To introduce the fundamental principles of computer-based information systems analysis and design and develop an understanding of the principles and techniques used.
3. To enable students understand the various knowledge representation methods and different expert system structures as strategic weapons to counter the threats to business and make business more competitive.
4. To enable the students to use information to assess the impact of the Internet and Internet technology on electronic commerce and electronic business and understand the specific threats and vulnerabilities of computer systems.
5. To provide the theoretical models used in database management systems to answer business questions.

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

| S.No. | Course Outcomes | Cognitive level |
|---|---|---|
| 1. | Relate the basic concepts and technologies used in the field of management information systems; | Understand |
| 2. | Compare the processes of developing and implementing information systems. | Understand |
| 3. | Outline the role of the ethical, social, and security issues of information systems. | Apply |
| 4. | Translate the role of information systems in organizations, the strategic management processes, with the implications for the management. | Apply |
| 5. | Apply the understanding of how various information systems like DBMS work together to accomplish the information objectives of an organization | Understand |

**Block I:**

**Unit 1:** Managers and Information Technology
**Unit 2:** Management Involvement and Governance, Information Resource Management
**Unit 3:** Strategic Management, Operational Management, Centralization versus Decentralization

**Block II:**

**Unit 4:** Managing IS Operations
**Unit 5:** Human Resource Management of IT
**Unit 6:** Network Management

**Block III:**

**Unit 7:** Advanced Technology Management,
**Unit 8:** Global Information Technology Management
**Unit 9:** Cultural, Political, and Geoeconomic Challenges

**Block IV:**

**Unit 10:** Global Business and IT Strategies,
**Unit 11:** Global IT Platforms,
**Unit 12:** The Internet as a Global IT Platform

**Block V:**

**Unit 13:** Global Data Issues
**Unit 14:** Systems Development Strategies,
**Unit 15:** You and Global IT Management

**Suggested Reading**


1. 1. Jawadekar, W.S., "Management Information Systems", Tata McGraw Hill Private Limited, New Delhi, 2009. 2.
2. Kenneth C. Laudon and Jane P. Laudon: "Management Information Systems" 9/e, Pearson Education, New Delhi. 3.
3. Alex Leon and Mathew Leon: "Data Base Management Systems", Vikas Publishing House, New Delhi. 4.
4. Goyal, D.P.: "Management Information System", MACMILLAN India Limited, New Delhi, 2008. 5.
5. Mahadeo Jaiswal, Monika Mital: "Management Information System", Oxford University Press, New Delhi, 2008. 6.
6. Murthy C.S.V.: "Management Information System", Himalaya Publications, New Delhi, 2008. 7.
7. Panneerselvam R.: "Database Management System", PHI Private Limited, New Delhi, 2008. 8.
8. Philip J, Pratt, Joseph J. Adamski: "Database Management Systems", Cengage Learning, New Delhi, 2009. 9.
9. Richard T. Watson: "Data Management ", WILEY INDIA Limited, New Delhi, 2008. 10.
10. Rob and Cornell: "Data Base Management Systems" Cengage Learning, New Delhi.

**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 MBA program is as follows:-

| S. No. | Name of Faculty | Designation | Nature of Appointment | Qualification | Subject |
|---|---|---|---|---|---|
| 1 | Prof. Shailendra Singh | Professor | Full-Time | Ph.D | Management |
| 2 | Prof. Ashish Mishra | Professor | Full-Time | Ph.D. | Management |

**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

There will be 6 counselling/ contact classes in face to face mode of two hours each for a course of 4 credits. The counselling sessions / face to face contact classes will be held on the campus of the University on Saturdays and 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 offline modes for easy and smooth services to the students through distance mode.

At present the university has only one study centre in the campus. The institution is not promotinganystudy 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 MBA programme will be done on the basis of screening of candidate's eligibility

on first come first serve basis. 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**

The maximum duration of the M.B.A. Programme is four years. Thereafter, students seeking completion of the left-over course(s) will be required to seek fresh admission.
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**

A candidate should be a graduate in any discipline of course (10+2+3)/(10+2+4)/(10+3+3) with minimum 50% marks.Program.

**Fee Structure**

| Name of the Program | Degree | Duration | Year | Tuition Fee/Year | Exam Fee/Year | Total (in Rs.) |
|---|---|---|---|---|---|---|
| Master of Business Administration | PG | 2 to 4 Years | 1 | 25500 | 2000 | 27500 |
| | | | 2 | 24000 | 2000 | 26000 |
| Total | | | | | | 53500 |

**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, 5 credit course requires 150 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 |
|---|---|---|---|
| 2 Yrs. | 84 | M.B.A. | Master 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:

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.

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 50% 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.

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 and other. The University intends to allocate expenses out of the total fee collection as per following details:

| | | |
|---|---|---|
| SLM Development and Distribution | : | 20% |
| Postal Expense | : | 10% |
| Salary and other Administrative expenses | : | 60% |
| Future development | : | 10% |

Once programmes are operational, fee receipt from the programmes budget to be planed as per the guidelines of University Grants Commission.

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## 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 amongall 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 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 formatas 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.B.A. Programme of Mangalayatan University in ODL mode, student will exhibit leadership skill and ability to work effectively in teams. After completion of M.B.A Programme, student will participate in business decision making and bring synergy to their ventures.

# 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 strengthen their capacity for problem-solving. 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. Chemistry programme has a comprehensive set of objectives aimed to 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 curriculum with the evolving needs of industries and academia to ensure that 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 enhancing 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/ZBC).

**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 | CHM-6111 | Inorganic Chemistry -I | DCC | 4 | 30 | 70 | 100 |
| 2 | CHM -6112 | Organic Chemistry -I | DCC | 4 | 30 | 70 | 100 |
| 3 | CHM-6113 | Physical Chemistry-I | DCC | 4 | 30 | 70 | 100 |
| 4 | CHM-6114 | Analytical Chemistry -I | DCC | 4 | 30 | 70 | 100 |
| 5 | CHM -6115 | Photochemistry and Pericyclic Reactions | DCC | 4 | 30 | 70 | 100 |
| 6 | CHM-6151 | Chemistry Lab-I | DCC | 4 | 30 | 70 | 100 |
| **Total** | | | | 24 | 180 | 420 | 600 |

| Semester-II | | | | | | | |
|---|---|---|---|---|---|---|---|
| S. No. | Course Code | Course Name | Category | Credit | Continuous Assessment Marks | Term End Exam Marks | Grand Total |
| | | | | | Max. Marks | Max. Marks | |
| 1 | CHM-6211 | Inorganic Chemistry –II | DCC | 4 | 30 | 70 | 100 |
| 2 | CHM-6212 | Organic Chemistry –II | DCC | 4 | 30 | 70 | 100 |
| 3 | CHM -6213 | Physical Chemistry-II | DCC | 4 | 30 | 70 | 100 |
| 4 | CHM -6214 | Analytical Chemistry -II | DCC | 4 | 30 | 70 | 100 |
| 5 | CHM-6215 | Polymer Chemistry | DCC | 4 | 30 | 70 | 100 |
| 6 | CHM-6251 | Chemistry Lab-II | DCC | 4 | 30 | 70 | 100 |
| Total | | | | 24 | 180 | 420 | 600 |

| Semester-III | | | | | | | |
|---|---|---|---|---|---|---|---|
| S. No. | Course Code | Course Name | Category | Credit | Continuous Assessment Marks | Term End Exam Marks | Grand Total |
| | | | | | Max. Marks | Max. Marks | |
| 1 | CHM-7111 | Bioinorganic and Biophysical Chemistry | DCC | 4 | 30 | 70 | 100 |
| 2 | CHM-7112 | Organometallic Chemistry | DCC | 4 | 30 | 70 | 100 |
| 3 | CHM-7113 | Organic Photochemistry | DCC | 4 | 30 | 70 | 100 |
| 4 | CHM-7114 | Research Methodology | GE | 4 | 30 | 70 | 100 |
| 5 | CHM-7151 | Chemistry Lab -III | DCC | 2 | 30 | 70 | 100 |
| Total | | | | 18 | 150 | 350 | 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 | | Elective -1 | Elective | 4 | 30 | 70 | 100 |
| 2 | | Elective -2 | Elective | 4 | 30 | 70 | 100 |
| 4 | CHM-7251 | Chemistry Lab -IV | DCC | 2 | 30 | 70 | 100 |
| 4 | CHM-7291 | Project | DCC | 4 | 0 | 100 | 100 |
| Total | | | | 14 | 90 | 310 | 400 |

**List of Elective Papers**

| | | |
|---|---|---|
| CHM-7211 | Supramolecular Chemistry | Elective |
| CHM-7212 | Green and Environmental Chemistry | Elective |
| CHM- 7213 | Chemistry of Natural Product | Elective |
| CHM- 7214 | Solid State Chemistry | Elective |

**Total credit of M.Sc. (Chemistry) program Semester wise**

| Semester | Credit |
|---|---|
| I | 24 |
| II | 24 |
| III | 18 |
| IV | 14 |
| **TOTAL** | **80** |

**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 Code: CHM-6111** **Credits: 4**

**Course Name: Inorganic Chemistry- I**

**Course Objectives:**

The objective of 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**

Introduction to s-and p-block elements, General Trends in s-block elements, General Trends in p-block elements, Stereochemistry, Bonding

**Unit 2: Quantitative Difference between Physical and Chemical Properties**

Physical properties of s-and p-block elements, Chemical properties of s and p-block elements

**Unit 3: Organometallic Compounds of Non-Transition Elements and their Importance**

Introduction to Organometallic compounds, s-and p-block organometallic compounds and their synthesis and importance

**Block II: s and p-Block elements: Group 1, 2, 13, 14 and 15**

**Unit 4: General Properties of p-Block Elements**

Metal complexes and Clusters

**Unit 5: Chemistry of Alkali and Alkaline Earth Metals**

Alkali metals, Alkaline earth metals, General Characteristics of Alkaline earth metals

**Unit 6: Chemistry of Group 13, 14, 15, And 16 Elements.**

Boron Family and their compounds, Carbon Family and their compound, Nitrogen Family and their compounds, Oxygen Family and their compounds

**Block III: Halogen Family**

**Unit 7: Chemistry of Halogen Compounds**

Halogen Family, General properties of Halogens, Halogen Oxoacids, Applications

**Unit 8: Polyhalogen and Interhalogen Compounds**

Polyhalogen Compounds, Interhalogen Compounds and their Applications

**Unit 9: Compounds of Halogens and Oxygen**

Halogen Family, General properties of Halogens, Halogen Oxoacids, Applications

**Block IV: Noble Gases**

**Unit 10: Chemistry of Noble Gasses**

Chemistry of noble gases, Xenon compounds, Applications

**Unit 11: Catenation between Heavier Elements**

Occurrence, RE=ER (E = P, As, Sb, Bi), $R_2E=ER_2$ and R2E (E = Si, Ge, Sn, Pb) systems, Applications

**Unit 12: Multiple Bonding between Heavier Elements**

Nature of Bonding, Multiple bonding

**Block IV: Phospha-Alkynes and Phospha-Alkenes, Chemistry of Alkali and Alkaline Earth Metals and Main Group Organometallic Chemistry**

**Unit 13: Phospha-Alkynes and Phospha-Alkenes.**

Phospha-alkynes, Phospha-alkenes

**Unit 14: Chemistry of Alkali and Alkaline Earth Metals**

Chemistry of alkali and alkaline earth metals, their uses in homogeneous catalysis and material chemistry.

**Unit 15: Main Group Organometallic Chemistry**

Variable 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 and inter halogen compounds.
4. Illustrate Noble gases.
5. Identify Phospha-alkynes and phospha-alkenes

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**Course Code: CHM-6112** **Credit: 4**

**Course Name: Organic Chemistry- I**

**Course Objectives:**

The objective of this course is to explain the concept of optical isomerism and stereochemistry of bridged, caged, cyclic compound, reaction mechanism and intermediates.

**Block I: Stereoisomerism: Optical Isomerism**

**Unit 1: Chiral Molecules with One Stereogenic Centre**

Stereoisomers, symmetry elements, chiral molecules with one stereogenic centre, optical activity, sequence rules, absolute configuration, enantiomeric excess.

**Unit 2: Two (or More) Stereogenic Centres**

Molecules with two (or more) stereogenic centres: diastereomers, Newman, Fischer and Sawhorse formulae.

**Unit 3: Optical Isomerism**

Erythro/threo, syn/anti configurations, meso configuration

**Block II: Stereochemistry**

**Unit 4: Stereochemistry of Fused, Bridged, and Caged Ring Systems**

Stereochemistry of fused, bridged, and caged ring systems

**Unit 5: Resolution of Enantiomers**
Resolution of enantiomers
**Unit 6: Chirality Without Stereogenic Carbon**
Chirality without stereogenic carbon: allenes, biphenyls, cyclophanes, helicenes, atropisomerism.

**Block III: Steroisomerism in Cyclic Compounds**
**Unit 7: Steroisomerism in Cyclic Compounds**
Steroisomerism in cyclic structures: cyclopropane, cyclobutene, cyclopentane.
**Unit 8: Cyclohexane**
Cyclohexane, decalins, anomeric effect, conformational analysis
**Unit 9: Diasterotopic Groups and Faces**
Prochirality, enantiotopic and diasterotopic groups and faces

**Block IV: Reaction Intermediates**
**Unit 10: Carbocations, Carbanions and free radicals**
carbocations, carbanions, Free radicals: Definition, Structure, Geometry, Stability, Reactivity and Applications.
**Unit 11: Carbenes**
Enolates, Carbenes, nitrenes, benzyne: Geometry, Stability, Reactivity and Applications.
**Unit 12: Kinetic and Thermodynamic Control of Reactions**
Kinetic and Thermodynamic control of reactions

**Block V: Reaction Mechanism**
**Unit 13: Substitutions, Eliminations Reactions**
Reaction mechanism: substitutions, eliminations reactions.
**Unit 14: Additions, Rearrangements**
Additions, rearrangements reactions
**Unit 15: The Hammett Relationship**
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 and discuss Reaction intermediates.
5. Identify and explain reaction mechanism.

**Course Code: CHM-6113** **Credits: 4**

**Course Name: Physical Chemistry- I**

**Course Objectives:**

Physical Chemistry is an important branch of Chemistry which deals at the small systems. Various phenomenons 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**

Introduction of Quantum Mechanics, Spectrum, black-body radiation, heat capacities, photoelectric and Compton effects

**Unit 2: Atomic and Molecular Spectra**

Atomic and molecular spectra, particle diffraction, wave-matter duality, Significance and Implications

**Unit 3: Foundation of Quantum Theory**

Foundation of Quantum Theory, Postulates of quantum mechanics, operators, role of operations in Quantum mechanism, specification and evolution of states

**Block II: Schrodinger Wave Equation and its Applications**

**Unit 4: Schrodinger Wave Equation**

Schrodinger wave equation, physical significance of wave functions and Properties of Eigen wave value

**Unit 5: Translational Motion**

Introduction of Translational Motion: Particle-in-a-box, penetration into and through barriers.

**Unit 6: Harmonic Oscillator Rotational Motion**

Introduction of 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**

Hydrogenic Atoms and Angular Momentum

**Unit 8: Many Electrons Atoms**

Many Electron Atoms

**Unit 9: Approximate Methods Perturbation theory**

Approximate Methods and its challenges in quantum mechanics and purpose, Types of approximated methods, Perturbation theory and variational methods.

**Block IV: Huckel Theory and its Molecular Orbital Wave Function**

**Unit 10: Huckel's Theory**

Huckel's theory, resonance integral, energy level diagram, Resonance diagrams for ethene, cyclobutadiene, allyl system, butadiene, benzene.

**Unit 11: Delocalization Energy of Organic Molecules**

Delocalization energy of Organic Molecules: Ethene, cyclobutadiene, benzene, allyl cation, allyl radical, allyl anion, cyclopropyl anion, cyclopropyl radical and cyclopropyl cation

**Unit 12: Huckel's Molecular Orbital Wave Function**

Huckel's molecular orbital wave function electron density and bond order. Huckels molecular Orbitals for ethene, allyl cation, cyclobutadiene, benzene

**Block V: Molecular Structure**

**Unit 13: Introduction to Molecular Structure**

Introduction to Molecular Structure: Born-Oppenheimer approximation, molecular orbital theory.

**Unit 14: Valence Bond Theory**

Introduction and postulates of Valence bond theory, number of orbital and types hybridization, applications, limitations.

**Unit 15: Computational Chemistry**

Molecular modeling, drug designing, software used in molecular modeling, applications of Computer chemistry in drug.

***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 and Molecular Interactions, Andrew Cooksy, Pearson Press.*
4. *Quantum Chemistry & Spectroscopy, Thomas Engel, Pearson Education.*
5. *Molecular Quantum Mechanics, Peter Atkins & Ronald Friedman, Oxford Press.*


**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 Code: CHM-6114** **Credits: 4**

**Course Name: Analytical Chemistry- I**

**Course Objectives:**

The objective of this 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.

**Block I: General Introduction to Analytical Methods**

**Units 1: Measurement Basics and Data Analysis**

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**

Introduction to Spectrometric Methods: General properties of electromagnetic radiation

**Unit 3: Basic Elements of Spectroscopy**

Basic elements of spectroscopy and its advantages, Einstein coefficients.

**Block II: Spectroscopic Analysis**

**Unit 4: Atomic Absorption**

Atomic Absorption Spectrometry: Sample atomization techniques, atomic Absorption instrumentation, Interferences in Atomic Absorption Spectroscopy, Atomic Absorption Analytical Techniques.

**Unit 5: Emission Spectroscopy**

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**

Mass and X-Ray Spectroscopy: Introduction to Atomic Mass and X-Ray Spectrometry.

**Block III: UV-VIS molecular absorption and Raman Spectroscopy**

**Unit 7: UV-VIS Molecular Absorption Spectrometry**

UV-VIS Molecular Absorption Spectrometry: Measurement of Transmittance and Absorbance, Beer's Law, Effects of Instrumental Noise on Spectrophotometric Analyses, Instrumentation, Magnitude of Molar Absorptivity's, Absorbing Species.

**Unit 8: Qualitative and Quantitative Analysis**

Application of Absorption Measurement to Qualitative Analysis, Quantitative Analysis by Absorption Measurements, Photometric Titrations

**Unit 9: Raman Spectroscopy**

Raman Spectroscopy: Theory of Raman Spectroscopy, Instrumentation, Applications of Raman Spectroscopy, Types of Raman Spectroscopy.

**Block IV: Infrared Spectrometry and Thermogravimetric Analysis**

**Unit 10: Infrared Absorption Spectrometry Structure**

Theory of Infrared Absorption Spectrometry, Infrared Sources and Transducers, Infrared Instruments

**Unit 11: Application of Infrared Spectroscopy**

Application of Infrared spectroscopy, Photoacoustic Infrared Spectroscopy, Near-Infrared Spectroscopy

**Unit 12: Thermogravimetric Analysis**

Instrumentation, Thermogravimetric Curves, Sources of Errors in TGA, Factors Affecting TG Curve, Applications of Thermogravimetric Analysis

**Block V: NMR and Mass Spectroscopy**

**Unit 13: Nuclear Magnetic Resonance Spectroscopy**

Nuclear Magnetic Resonance Spectroscopy: Theory of Nuclear Magnetic Resonance (NMR), Environmental Effects on NMR Spectra, NMR Spectrometers, Applications of Proton NMR.

**Unit 14: Carbon 13 NMR**

Carbon13 NMR, Application of NMR to Other Nuclei, Two-Dimensional Fourier Transform NMR, Magnetic Resonance Imaging.

**Unit 15: Mass Spectrometry**

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 Code: CHM-6115** **Credits: 4**

**Course Name: Photochemistry and Pericyclic Reactions**

**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 systems. Therefore, the objective of this study is to explain the photochemistry and pericyclic reactions in 4n and 4n+2 electron systems.

**Block I: Photochemistry**

**Unit 1: Photochemical Processes and Excited States Properties**

Absorption of light (radiation), Laws of photochemistry, Quantum yield or Quantum efficiency (Φ), Determination of Quantum yield (Efficiency of Quantum yield), Factors affecting quantum yield, Photosensitized Reaction, Photosynthesis, Photophysical Processes, Photochemical Processes, Jablonski Diagram, Potential Energy Surface, Potential Energy Curves (1-DPotentialEnergySurfaces), Mathematical definition and computation, Application of Potential Energy Surfaces, Properties of excited state, Dipole moment

**Unit 2: Deactivation and Energy Transfer Mechanisms**

Theories, factor effecting and application of Uni and Bimolecular deactivation, Quenching – types and factors affecting, applications, Electronic Energy Transfer Mechanisms and their factors

**Unit 3: Photochemical Transformations**

Intramolecular and Intermolecular photochemical processes- Isomerizations, rearrangements & dissociation, Factors impacting intermolecular additions in photochemical processes

**Block II: Inorganic photochemistry**

**Unit 4: Fundamentals of Inorganic Photochemistry**

Introduction to inorganic photochemistry, photochemical laws and photochemical kinetics, Laws of Absorption, Units of Molar Absorption Coefficient

**Unit 5: Electronic Absorption in Inorganic Compounds**

Photochemical processes. The electronic absorption spectra of inorganic compounds, Characteristics of the electronically excited states of inorganic compounds

**Unit 6: Excited State Redox and Photosensitization**

Photo electro chemistry of excited state redox reactions, Photosensitization

**Block III: Photochemical reactions**

**Unit 7: Overview of Photochemical Reactions**

Absorption of light (radiation), Laws of photochemistry: Quantum yield or Quantum efficiency (Φ), Determination of Quantum yield (Efficiency of Quantum yield), Factors affecting quantum yield, Photosensitized Reaction, Photosynthesis, Photophysical Processes, Photochemical Processes, Jablonski Diagram, Potential Energy Surface, Potential Energy Curves (1-DPotentialEnergySurfaces), Mathematical definition and computation, Application of Potential Energy Surfaces, Properties of excited state, Dipole moment

**Unit 8: Miscellaneous Photochemical Reactions**

Photo-Fries reactions of anilides, Photo Fries rearrangement, Barton reaction, Singlet molecular oxygen reactions, Photochemical formation of smog, Photo degradation of polymers, Photochemistry of vision.

**Unit 9: Photochemistry in Biological Process**

Photosynthesis, Photosystem I and Photosystem II, Excited States of Porphyrins and Metalloporphyrins, Porphyrins, Other Bioinorganic Systems

**Block IV: Molecular orbital approach and pericyclic reactions**

**Unit 10: Symmetry and Molecular Orbitals**

Molecular orbital symmetry, Frontier orbitals of ethylene, 1,3-butadiene, 1,3,5-hexatriene and allyl system.

**Unit 11: Molecular Orbital Theory**

Woodward–Hoffmann: Conservation of Orbital Symmetry, Fukui: Frontier Molecular Orbital Theory Dewar–Zimmerman: Aromatic Transition State, Types of Diels–Alder Reactions, Net Bonding Interaction, Diastereoselectivity: Endo vs. Exo, Regioselectivity & Rates: Substituent Effects, Lewis Acid Effects

**Unit 12: Electrocyclic Reactions and Molecular Motions**

Electrocyclic Reactions- 4n, 4n+2 and Allyl Systems, Synthetic Applications of Electrocyclic Reactions

**Block V: Cycloaddition reactions**

**Unit 13: Introduction of Cycloaddition Reactions**

Cycloadditions - antarafacial and suprafacial additions, 4n and 4n+2 systems, 2 + 2 addition of ketenes, 1,3-dipolar cycloadditions and cheleotropic reactions, Endo and Exo Stereochemistry.

**Unit 14: Sigmatropic Rearrangements: H and C Shifts**

Sigmatropic rearrangements - suprafacial and antarafacial shifts of H, sigmatropic shifts involving carbon moieties, 3,3- and 5,5 - sigmatropic rearrangements.

**Unit 15: Rearrangements and Reactive Dynamics**

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 Code: CHM-6151** **Credits: 4**

**Course Name: Chemistry Lab-I**

**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 unknown radicals including insoluble residue by semi-micro analysis

**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:**


1. Ozin G.A., Arsenault A.C. and Cademartiri L.: NANOCHEMISTRY: A CHEMICAL APPROACH TO NANOMATERIALS (2009).
2. Sergeev G.B.: NANOCHEMISTRY, Elsevier, B.V. (2006).
3. Day R.A. and Underwood A.L.: QUANTITATIVE ANALYSIS, Prentice Hall India Pvt. Ltd., New Delhi, 3rd Ed., (1997).
4. Yadav J.B.: ADVANCED PRACTICAL PHYSICAL CHEMISTRY, Krishna Prakashan Media (P) Ltd., Meerut (2016).
5. Jeffery G.H., Bassett J., Mendham J. and Denney R.C.: VOGEL'S TEXTBOOK OF QUANTITATIVE CHEMICAL ANALYSIS, 5th Ed.,
6. John Wiley & Sons, Inc., New York (1989).
7. 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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# Semester: II

**Course Code: CHM-6211** **Credit: 4**

**Course Name: Inorganic Chemistry – II**

**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 theories related to the coordination chemistry.

**Block I: Coordination Chemistry: General Introduction**

**Unit 1: Introduction to Coordination Chemistry**

Introduction of Coordination compounds, Structure, bonding and Isomers, Coordination Numbers and Structures.

**Unit 2: Ligand Field Theory, Molecular Orbital Theory**

Introduction to theories of Coordination compounds, Werner coordination theory, Crystal Field Theory, Ligand Field Theory, Angular Overlapping

**Unit 3: Magnetic and Spectral Characteristics of Inner Transition Metal Complexes**

Magnetic Susceptibility, Electronic Spectra, Coordination Number and Molecular Shapes/Geometry

**Block II: Electron Transfer Reaction**

**Unit 4: Electron Transfer and Photochemical Reactions**

Electron transfer and photochemical reactions of transition metal complexes, The Jahn-Teller Effect, Absorption of Light, Beer-Lambert Absorption Law.

**Unit 5: Spectroscopic Properties of Transition Metal Complexes**

Spectroscopic properties of transition metal, Magnetic Moments of Molecules and Ions, Colours of Transition Metal Complexes

**Unit 6: Kinetics and Reaction Mechanism**

Kinetics of the Reaction Mechanism, Rate Law for Dissociative Mechanisms, Rate Laws for Interchange Mechanisms, Rate Law for Associative Mechanisms

**Block III: Metal-Metal Bonded Compounds and Bioinorganic Chemistry**

**Unit 7: Metal-Metal Bonded Compounds and Transition Metal Cluster Compounds.**

Molecular orbital considerations in Dinuclear Metal Complexes with Multiple M-M Bonds, Cluster Compounds

**Unit 8: Uses of Lanthanide Complexes**

Lanthanide Complexes, Shift Reagents, Magnetic Compounds, Fluorescence

**Unit 9: Bioinorganic Chemistry**

Bioinorganic chemistry of iron, Haemoglobin, Myoglobin, Cytochromes, Bioinorganic chemistry of zinc, cobalt and copper

**Block IV: Transition Elements**

**Unit 10: Introduction of Transition Elements**

Electronic configuration, oxidation states, complex compounds, Configuration and Oxidation states, Coordination Chemistry of Lanthanides

Symmetry Operations and Elements, Point Groups, Groups of Low and High Symmetry, Properties and Representations of Groups

**Unit 12: Stereochemistry of Octahedral Reactions**

Substitution in (trans-sys) octahedral complexes, Substitution in cis-en octahedral complexes Isomerization of Chelate Rings

**Block V: Block II Struture/Isomers**

**Unit 13: Introduction to Structures and Isomers of Coordination Compounds**

Nomenclature and Ligands, Isomerism, Stereoisomerism

**Unit 14: Coordination Compounds of Transition Metals**

Nomenclature of Complexes, Structure of Complexes, Isomerism in Complexes

**Unit 15: Coordination Complexes in Nature and Technology**

Transition Metal catalysis, Uptake and Storage of Transition Metals, Metalloproteins and Metalloenzymes

***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 Code: CHM-6212** **Credits: 4**

**Course Name: Organic Chemistry - II**

**Course Objectives:**

The scope of organic chemistry in different fields is highly important. The objective of this study is to explain the synthesis of organic compounds, their derivative for various reaction mechanisms.

**Block I: Organic Synthesis**

**Unit 1: Formation of Carbon-Carbon Bonds and Applications**

Organometallic reactions, Synthetic applications of organoboranes and organ silanes

**Unit 2: Carbon-Hydrogen Bond Activation**

C-H bond activation, 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 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**

Synthetic equivalents and Umpolung benzoyl and acyl anion equivalents, dithianes, enol ethers and nitro compounds

**Unit 6: Alkylation Reactions**

Alkylation of enolates, enamines and hydra zones, alkylation of heteroatom stabilized anions.

**Block III: Carbon-Carbon double bond formation**

**Unit 7: Carbon-Carbon Double Bond Formation**

Carbon-Carbon double bond formation, Aldol condensation, Wittig and related reactions

**Unit 8: Some Name Reactions**

Peterson olefination, Julia-Lythgoe olefination, carbonyl coupling reaction (McMurry reaction)

**Unit 9: Tebbe Reagent, Shapiro and Related Reactions**

Tebbe reagent, Shapiro and related reactions

**Block IV: Carbon-Carbon Triple Bond Formations and Cross Coupling Reaction**

**Unit 10: Elimination and Dehydration Reactions**

Elimination reaction, Dehydration reaction, olefin metathesis and transition metal catalysed cross coupling reactions.

**Unit 11: Carbon-Carbon Triple Bond Formations**

Carbon-Carbon triple bond formations from acetylenes and from carbonyls

**Unit 12: Triple Bond Formations from Olefins and Other Compounds**

Olefins triple bonds, Cycloalkanes- strained rings, Eschenmoser fragmentation, allenes etc.

**Block V: Ring Compounds**

**Unit 13: Three 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

**Unit 14: Four Membered Rings**

Various methods of forming cyclobutanes, cyclobutene's and oxetanes

**Unit 15: Five 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.

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**Course Code: CHM-6213** **Credits: 4**

**Course Name: Physical Chemistry – II**

**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 Thermodynamics**

Basics concepts, Introduction of Laws of thermodynamics, Gibb's free energy, Chemical potential, Ideal and non-ideal solution

**Unit 2: Phase Rule**

Phase rule, Phase diagram, Solutions, Chemical equilibrium.

**Unit 3: Postulates of Statistical Thermodynamics & Ensembles**

Postulates of statistical thermodynamics, Ensembles, Monoatomic and polyatomic ideal gases, Molar heat capacities

**Block II: Laws of Thermodynamics**

**Unit 4: Basic Concepts of State Function**

Basic concepts (State function, mixed derivative, Equations of gases)

**Unit 5: First Law of Thermodynamics**

First law of thermodynamics (internal energy, enthalpy, heat capacity, Joule Thomson experiment)

**Unit 6: Second and Third Law of Thermodynamics**

Second and Third law of thermodynamics (entropy change, Clausius inequality, probability, absolute entropy)

**Block III: Chemical Potential and Statistical Thermodynamics**

**Unit 7: Chemical Potential**

History, Related terms, Thermodynamic chemical potential, Electronic chemical potential

The values of the chemical potential, Fundamental particle chemical potential, Clausius-Clapeyron Equation

**Unit 8: Change of Chemical Potential**

Definition, Effect of Change of chemical potential with reference to Temperature, pressure and addition of solute

**Unit 9: Statistical Thermodynamics**

Introduction of Statistical thermodynamics hemodynamic ensembles, mono and polyatomic ideal gases, molar heat capacities, Classical statistical mechanics

**Block IV: Chemical and Phase Equilibrium**

**Unit 10: Ideal and Real Gases**

Ideal and real gases, properties of fugacity, mixing and excess functions

**Unit 11: Chemical Equilibrium**

Chemical equilibrium, Conditions for Chemical Equilibrium, Equilibrium Constant, Reaching Chemical Equilibrium, Dynamic Equilibrium, Factors Affecting Chemical Equilibrium Le Chatelier's principle, partial molar quantities, standard states.

**Unit 12: Phase Equilibrium**

Phase equilibrium involving one, two and three components.

**Block V: Equilibrium in Condensed Phases**

**Unit 13: Solutions**

Types of solutions, concentration of solutions, solubility, colligative properties, binary solutions and azeotropes

**Unit 14: Non-Ideal Systems**

Non-ideal systems, activity and activity coefficients, Relationship between activity and activity Coefficients, Thermodynamic formulation of surface phenomena

**Unit 15: Surface Chemistry**

Adsorption, Distinction Between Adsorption And Absorption, Adsorption Mechanism, Types of Adsorption, Adsorption From Solution Phase, Catalysis, Homogeneous Catalysis, Heterogeneous Catalysis , Colloids, Emulsions.

***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 Code: CHM-6214** **Credits: 4**

**Course Name: Analytical Chemistry - II**

**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–1: Electron Microscopy and X-ray Crystallography**

**Unit 1: Scanning electron microscopy (SEM):**

Introduction of Scanning electron microscopy (SEM), Basic principles, instrumentation and Sample Preparation, applications of SEM

**Unit 2: Transmission electron microscopy (TEM)**

Transmission electron microscopy (TEM): Introduction of Transmission electron microscopy (TEM), Basic Principles, Electron gun, Electromagnetic lenses, Imaging, Operating parameters-magnification, resolution, depth of field, Applications of TEM

**Unit 3: Energy Dispersive X-ray Spectroscopy (EDS)**

Energy Dispersive X-ray Spectroscopy (EDS): Introduction of EDS, Basic principles, instrumentation and Sample Preparation, interpretation and applications of EDS.

**Block 2: Electroanalytical Techniques**

**Unit 4: Polarography**

Polarography- Principles, Ilkovic Equation, factors affecting on polarographic wave, application.

**Unit 5: Voltammetry**

Voltammetry - Principle, cyclic Voltammetry, criteria of reversibility of electrochemical reactions, quasi-reversible and irreversible processes, application

**Unit 6: Coulometry**

Coulometry: Principles, types of Coulometric Methods; Controlled Potential Coulometry, Constant Current Coulometry; Applications of Coulometric Methods

**Block 3: Thermal Analysis Techniques**

**Unit 7: Thermogravimetric Analysis**

Thermogravimetric Analysis: Principle; Instrumentation: Working Function of Each Component; Sources of Error in TGA; Factors Affecting TG Curve; Interpretation of TG Curve Thermogravimetric analysis (TGA); Application of Thermogravimetric Analysis; Analysis of Inorganic Mixtures, Determination of nature of Gravimetric Precipitation, Reaction Kinetics

**Unit 8: Differential Thermal Analysis**

Differential Thermal Method of Analysis; Principle, Instrumentation, DTA Curves, Factors Affecting DTA Curves, Sources of Errors; Applications of DTA

**Unit 9: Differential Scanning Calorimetry**

Differential Scanning Calorimetry: Experimental Setup, Interpretation of DSC Curve, Applications of DSC, Advantages of DSC

**Block 4: Chromatography Techniques**

**Unit 10: Thin layer chromatography (TLC)**

Thin layer chromatography (TLC) - Fundamentals and Principles of Thin Layer Chromatography (TLC), Mobile- Stationary phases, Normal- Reverse phases, visualizing reagent ($KMnO_4$, Ninhydrin, DD and others), Applicability and Importance with examples

**Unit 11: Gas Chromatography (GC)**

Gas Chromatography (GC) -Fundamentals and Principles of Gas Chromatography (GC), Instrumentation, Sample preparation, Carrier gases , Injectors (split/splitless, PTV, Head Space, Pyrolyzer and others), Pack and Capillary Columns, Detectors (TCD, FID, ECD, NPD, TEA, Ion Mobility Scan), Applications and importance with examples, Limitations.

**Unit 12: High Performance Liquid Chromatography (HPLC)**

High Performance Liquid Chromatography (HPLC): Fundamentals and Principles of High Performance Liquid Chromatography (HPLC), Instrumentation, Types of HPLC–Normal phase HPLC, Reverse Phase HPLC, Mobile phases, Sample preparation, Limitations of HPLC, HPLC injectors, HPLC pumps, HPLC columns, HPLC detectors (UV-Visible, fluorescence, PDA, RI and others).

**Block 5: Analytical Biochemistry**

**Unit 13: Body Fluids Analysis**

Body fluids analysis: Composition of body fluids and detection of abnormal level of certain constituents leading to diagnosis of diseases, Physiological and nutritional significances of water and fat soluble vitamins and minerals.

**Unit 14: Immunological Methods**

Immunological methods: General Processes of immune response, Antigen-antibody reactions, Precipitation reactions, radio, enzyme, and fluoro-immuno assays, affinity chromatography.

**Unit 15: Analysis of Human Nutrition**

Analysis of Human nutrition: Biological values and estimation of enzymes, carbohydrates, essential amino acids, proteins, and lipids.

***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: Polymers Chemistry**

**Course Code: CHM-6215** **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 do 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: Introduction to Polymers**

**Unit 1: Introduction and Classification of Polymers**

Introduction and history of polymeric materials, Classification of Polymers-Thermoplastics and Thermosets, Classification based upon polymerization mechanism, classification based upon polymer structure.

**Unit 2: Polymer Structure and Molecular Weight**

Polymer structure (Copolymers, Tacticity, geometrical isomerism, nomenclature), Molecular weight (molecular-weight averages and molecular-weight distribution), chemical structure and thermal transitions.

**Unit 3: Stereochemistry and Polymerization Methods**

Stereoisomerism in polymers, Monosubstituted ethylenes (Site of steric isomerism, Tacticity), Stereoregular polymers: Significance of stereoregularity (isotactic, syndiotactic, and atactic polypropenes), Coordination polymerization: Ziegler Natta catalyst.

**Block II: Polymer Synthesis**

**Unit 4: Step-Growth Polymerization: Synthesis and Kinetics**

Synthesis and kinetics of step-growth polymerization, molecular weight in step-growth polymerization

**Unit-5: Chain-Growth Polymerization: Mechanisms and Types**

Chain-growth polymerization- free-radical polymerization and copolymerization, Ionic polymerization and copolymerization, coordination polymerization

**Unit 6: Polymerization Techniques: Methods and Applications**

Important techniques of polymerization such as bulk, solution, suspension, emulsion, melt polycondensation, solution polycondensation, interfacial-condensation, solid and gas phase polymerization.

**Block III: Polymer-Structure Characterization**

**Unit 7: Determination of Polymer Molecular Weight**

Determination of molecular weight of polymers (Mn, Mw, etc), by end group analysis, viscometry, light scattering, gel permeation chromatography and osmotic pressure methods

**Unit 8: Molecular Weight Distribution in Polymers**

Molecular weight distribution and its significance, Polydispersity index

**Unit 9: Polymer Characterization Techniques**

Polymer characterization by IR, NMR, X-ray etc

**Block IV: Polymer Degradation And Stabilization**

**Unit 10: Types and Mechanisms of Polymer Degradation**

Degradation in polymers, Types of degradation (chain-end and random), thermal degradation, mechanical degradation, degradation by ultrasonic waves, photodegradation, degradation by high-energy radiation, oxidative degradation,

**Unit 11: Oxidation Processes in Polymers**

Mechanism of rubber oxidation, ozone oxidation, oxidative degradation of saturated Polymers.

**Unit 12: Polymer Stabilization Techniques**

Polymer stabilization: antioxidants, photstabilisers.

**Block V: Polymer Rheology**

**Unit 13: Fundamentals of Polymer Rheology**

Introduction to polymer rheology: Newtonian and non-Newtonian flow, pseudo plastic, bingham,

dilatants and thixotropic behaviour, Origin of non-Newtonian flow, Factors influencing flow behaviour: molecular weight dependence, chain branching, temperature dependence and time dependence.

**Unit 14: Rheometry and Flow Property Testing**

Boundary conditions of rheometry, Standard test methods for melt flow rate, Measurement of flow properties, characteristics.

**Uni -15: Thixotropy and Yield Stress Measurement**

Measuring thixotropy: measuring the breakdown of thixotropic structures and measuring the rate of recovery of gel structure, measurement of yield stresses using CS and CR rheometers.

***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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**Course Code: CHM-6251** **Credits: 4**

**Course Name: Chemistry Lab-II**

**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 CHMoride 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:**


1. Khosla B.D., Gulati A. and Garg V.C.: SENIOR PRACTICAL CHEMISTRY, R. Chand & Co., (2008).
2. Shoemaker D.P., Garland C.W. and Nibler J.W.: EXPERIMENTS IN PHYSICAL CHEMISTRY, McGraw Hill, New York (1996).
3. Yadav J.B.: ADVANCED PRACTICAL PHYSICAL CHEMISTRY, Goel Publishing House (2000).
4. Lewitt B.P.: FINDLEY'S PRACTICAL PHYSICAL CHEMISTRY, Longman (1990).


**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.

## Semester: III

**Course Code: CHM-7111** **Credits: 4**
**Course Name: Bioinorganic and Biophysical Chemistry**

**Course Objectives:**
The objective of this course is to explain the role of essential metal ions, metalloenzymes, biopolymer and biomolecular simulation in biological systems.

**Block I: Essential Metal Ions and their Deficiency**
**Unit 1: Essential and Trace Metal Ions**
Introduction to essential and trace metal ions, Importance in biological system.
**Unit 2: Deficiency of Essential Metal Ions**
Deficiency causes by lack /excess of Mn, Co, and Zn metal ions.
**Unit 3: Types of Photosystems and their Structures**
Structure of Chlorophyll, Photosynthesis, Photo system I and Photo system II

**Block II: Metalloenzymes**
**Unit 4: Metalloenzymes: Zinc Enzymes and their Catalytic Roles**
Zinc enzymes, carboxypeptidase and carbonic anhydrase.
**Unit 5: Biochemical Pathways**
Cytochromes, iron-sulphur proteins, and nitrogen fixation
**Unit 6: Metalloenzymes In Action: Iron, Copper and Cobalt Enzymes**
Iron enzymes-catalase and peroxidase, Copper enzyme –superoxide dismutase, Cobalt enzyme; cyanocobalamin.

**Block III: Biopolymers Interactions and Thermodynamics of Macromolecular Solvation**
**Unit 7: Fundamentals of Non-Covalent Interactions**
Non-covalent interaction, Electrostatic- dipole-dipole interaction, Dispersion force interaction, Hydrophobic interaction.
**Unit 8: Equilibria and Binding Processes in Biological Systems**
Multiple Equilibria and various types of binding processes in biological systems, Thermodynamics of biopolymer solutions
**Unit 9: Polymer Solvation and Membrane Equilibria**
Flory-Huggins model of macromolecular solvation, Osmotic pressure and Donnean membrane equilibriums.

**Block IV: Statistical Mechanics and Biomolecular Simulations**
**Unit 10: Macromolecular Structure**
Chain configuration of macromolecule, Random walk model
**Unit 11: Statistical Analysis of Macromolecular Conformation**
Statistical distribution of end to end dimension
**Unit 12: Average Dimension Analysis of Chain Structures**
Calculation of average dimension of various chain structures

**Block V: Conformational transitions**

**Unit 13: Understanding Protein Structure**

Helix-coil transition, Protein folding problem, primary, secondary, tertiary and quaternary structure of protein

**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: Fundamentals of Molecular Dynamics**

Van-der Waal's 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 Code: CHM-7112** **Credits: 4**

**Course Name: Organometallic Chemistry**

**Course Objectives:**

The objective of this course is to understand the organometallic compounds and reactions involving formation of 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 major objective of this course.

**Block I: Metal-Carbon Bond**

**Unit 1: General Introduction of Organometallics**

Introduction, factors guiding metal-carbon bond formation, general synthetic methods for Main Group organometallics

**Unit 2: Alkali and Alkaline-Earth Organometallics**

Structure and bonding of alkali, alkaline-earth organometallics, EAN rule

**Unit 3: Classification of Carbon-Based Ligands**

Classification of carbon-based ligands by donor atoms and number of electrons donated by the ligand, sigma-donor and pi-acceptor, transition metal organometallics; reactivity studies

**Block II: Organometallics as Homogeneous Catalysis**

**Unit 4: Applications of Organometallic Compounds**

Applications of organometallic compounds in homogenous catalysis; hydrogenation, carbonylation, metal-mediated C-X (X = C, heteroatom) bond formations.

**Unit 5: Olefin Metathesis**

Olefin metathesis and Ziegler-Natta polymerization

**Unit 6: Stereochemistry**

Stereochemistry, applications in asymmetric synthesis

**Block III: Organometallic Chemistry and their Synthesis**

**Unit 7: Organometallic Chemistry**

Organometallic chemistry of main group, transition and inner transition metals

**Unit 8: Synthesis and Applications of Buli, Grignard, Organo aluminum and Organozinc Reagents**

Synthesis and applications of Buli, Grignard, organo aluminum and organozinc reagents

**Unit 9: d- and f-Block Organometallic Compounds**

Simple Alkyl Ligands, Alkylidene Ligands, Alkylidyne Ligands, Alkene And Alkyne Ligands, Polyene Ligands, Cyclic Polyene Ligands

**Block IV: Metal Carbonyls**

**Unit 10: Metal Carbonyls**

The Structure of Metal Carbonyls, Metal Carbonyl Anions, Compounds with Metal-Carbon Bonds: Metal carbonyls- bonding and infrared spectra, phosphines and NHC's

**Unit 11: Different Alkenes, Alkynes, Carbenes and Carbines Ligands**

Alkenes and alkynes, carbenes and carbines, Hapto ligands with hapticity from 2- 8

**Unit 12: Oxidative Addition and Reductive Elimination Reactions**

Oxidative addition and reductive elimination, 1,1 and 1,2-migratory insertions and β hydrogen elimination, mechanism of substitution reactions.

**Block V: Organometallic Cluster and Cross Coupling Reactions**

**Unit 13: Organometallic Clusters**

Fluxionality and hapticity change, organometallic clusters, C-H activationagostic and anagostic interactions.

**Unit 14: Homogeneous Catalysis**

Homogeneous catalysis: hydrogenation, hydroformylation, methanol to acetic acid processes, Wacker oxidation.

**Unit 15: Introduction to Cross Coupling and Olefin Metathetical Reactions**

Introduction to cross coupling and olefin metathetical 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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**Course Name: Organic Photochemistry**
**Course Code: CHM-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: Introduction to Photo-Physical Chemistry**
**Unit 1: Interaction of electromagnetic radiations**
Interaction of electromagnetic radiations with matter, types of excitations, Distinctionof photoreactions from thermally initiated reactions,
**Unit 2: Basic laws of photochemistry**
Basic laws of photochemistry; Grothus & Draper law, law of photo chemical equivalence and law of absorption (Lambert Beer's law) and its limitations, Quantum yield.
**Unit 3: Fates of Excited States**
Fates of excited states; Jablonski Diagram, Fluorescence and phosphorescence, Vibrational relaxation, Intersystem crossing and internal conversion, Intramolecular VibrationalRedistribution, Dissociation/Predissociation, Quantum yield, Lifetimes of excitedstates. Emission spectra, Excitation spectra, Stokes shift, Effects of molecularstructure on fluorescence

**Block II- Photoadditon, Substitution and Fragmentation**
**Unit 4: Photoreduction of Carbonyl Compounds**
Photoreduction of carbonyl compounds-Linear addition initiated by hydrogen abstraction reaction, Synthetic applications of photochemical hydrogen abstraction reactions
**Unit 5: Intramolecular Hydrogen Abstraction**
Intramolecular hydrogen abstraction: The type-II family of reaction, Addition reactions of cyclic conjugated enones, Homolytic $\alpha$– cleavage of ketones.
**Unit 6: Photochemical Reactions of Cyclobutanones**
Photochemical reactions of cyclobutanones, Sigmatropic rearrangements of $\beta$, $\gamma$– unsaturated ketones initiated by $\alpha$ - cleavage.

**Block III: Cycloadditions**
**Unit 7: Theory of Cycloaddition Reactions**
Theory of cycloaddition reactions: FMO method, [2+2] cycloadditon and [4+2] cycloaddition reactions, mechanism and stereochemistry of cycloadditionsreactions,
**Unit 8: Correlation Diagrams of Cycloaddition Reactions**

Correlation diagrams of cycloaddition reactions, Woodward-Hoffmann rulein [4+2] and [2+2] cycloaddition reactions, Huckel-Mobius method,

**Unit 9: Retrocycloaddition reactions**

Retrocycloaddition reactions, [4+2] cycloadditions of cations and anions, [2+2] chelotropic cycloadditions, 1,3-dipolar cycloadditions, cycloadditions involving more than [4+2] electrons

**Block IV- Isomerisations and Rearrangements**

**Unit 10: Photochemical cis-trans Isomerisation of Alkenes**

Photochemical cis-trans isomerisation of alkenes, photochemical cis-transisomerisation of conjugated dienes, cis-trans isomerisation of cycloalkenes

**Unit 11: Photovalence isomerisation reactions of benzene**

Photovalence isomerisation reactions of benzene: Photochemistry of benzene valenceisomers. Photorearrangements of 2, 4-cyclohexadienones

**Unit 12: Sigmatropic Isomerisation**

Sigmatropic isomerisations of β, γ - unsaturated enones, Norrish-I and Norrish-II leavages, Paterno-Buchoreaction, Fries rearrangement, Barton reaction

**Block V: Advanced Topics in Photochemistry**

**Unit 13: Supramolecular Photochemistry**

Supramolecular photochemistry – Photochemistry in organized and constrained media – Organic photoresponsive materials

**Unit 14: Applications of Photochemistry**

Applications of photochemistry in biochemistry, biology, medicine and technology

**Unit 15: Some Current Topics in Photochemistry**

Chemistry of stratospheric ozone, Plant photosynthesis, Photodynamic therapy of tumour.

***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.

**Course Code: CHM-7114** **Credits: 4**

**Course Name: Research Methodology**

**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: CHM-7151** **Credits: 4**
**Course Name: Chemistry Lab – III**

**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 insoluble residue by semi-micro analysis
   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:**
   (ii) trans-potassium di aqua bis(oxalato) chromate (III)
   (iii)cis-potassium di aqua bis(oxalato) chromate (III)
3. **Reaction Mechanism**
   (ii) To perform Cannizaro reaction: Benzyl alcohol and benzoic acid from benzaldehyde
   (iii)To perform Perkin reaction: Cinnamic acid from benzaldehyde
4. Analysis of water quality parameters: pH, conductance, dissolved oxygen, hardness, CHMoride 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 TEXT BOOK OF QUANTITATIVE CHEMICAL ANALYSIS, 5th Ed.,

3. John Wiley & Sons, Inc., New York (1989).

# Semester: IV

## Program Elective - I

**Course Code: CHM-7211** **Credits: 4**
**Course Name: Supramolecular Chemistry**

**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: Exploring Host-Guest Chemistry**
Host-Guest Chemistry, Definition, classifications of host guest compounds
**Unit 2: Interactions in Supramolecular Systems**
Hydrodynamics and kinetic stability, role of weak interactions in supramolecules, Complementarity and cooperativity
**Unit 3: Macromolecular Hosts and Hydride Clathrates**
Hydride sponge and related clathrates, Different macromolecular hosts, host design, preorganised hosts, cyclodextrins, calixarenes, cucurbiturils etc.

**Block II: Recognition and Reactivity**
**Unit 4: Molecular Recognition and Reactivity**
Recognition and reactivity, molecular and Ion recognition, enatioselectivity, proton pumps and basis of supramolecular catalysis
**Unit 5: Metal-Directed Inorganic Hosts**
Inorganic host design, Metal directed assemblies, confinement, container molecules.
**Unit 6: Structural Diversity in Molecular Assemblies**
Molecular flasks, layered solids, channel structures, Intra-cavity complexes of neutral molecules.

**Block III: Physical Methods of Characterization**
**Unit 7: Quantifying Molecular Affinities**
Physical methods in understanding supramolecular chemistry, Determination of binding constant
**Unit 8: Calorimetric Analysis**
Isothermal titration calorimetry
**Unit 9: Advanced Materials Characterization**
Rheology, SEM, TEM etc

**Block IV: Supramolecular Polymers and Gel**
**Unit 10: Advanced Polymer Architectures and Applications**
Co-ordination polymers, hydrogen bond-based polymers, guest included polymers examples and applications.
**Unit 11: Supramolecular Gels: Structure and Applications**
Supramolecular gels, hydrogel and organogel and their structure and applications.
**Unit 12: Transient Gels: Properties and Uses**
Transient gels, and their applications.

**Block V: Molecular Machines**

**Unit 13: Dynamic Molecular Systems**

Molecular machines: interlocked dynamic systems, molecular motors, switch, and shuttles.

**Unit 14: Amphiphiles and Self-Assembly**

Amphiphiles and their self-aggregation: micelle, vesicles, liposomes, microemulsions.

**Unit 15: Self-Aggregation of Amphiphiles**

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.

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**Program Elective - II**

**Course Code: CHM-7212** **Credits: 4**

**Course Name: Green and Environmental Chemistry**

**Course Objectives:**

The objective is to familiarize students with the fundamental concepts and methodologies of green chemistry and sustainability, with a specific focus on the significance of reducing the environmental footprint in chemical processes. The aim is to provide a thorough comprehension of the fundamental principles and important ideas of green chemistry, together with practical examples.

**Block I: Introduction of Green Chemistry**

**Unit 1: Introduction to Green Chemistry and Sustainability**

Green chemistry: History, need, and goals, Green chemistry and Sustainability, Dimensions of sustainability, Limitations/Obstacles in pursuit of the goals of Green Chemistry, Opportunities for the next generation of materials designers to create a safer future

**Unit-2: Foundations of Green Chemistry**

Basic principles of Green Chemistry and their illustrations with examples

**Unit-3: Green Synthesis**

Green starting materials, Green reagents, Green solvents and reaction conditions, Evolution of the type of the reaction ***i)*** Rearrangements (100% atom economic), ***ii)*** Addition reaction (100% atom economic), Microwave assisted reaction, Ultrasound assisted reactions, Photochemical reactions using sunlight.

**Block II: Green Solvents & Ionic Liquids**

**Unit 4: Green Solvents, Aqueous Medium**

Green solvents, aqueous medium: Enhancement of selectivity, efficiency, and industrial applicability, Ionic liquids, Supercritical fluids.

**Unit 5: Solvent Free Neat Reactions in Liquid Phase**

Solvent free neat reactions in liquid phase, Solvent free solid phase reactions, Nonconventional energy sources, Microwave assisted reaction, Ultrasound assisted reactions, photochemical reactions using sunlight.

**Unit 6: Characteristics of Catalysts**

Characteristics of catalysts, catalyst affecting energy usage, stoichiometric of reagents, zeolite for solid acid catalysis, Bio catalysis for the synthesis of catechol, Baeyer- Villiger reaction, comparison of molecular and enzymatic catalysis.

**Block III: Future Trends in Green Chemistry**

**Unit 7: Future Trends in Green Chemistry**

Future trends in Green Chemistry: oxidation-reduction reagents and catalysts; Biomimetic, multifunctional reagents; Combinatorial green chemistry;

**Unit 8: Proliferation of Solvent less Reaction**

Proliferation of solvent less reactions; Noncovalent derivatization, Biomass conversion, emissioncontrol

**Unit 9: Chemical Industry Hazards: Assessment & Mitigation**

Biocatalysis, Hazard assessment and mitigation in chemical industry

**Block IV: Introduction to Environmental Chemistry**

**Unit 10: Fundamentals of Environmental Chemistry**

Concept and scope of Environmental Chemistry, Environmental terminology and nomenclatures, Environmental segments, Vertical temperature and vertical structure of the atmosphere, Biogeochemical cycles in the environment (Oxygen, Carbon, Nitrogen, Phosphorous and Sulphur cycles).

**Unit 11: Atmospheric Chemistry and Air Pollution**

Photochemical smog and formation of Peroxyacylnitrate (PAN), Formation and depletion of ozone in the atmosphere, Green House effect, Particulate pollutant: Classification, Physical, chemical and biological characteristics of particulate, Significance of PM-2.5 and PM-10, Effects of particulates on human health.

**Unit 12: Environmental Management and Resource Conservation**

Environmental Management: Methods of environmental management, Radioactive waste management, Environmental impact assessment, Natural resources of energy-consumptions and conservation.

**Block V: Pollution**

**Unit 13: Air Pollution**

Air pollutants (sources, classification, sampling and monitoring): Particulates, Aerosols, SOx, NOx, COx and hydrocarbon emission, Photochemical smog, Acid rains, Air-quality standards, Air pollution controls and their chemistry.

**Unit 14: Water Pollution**

Water pollutants (sources, classification, sampling and monitoring), *Water-quality parameters and standards*: physical and chemical parameters (colour, odour, taste and turbidity), Dissolved oxygen, BOD and COD.

**Unit 15: Radiation pollution**

Classification & effects of radiation; Effects of ionizing radiation on man; Effects of non ionizing radiation on life; Radioactivity and Nuclear fallout; Protection and control from radiation.

***Books Recommended/Suggested Reading:***

1. *"Green Chemistry: Theory and Practice" by Paul T. Anastas and John C. Warner*
2. *"Green Synthetic Approaches for Biologically Relevant Heterocycles" edited by Wei Zhang*
3. *"Handbook of Green Chemistry and Technology" edited by James H. Clark and Duncan J. Macquarrie*
4. *"Introduction to Environmental Chemistry" by Julian E. Andrews and Peter Brimblecombe*
5. *"Air Pollution and Control" by C. David Cooper and F. C. Alley*

**Course Outcomes:**

1. Students will be proficient in utilizing green synthesis techniques to design environmentally friendly chemical processes.
2. Students will be familiar with advanced topics in green chemistry, such as the use of green solvents, catalysts, and solvent-free reactions.
3. Students will be able to identify and discuss future trends in green chemistry and their implications for sustainable development.
4. Students will gain a comprehensive understanding of environmental chemistry principles, including the identification and management of various types of pollution.
5. Students will develop skills in assessing environmental impact and implementing strategies for pollution control and resource conservation.

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**Program Elective - III**

**Course Code: CHM-7213** **Credits: 4**

**Course Name: Chemistry of Natural Products**

**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: History of Natural Products**

**Unit 1: Introduction and Function of Natural Products**

Introduction, Functions, Primary and Secondary Metabolites

**Unit 2: Classification of natural Products**

Animal Based, Plant based, naturally occurring their sources and functions.

**Unit 3: Isoprenoid Compounds**

Terpene Hydrocarbon, Oxygenated Isoprenoid compounds, Animal based isoprenoid compounds.

**Block II: Alkaloids**

**Unit 4: Nitrogen based natural products**

Structure, stereochemistry, synthesis of morphine, Quinine, Nicotine, Caffeine

**Unit 5: Unraveling Nature's Chemistry: Biosynthesis Pathways**

Biosynthesis of the following Structure of morphine, reserpine

**Unit 6: Exploring Pharmacologically Active Alkaloids**

Structure, occurrence and functions of Ephedrine, (+) Conin.

**Block III:**

**Unit 7: Steroids**

Occurrence, nomenclature, basic skeleton

**Unit 8: Exploring Steroid Hormones**

Diels hydrocarbon and study of the following hormones, Androsterone, Testosterone, Estrone, Progesterone

**Unit 9: Unraveling Steroid Biosynthesis**

Aldosterone and cartisone. Biosynthesis of steroids.

**Block IV: Prostaglandins**

**Unit 10: Occurrence and nomenclature Prostaglandins**

Introduction, ocurrance and classification.

**Unit 11: Effects of Prostaglandins**

Biogenesis and physiological effects

**Unit 12: Synthesis of Prostaglandins**

Synthesis via PGE2 and PGF2 pathways

**Block V: Biogenesis**

**Unit 13: Synthesis of 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 Aspects**

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

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**Program Elective - IV**

**Course Code: CHM-7214** **Credits: 4**

**Course Name: Solid State Chemistry**

**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: Bonding, Structure and Preparative Methods**

**Unit 1: Bonding**

Bonding: Classification of solids based on nature of forces (Ionic, Covalent, Metallic, van der Waals, Hydrogen-bonded),

**Unit 2: Crystal Structures**

Crystal Structures: Symmetry and Choice of Unit- cell, Bravais lattice, Miller indices, Point groups and space groups, Close packing, Lattices and Unit- cells, Crystalline solids, ionic radii, radius ratio rule, lattice energy, crystal structure determination by powder diffraction and single crystal X-ray diffraction.

**Unit 3: Preparative Methods**

Preparative Methods: Solid state reactions (General Principles, precursor methods), Crystallization of solutions, melts, glasses and gels, vapour phase transport methods, Preparation of thin films, growth of single crystals, high pressure and hydrothermal methods.

**Block II: X-ray Diffraction and Crystal Structure**

**Unit 4: Diffraction of X-rays by Crystals**

Diffraction of X-rays by crystals: Bragg's law, Definitions related to crystal structure, crystallographic direction and crystallographic phases.

**Unit 5: X-Ray Diffraction Experiments**

X-ray diffraction experiments: The powder method and the single crystal method, Reciprocal lattice, Structure factor and its relation to intensity and Electron density, The phase problem, Description of procedure for an X-ray structure analysis,

**Unit 6: Crystal Defects and Non-Stoichiometry**

Perfect and imperfect crystals, intrinsic and extrinsic defects, point defects, Schottky and Frenkeldefects, Thermodynamics of Schottky and Frenkel defect, colour centres, non-stoichiometry and defects.

**Block III: Phase Transitions and Diffusion in Solids:**

**Unit 7: Phase Transitions**

Phase Transitions: Thermodynamic and Burger's classification of phase transition, Kinetics of phase transition- nucleation and growth, T-T-T diagrams,

**Unit 8: Factors Influencing Kinetics of Phase Transition**

Factors influencing kinetics of phase transition: Factors influencing kinetics of phase transition, Martensitic and order-disorder transitions.

**Unit 9: Diffusion in Solids**

Diffusion in solids: Mechanisms, Steady state and non-steady state diffusion, factors affecting diffusion, Kirkendall effect.

**Block IV: Electrical and Magnetic properties**

**Unit 10: Electrical Properties**

Electrical Properties: Electrical conductivity of metals, free electron theory, semiconductors, Intrinsic and extrinsic semi-conductivity, Band theory,

**Unit 11: Superconductivity**

Superconductivity: Conventional Superconductors, Bardeen-Cooper Schrieffer (BCS) theory, High temperature Superconductors, Ferromagnetic Superconductors, Uses of High temperature Superconductors.

**Unit 12: Magnetic Properties**

Magnetic Properties: Diamagnetism, paramagnetism, ferromagnetism, anti-ferromagnetism, ferrimagnetism, Calculation of magnetic moments, influence of temperature on magnetic behaviour, domains and hysteresis, Soft and hard magnetic materials.

**Block V: Optical Properties and Dielectric Properties**

**Unit 13: Optical Properties**

Optical Properties: Electron emission in Metals, Photovoltaic effect, Luminescence, Laser and Maser actions, The Ruby laser, Light emitting diodes, Optical fibers.

**Unit 14: Dielectric Properties**

Dielectric Properties: Dielectric constant, Clausius-Mosotti equation, Piezoelectricity, Ferroelectricity, Antiferroelectricity, Ferrielectricity.

**Unit 15: Organic Solids**

Organic Solids: Electrically conducting solids, organic charge transfer complex, organic metals, new superconductors.

**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: Chemistry Lab – IV**

**Course Code: CHM-7251** **Credits: 4**

**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 hydro Chloride 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 potentiometrically.

**4. Environmental Analysis**

(ii) Analysis of water quality parameters: pH, conductance, dissolved oxygen, hardness, Chloride and fluoride.

(iii) Determination of Pesticides by Gas chromatography in drinking water samples.

(iv) Analysis of $SO_2$, $NH_3$, $NO_2$ and $O_3$ with real time value from online analyzers.

**SUGGESTED BOOKS**


(i) Burns D.T. and Rattenbury E.M.: INTRODUCTORY PRACTICAL PHYSICAL CHEMISTRY, Pergamon Press (1966).

(ii) Daniels F., Williams J.W., Bender P., Alberty R.A., Cornwell C.D. and Harriman J.E.: EXPERIMENTAL PHYSICAL CHEMISTRY, McGraw Hill (1962).

(iii) Day R.A. and Underwood A.L.: QUANTITATIVE ANALYSIS, Prentice Hall India Pvt. Ltd., New Delhi, 3rd Ed.,

(iv) Ewing G.W.: INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS, McGraw Hills (1989).

(v) 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.

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**Course Code: CHM-7291** **Credits: 4**

**Course Name: Project**

**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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**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 counseling 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 centers 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.

# MANGALAYATAN UNIVERSITY, ALIGARH

## CENTRE FOR DISTANCE AND ONLINE EDUCATION


# PROGRAMME PROJECT REPORT

## MASTER OF SCIENCE (PHYSICS)

## M.Sc. (Physics)

**2024-25**

## 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 PCM and Hons. in Physics.

**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 mathematicaltechniques 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 semesters and minimum credit requirement is 80 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 is 4 years.

## Evaluation Scheme
## Semester-I

| S. No. | Course Code | Course Name | Course Type | Credit | Continuous Assessment | Term End Exam | Grand Total |
|---|---|---|---|---|---|---|---|
| | | | | | MM | MM | |
| 1 | PHM-6111 | Mathematical Physics | DCC | 4 | 30 | 70 | 100 |
| 2 | PHM-6112 | Classical Mechanics | DCC | 4 | 30 | 70 | 100 |
| 3 | PHM-6113 | Quantum Mechanics-I | DCC | 4 | 30 | 70 | 100 |
| 4 | PHM-6114 | Classical Electrodynamics | DCC | 4 | 30 | 70 | 100 |
| 5 | PHM-6151 | Physics Lab-I | DCC | 4 | 30 | 70 | 100 |
| | | | **Total** | **20** | **150** | **350** | **500** |

## Semester-II

| S. No. | Course Code | Course Name | Course Type | Credit | Continuous Assessment | Term End Exam | Grand Total |
|---|---|---|---|---|---|---|---|
| | | | | | MM | MM | |
| 1 | PHM-6211 | Statistical Mechanics | DCC | 4 | 30 | 70 | 100 |
| 2 | PHM-6212 | Quantum Mechanics-II | DCC | 4 | 30 | 70 | 100 |
| 3 | PHM-6213 | Nuclear and Particle Physics | DCC | 4 | 30 | 70 | 100 |
| 4 | PHM-6214 | Computational Physics and Programming | SE | 4 | 30 | 70 | 100 |
| 5 | PHM-6251 | Physics Lab-II | DCC | 4 | 30 | 70 | 100 |
| 6 | PHM-6252 | Computational Physics and Programming Lab | SE | 2 | 30 | 70 | 100 |
| | | | **Total** | **22** | **180** | **420** | **600** |

## Semester-III

| S. No. | Course Code | Course Name | Course Type | Credit | Continuous Assessment | Term End Exam | Grand Total |
|---|---|---|---|---|---|---|---|
| | | | | | MM | MM | |
| 1 | PHM-7111 | Mathematical Physics-II | DCC | 4 | 30 | 70 | 100 |
| 2 | PHM-7112 | Atomic and Molecular Physics | DCC | 4 | 30 | 70 | 100 |
| 3 | PHM-7113 | Condensed Matter Physics | DCC | 4 | 30 | 70 | 100 |
| 4 | | Elective | Elective | 4 | 30 | 70 | 100 |
| 5 | PHM-7151 | Physics Lab-III | DCC | 4 | 30 | 70 | 100 |
| | | | **Total** | **20** | **150** | **350** | **500** |

| | | | | | | |
|---|---|---|---|---|---|---|
| PHM-7114 | Electronics-I | Elective | 4 | 30 | 70 | 100 |
| PHM-7115 | Plasma Physics | Elective | 4 | 30 | 70 | 100 |
| PHM-7116 | Optical Fiber Communication | Elective | 4 | 30 | 70 | 100 |

## Semester-IV

| S. No. | Course Code | Course Name | Course Type | Credit | Continuous Assessment | Term End Exam | Grand Total |
|---|---|---|---|---|---|---|---|
| | | | | | MM | MM | |
| 1 | PHM-7211 | Material Science | DCC | 4 | 30 | 70 | 100 |
| 2 | | Elective | Elective | 4 | 30 | 70 | 100 |
| 3 | PHM-7251 | Physics Lab-IV | DCC | 4 | 30 | 70 | 100 |
| 4 | PHM-7291 | Project | DCC | 6 | 30 | 70 | 100 |
| | | | **Total** | **18** | **120** | **280** | **400** |

| | | | | | | |
|---|---|---|---|---|---|---|
| PHM-7212 | Electronics-II | Elective | 4 | 30 | 70 | 100 |
| PHM-7213 | Astrophysics | Elective | 4 | 30 | 70 | 100 |
| PHM-7214 | Physics of Nanomaterials | Elective | 4 | 30 | 70 | 100 |

**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 Code: PHM-6111** **Credit:** 4
**Course: Mathematical Physics-I**

**Course Objectives** The main objective of the course is to teach the students about the theory of functions of a complex variable, Fourier transform, Laplace transform and Group theory.

**Block-I: Theory of Functions of a Complex Variable**
Unit-1: Fundamentals of Complex Analysis- Analyticity and Cauchy-Reimann Conditions, Cauchy's integral theorem and formula
Unit-2: Advanced Topics in Complex Analysis - Taylor's series and Laurent's series expansion, Zeros and singular points, Multi valuedfunctions, Branch Points and Cuts
Unit-3: Exploring Complex Analysis- Reimann Sheets and surfaces, Residues, Cauchy's Residue theorem, Jordan's Lemma
Unit-4: Complex Integration- Evaluation of definite integrals, Principal Value, Bromwich contour integrals.

**Block-II: Fourier Transform**
Unit-5: Transforms- Fourier transform, Sine, Cosine and Complex transforms with examples, Definition,Properties and Representations of Dirac Delta Function
Unit-6: Analyzing Fourier Transforms- Properties of Fourier Transforms, Transforms of derivatives
Unit-7: Exploring Fourier Transforms- Parseval's Theorem, Convolution Theorem, Momentum representation, Applications to Partial differential equations,
Unit-8: Discrete Fourier Transform- Discrete Fourier transform, Introduction to Fast Fourier transform

**Block-III: Laplace Transforms**
Unit-9: Power of Laplace Transform- Laplace transform,
Unit-10: Laplace Transform- Properties and examples of Laplace Transform
Unit-11: Convolution Theorem- Convolution theorem and its applications,
Unit-12: Differential Equations with Laplace Transform Method- Laplace transform method of solving differential equations.

**Block-IV: Group Theory**
Unit-13: Fundamentals of Group Theory- Concept of a group (additive and multiplicative, isomorphism and homomorphism)
Unit-14: Exploring Group Theory- Matrix representation of a group, Reducible and irreducible representation of a group,
Unit-15: Orthogonality Theorem- The Great Orthogonality Theorem (without proof), Continuous,
Unit-16: Lie Groups- Lie groups.

**Course Outcomes:** After completion of the course, students will learn about the

| COs. No. | Course Outcomes (COs) |
|---|---|
| 1. | **Recall** the concepts of complex variable. |
| 2. | **Solve** problems of Fourier and Laplace transforms. |
| 3. | **Apply** Laplace transform methods to solve differential equations. |
| 4. | **Explain** Group Theory. |

**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. Chur chill. 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: PHM-6112** **Credit:4**
**Course: Classical Mechanics**

**Course Objectives:** The main objective of the course is to teach the students about the difference between Newtonian and Classical Mechanics. Canonical Transformations, Hamilton-Jacobi Method, Celestial mechanics, small oscillations and Relativistic Mechanics are also aimed to discuss.

**Block I: Classical Mechanics Fundamentals and Principles**
Unit 1: Foundations of Classical Mechanics- General idea of Newtonian physics; Mechanics of a particle, mechanics of a system ofparticles
Unit 2: Exploring Classical Mechanics- Constraints, generalized coordinates, D'Alembert's principle and Lagranges equations
Unit 3: Hamilton's Principle- Hamilton's principle, derivation of Lagrange's equations from Hamilton's principle,extension of Hamilton's principle to non-holonomic systems
Unit 4: Conservation Laws and Symmetry in Dynamics- Conservation theorems and symmetry properties, Generalized momenta, cyclic co-ordinates

**Block II: Canonical Transformations and Hamilton-Jacobi Method**
Unit 5: Canonical Transformations- Equation of canonical transformation, examples of canonical transformation
Unit 6: Analyzing Poisson and Lagrange Brackets- Poisson and Lagrange brackets and their invariance under canonical transformation, Jacobi'sIdentity, Poisson's Theorem
Unit 7: Infinitesimal Canonical Transformations- Equations of motion infinitesimal canonical transformation in the Poisson bracketformulation
Unit 8: Hamilton-Jacobi Method- Hamilton Jacobi Method, Generating functions.

**Block III: Celestial Mechanics and Small Oscillations**
Unit 9: Two-Body Central Force Problem- Two body central force problem: bound state, reduction of two-body problem to one body problem
Unit 10: Central Force Motion- Motion in a central force field, The virial theorem, the inverse square law of force
Unit 11: Central Force Motion- The motion in central force in the Kepler problem
Unit 12: Small Oscillations- Concept of small oscillations, eigen value equation, simple application ($CO_2$), Normalcoordinates and modes

**Block IV: Tensor Analysis**
Unit 13: Elementary idea of tensors- Elementary idea of tensors: co-variant, contra variant and mixed tensor, addition, subtraction, multiplication and characterization of tensors, quotient law.
Unit 14: Lorentz Transformations- Four-dimensional representation of the Lorentz transformations, covariance of the laws of nature, four vectors; velocity momentum,
Unit 15: Force and Its Transformation- Force and their transformation, equation of motion of a point particle in four vector form,
Unit 16: Relativistic Dynamics in Electromagnetic Fields- Relativistic Lagrangian and Hamiltonian of a charged particle in an em field.

**Course Outcomes:** At the end of the Classical Mechanics, student will be able to

| COs No. | Course Outcomes (COs) |
|---|---|
| 1. | **Solve** Lagrangian and Hamiltonian of the system. |
| 2. | **Understand and solve** the problems using various canonical transformations. |
| 3. | **Explain** two body central force problem. |
| 4. | **Define** and **Make use of** tensors |

**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: PHM-6113** **Credit: 4**
**Course: Quantum Mechanics-I**

**Course Objectives:** The primary objective of the course is to teach origin, postulates, Abstract formulation, Quantum dynamics and Angular momentum of the Quantum Mechanics.

**Block I: Introduction of Quantum Mechanics**
Unit 1: Mathematical Framework and Historical Context- Mathematical tools and brief introduction to origins of quantum physics.
Unit 2: Postulates and Vector Spaces- Review of quantum postulates. Properties of linear vector space,
Unit 3: Dirac Notation and Quantum Operator Theory- Dirac notation. Operators, their Eigen values and Eigen functions, orthonormality, completeness and closure.
Unit 4: Unitary Operations and Basis Changes- Generalized Uncertainty Principle. Unitary transformations, change of basis.

**Block II: Abstract Formulation**
Unit 5: Matrix Representation of Quantum Operators- Matrix Representation of operators.
Unit 6: Continuous Basis in Quantum Mechanics- Continuous basis, position and momentum representation and their connection.
Unit 7: Unitary Transformations and Basis Changes -Change of basis and unitary transformation,
Unit 8: Expectation Values and Insights from the Ehrenfest Theorem- Expectation values and Ehrenfest theorem

**Block III: Quantum Dynamics**
Unit 9: Schrödinger and Heisenberg Pictures Schrödinger and Heisenberg Pictures Schrödinger picture, Heisenberg picture and equation of motion
Unit 10: Harmonic Oscillator via Operator Methods- Classical limit, solution of harmonic oscillator by operator method
Unit 11: Symmetries and Exploring Their Role and Significance- Symmetries in quantum mechanics, general view of symmetries,
Unit 12: Spatial and Temporal Transformations- Spatial transition, continuous and discrete, time transition, parity and time reversal

**Block IV: Angular Momentum**
Unit 13: Properties and Commutation Relations- Angular Momentum, commutation relations of angular momentum
Unit 14: Orbital, Spin, and Total Operators- Orbital, Spin and total angular momentum operators.
Unit 15: Pauli Spin Matrices- Pauli spin matrices, their Commutation relations.
Unit 16: Eigenvalues, Eigenfunctions, and Clebsch-Gordan Coefficients- Eigen values and Eigen functions of L2 and Lz. Clebsch-Gordon coefficients

**Course Outcomes:** At the end of the Quantum Mechanics-I, student will be able to

| COs No. | Course Outcomes (COs) |
|---|---|
| 1. | **Explain** the origin of quantum physics and postulates of quantum mechanics. |
| 2. | **Outline** the Abstract Formulation of Quantum Mechanics. |
| 3. | **Understand** the Quantum dynamics. |
| 4. | **Explain** the quantization of angular momentum. |

**Text and References Books:**


*1.* Franz Schwabl: Quantum Mechanics.
*2.* J.J.Sakurai: ModernQuantum Mechanics.
*3.* N. Zettili: Quantum Mechanics.
*4.* P.A. M. Dirac: Principles' of Quantum Mechanics.
*5.* Bohm: Quantum Mechanics.

**Course Code: PHM-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. To understand the concept of electromagnetic radiation in vacuum, conducting and non-conducting media, formulation of Lagrangian of Electrodynamics are also aimedto discuss.

**Block I: Review of Maxwell's Equation**
Unit1: Fundamentals of Electromagnetic Theory- Review of Maxwell's equations, propagation of EM waves in conducting medium, linear, circular,elliptical polarization.
Unit 2: EM Wave Behavior in Conducting Media- Propagation of EM waves in conducting medium. Skin depth, Reflection and refraction frommetallic surface.
Unit 3: Wave Propagation- Propagation of waves between perfectly conducting planes, waves in hollow-conductors,
Unit 4: TE and TM Modes- TE and TM modes. Rectangular waveguides, resonant cavity

**Block II: Particle Dynamics in EM field**
Unit 5: Relativistic Dynamics of Charged Particles- Relativistic Charged particle motion in uniform statics E and B fields
Unit 6: Interplay of Electric and Magnetic Fields- Cross E & B fields
Unit 7: Particle Drifts in Non-Uniform Static Magnetic Fields- Particle drifts in (velocity and curvature) in non-uniform statics B field.
Unit 8: Adiabatic Invariance and Magnetic Mirrors- Adiabatic invariance and magnetic mirror.

**Block III: Radiation**
Unit 9: The Lienard-Wiechert Potential- Lienard Weichert potential, field produced by charged particle in motion,
Unit 10: Radiation from Accelerated Charged Particles- Radiation from accelerated charged particle, Larmor formula and its relativistic generalization,
Unit 11: Scattering of Electromagnetic Radiation by Free Charges- Scattering of EM radiation by free charges. Thomson scattering,
Unit 12: Scattering by Charged Systems- Scattering by a system of charges, dipole radiation.

**Block IV: Lagrangian formulation of Electrodynamics**
Unit 13: Lagrangian and Hamiltonian Formulations- Lagrangian and Hamiltonian formulation for a free relativistic particle, for a charged particle inEM field
Unit 14: Interaction of Charged Particles with Fields- Interacting charged particle and fields
Unit 15: Energy-Momentum Tensor and Conservation Laws- Energy-momentum tensor and related conservation laws
Unit 16: Canonical and Symmetric Stress Tensors- Canonical and Symmetric Stress Tensors, Solution of the wave equation in covariant form

**Course Outcomes:** At the end of the Classical Electrodynamics, student will be able to

| COs No. | Course Outcomes (COs) |
|---|---|
| 1. | **Explain** Maxwell's equation, gauge transformation and boundary conditions between different media. |
| 2. | **Apply** Maxwell's equations to deduce wave equation, electromagnetic field energy, momentum and angular momentum density. |
| 3. | **Determine** Lienard-Weichert potentials and fields, Larmor's and Thomson's classical radiation and scattering concepts. |
| 4. | **Explain** Lagrangian formulation of Electrodynamics. |

**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.

**Course Name: Physics Lab-I** **Credit:** 4
**Course Code: 6151**

**List of Experiments**

1. To determine the wavelength of the sodium light and the wavelength difference between D1and 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 ofsemiconductor.
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-Perotinterferometer.
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.

Semester-II

**Course Code: PHM-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 courseis designed to teach the phenomenological postulates and theories of the matter and their relationship with the quantum mechanics.

**Block I: Classical ensemble theory**
Unit 1: Quantum Statistical Mechanics of Identical Particles- Quantum statistical mechanics of identical particles, Condition for statistical equilibrium,
Unit 2: Symmetry, Probability, and Quantum Ensembles- Symmetry of wave function, Postulate of equal a prior probability, Random walk, Ensemblein quantum statistics,
Unit 3: Grand Canonical Ensemble & Quantum Distributions- Grand Canonical Ensemble, Partition function, Quantum distribution functions (Bose-
Einstein and Fermi-Dirac),
Unit 4: Derivation via Grand Partition Function- Derivation of distribution laws using grand partition function.

**Block II: Quantum ensemble theory**
Unit 5: Phase Space, Liouville's Theorem, and Microcanonical Gas Theory- Phase space and Liouville's theorem, Micro canonical ensemble theory and its application toideal gas of monatomic particles
Unit 6: Canonical Ensemble: Thermodynamics and Ideal Gas Dynamics- Canonical ensemble and its thermodynamics, partition function, classical ideal gas incanonical ensemble theory, energy fluctuations,
Unit 7: Gibbs Paradox, Sackur-Tetrode Equation, and Quantum Ensembles- Gibbs paradox and its solution, Sackur-Tetrode equation, a system of quantum harmonic oscillators as canonical ensemble, Grand canonical ensemble,
Unit 8: Statistical Quantities and Ideal Gas in Grand Canonical Ensemble- Significance of statistical quantities, classical ideal gas in grand canonical ensemble theory.

**Block III: Ideal Bose systems**
Unit 9: Ideal Bose Gas and Bose-Einstein Condensation: Fundamentals and Thermodynamics- Basic concepts and thermodynamic behaviour of an ideal Bose gas, Bose-Einstein condensation,
Unit10: Blackbody Radiation and Ideal Fermi Systems: Thermodynamic Behavior- Blackbody radiation-Planck's formula, Ideal Fermi systems: thermodynamic behavior of an idealFermi gas,
Unit 11: Heat Capacity of Free-Electron Gas at Low Temperatures: Insights and Discussion- Discussion of heat capacity of a free-electron gas at low temperatures,
Unit 12: Electron Gas in Metals: Exploring the H-Theorem- Electron gas in metals, H-theorem.

**Block IV: Phase transition**
Unit 13: Phase Transitions: Ising Model and Critical Fluctuations- Phase transitions, Ising model, Thermodynamic fluctuations, Critical exponents,
Unit 14: Thermodynamic Limit and Random Walk Dynamics- Thermodynamic limit and its importance Random walk
Unit 15: Brownian Motion, Diffusion, and Fluctuation-Dissipation- Brownian motion, Diffusion equation, Fluctuation-Dissipation theorem.
Unit 16: Universality in Phase Transitions: Ising vs. Heisenberg Models- Concepts of universality of phase transitions, Ising and Heisenberg models

**Course Outcomes:** At the end of the **Statistical Mechanics**, student will be able to

| COs No. | Course Outcomes (COs) |
|---|---|
| 1. | **Explain** the laws of thermodynamics, equipartition and Liouville's theorem. |
| 2. | **Determine** the ensemble theory and its applications. |
| 3. | **Illustrate** the phenomenon of black body radiation and Bose-Einstein condensations. |
| 4. | **Formulate** random walk problem and should be able to apply it to realistic systems in nature. |

**Text and Reference Books:**


1. Landau and Lifshitz, Statistical Physics, Reed Educational & professional publication Ltd.
2. Pathria R.K., Statistical Mechanics (2ndedition), 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.

**Course Code: PHM-6212** **Credit: 4**
**Course Quantum Mechanics-II**

**Course Objectives:**
Students will earn 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.

**Block I: Approximation methods for stationary systems**
Unit 1: Perturbation Theory: Non-Degenerate States- Time independent perturbation theory. Perturbation of non-degenerate states: first and secondorder perturbation.
Unit 2: Perturbation: Harmonic Oscillator & Degeneracy Removal- Perturbation of a harmonic oscillator. Perturbation of degenerate states, removal of degeneracy.
Unit 3: Zeeman, Isotopic, and Stark Effects- Zeeman effect, isotopic shift and Stark effects.
Unit 4: Variational & WKB Methods- Variational and WKB methods.

**Block II: Approximation methods for time dependent problems**
Unit 5: Interaction Picture & Time-Dependent Perturbations- Interaction picture and Time dependent perturbation theory
Unit 6: Dynamics: Constant & Harmonic Perturbations- Equations of Motion. Constant and harmonic perturbation.
Unit 7: Transition Probabilities: Discrete and Continuous Cases- Discrete and continuous case, transition probability. Fermi golden rule.
Unit 8: Adiabatic and sudden- Adiabatic and sudden approximations.

**Block III: Scattering Theory**
Unit 9: Scattering of Wave Packets: Theory- Scattering Theory Scattering of a wave packet.
Unit 10: Cross Sections and Born Approximation -The differential and total Cross section. The Born approximation.
Unit 11: Partial Waves, Lippman-Schwinger Equation, S-Matrix Properties- Partial waves and phase shifts, The Lippman Schwinger equation.
Unit 12: S-Matrix & T-Matrix: Properties and Optical Theorem -Definition and properties of S-matrix, T matrix. Optical theorem.

**Block IV: Relativistic Quantum Mechanics**
Unit 13: Klein-Gordon & Dirac Equations: Properties of Matrices- Klein-Gordon and Dirac equations, properties of Dirac matrices.
Unit 14: Dirac Equation: Plane Wave Solution & Electron Spin- Plane wave solution of Dirac equation. Spin and magnetic moment of the electron
Unit 15: Non-Relativistic Dirac Equation: Central Forces & Hydrogen Atom -Non-relativistic reduction of the Dirac equation. Central forces and the hydrogen atom.
Unit 16: Hydrogen Atom in Dirac Theory & Dirac Electron in Magnetic Field- Hydrogen atom in Dirac's theory, Dirac electron in constant magneticfield,

**Course Outcomes:** At the end of the Quantum Mechanics-II, student will be able to

| COs No. | Course Outcomes (COs) |
|---|---|
| 1. | **Tell** approximation methods for stationary systems. |
| 2. | **Illustrate** approximation methods for non-stationary systems. |
| 3. | **Explain** scattering theory. |
| 4. | **Know** relativistic quantum mechanics. |

***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.

**Course Code: PHM-6213** **Credit: 4**
**Course: Nuclear and Particle Physics**

**Course Objectives:** The primary objective is to introduce the basic ideas and concepts ofNuclear Physics and impart knowledge about nuclear basic properties, nuclear decays and nuclear reactions.

**Block I: General properties of atomic nuclei**
Unit 1: Atomic Nuclei: Properties & Nuclear Forces- General properties of atomic nuclei and nuclear forces (qualitative),binding energy,
Unit 2: Nuclear Potentials & Deuteron States- Types of nuclear potential, Ground and excited states of deuteron,
Unit 3: Tensor Force & Spin Dependence in Nuclear Force- Tensor force S & D states, spin dependence of nuclear force,
Unit 4: Low-Energy n-p and p-p Scattering -n-p scattering and p-p scattering at low energies.

**Block II: Review of barrier penetration of alpha decay**
Unit 5: Alpha Decay Barrier Penetration & Geiger-Nuttal Law: Review- Review of barrier penetration of alpha decay &Geiger-Nuttal law.
Unit 6: Beta Decays: Fermi Theory & Transition Types- Beta decays, Fermi theory, Allowed and forbidden transitions,
Unit 7: Parity Violation in Beta Decay & Electron Capture- Experimental evidence for Parity-violation in beta decay, Idea of electron capture,
Unit 8: Gamma Transition Multipolarity & Selection Rules- Multipolarity of gamma transitions and selection rules, internal conversion, idea ofCoulomb excitation.

**Block III: Nuclear models**
Unit 9: Extreme Particle Model: Square-Well & Harmonic Oscillator- Extreme particle model with square-well & harmonic oscillator potentials
Unit 10: Spin-Orbit Coupling & Shell Model Predictions- Spin-orbit coupling, shell model predictions, magnetic moment-Schmidt lines,
Unit 11: Single-Particle Model: Total Spin Configurations - Single particle model, Total spin 'J' for various configurations,
Unit 12: Electric Quadrupole Moment & Nuclear Collective Modes- Electric quadrupole moment. Collective modes of motion, nuclear vibrations androtations.

**Block IV: Introduction of elementary particles**
Unit 13: Elementary Particles: Quantum Numbers & Conservation Laws- Introduction of elementary particles. Quantum numbers and conservation laws,
Unit 14: Charge Conjugation, Time Reversal, CPT Theorem & Particle Families -Charge conjugation, time reversal invariance, CPT theorem. The Baryon decuplet,meson octet, quark spin and color.
Unit 15: Pion-Parity, Neutrino Helicity, K-Decay & CP Violation - Pion-Parity, Neutrino Helicity, K-Decay & CP Violation- Pion-parity, helicity of neutrino, K-decay, CP violation in K-decay and its experimental determination, resonances,
Unit 16: Hadron Classification: SU(2) and SU(3) Symmetry- Special symmetry groups SU(2) and SU(3) classification of hadrons, quarks, Gell-Mann-Okubo mass formula.

**Course Outcomes:** At the end of the Nuclear and Particle Physics, student will be able to

| COs No. | Course Outcomes (COs) |
|---|---|
| 1. | **Explain** general properties of atomic nuclei and nuclear forces. |
| 2. | **Tell** alpha, beta and gamma decay and the idea of coulomb excitation. |
| 3. | **Explain** the idea of resonance and nuclear model |
| 4. | **Solve** the particle flavor oscillation based on semi-quantum mechanical approach for neutrino and K-mesons. |

**Text and Reference Books:**


1. EngeH. 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: Computational Physics and Programming** **Credit: 4**
**Course Code: PHM-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: Algorithmic Process, Basics of 'C' Programming**
Unit 1: Foundations of Programming: Algorithms, Analysis, and Languages- Algorithms, General Approaches & Analysis, Program and Programming Language, Fundamental Stages of Problem Solving, Feature of Programming Language, Flow Charts.
Unit 2: Mastering C: Learning Outcomes and Programming Essentials- Learning outcomes, Program and Programming Language, Introduction to C Language, Programming Format of C, Creating a C Program, Compilation process in C Program,Link and Running C Program, Diagrammatic Illustration.
Unit 3: C's Core Elements: Characters, Tokens, Keywords, and Identifiers -Building Blocks – Character set of C, C Tokens, Keywords and Identifiers of the C.
Unit 4: Essential 'C' Elements: Data Types and Variables- Fundamental elements of 'C' – Data Types in C, Variables.

**Block II: Operator and Expressions of 'C', Control Flow Mechanisms**
Unit 5: Coding Logic: Operators, Expressions, and Conversions in C- Logical and Relational – Operators in 'C', Expressions in 'C' and Types Conversionsin Expressions.
Unit 6: Essential Concepts in C: Control and Loop Statements- Key Terminologies, Design Control Statements, Loop Control Statements and ExitFunction.
Unit 7: Data Management in C: Arrays and Function Handling- Declaring & Accessing Data Elements, Arrays Declaration, Initialization andPassing Functions.

**Block III: Strings, Tools for Modular Programming and Pointers**
Unit 8: Essential Skills in C: Strings Overview and Usage- Essential Techniques & Functions, Declaration and Initialization of Strings,Overview and Applications.
Unit 9: Function Essentials: Prototypes, Calls, Returns, Storage, and Recursion- Functions Prototypes, Calling a Function, Return Statement, Sets of Variables & Storage Classes and Recursion.
Unit 10: Mastering Pointers: Variables, Functions, and Strings -Handle Variables and Parameters, Pointer and their Characteristics, Passing Pointersto Functions and Pointers and Strings.

**Block IV: Multiple Data Elements, Preprocessors Directives and Files**
Unit 11: Structures in Action: Declaration, Access, Initialization, and Pointers- Declaration of Structures, Accessing the Members of a Structure, Initializing, FunctionArguments and Pointers to Structures.
Unit 12: Unions Unveiled: Definition, Initialization, and Access - Defining of Unions, Initialization of Unions and Accessing the Members of an Union.
Unit 13: C Preprocessing and Translation: Constants, File Handling, and Conditional Compilation- Translation Phase, 'C' Preprocessor, Implement Constants, Reading from other filesand Conditional Selection of code and Pre-Processor Commands.
Unit 14: File Handling Mastery in C: Pointers, Input/Output, and Access Modes- File Handling in C using file Pointers, Input and Output using file Pointers,Sequential Vs Random Access Files and Unbuffered I/O – The UNIX File Routines.

**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.; Letus C, B PB Publications.
6. Jones J.A. and Harrow K.; Problem solving with C, Pearson Education India.

**Course Name: Physics Lab-I** **Credit: 4**
**Course Code: PHM-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 16bit.
3. To perform addition and subtraction of two 8 bit numbers; sum16 bit.
4. To perform the decimal addition of two8 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 16bit.
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 P Pi to microprocessor and set port A as input port inMode0.
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: Computational Physics and Programming Laboratory**
**Course Code: PHM-6252** **Credit: 2**

**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.

**Programming Lab**

- Introduction (Overview of the Lab)
- Objectives
- Overall Directions
- Algorithms and Flow Charts
- Structure of 'C' Program
- Salient Features of C
- 'C' Program development Environment
    - Phase-I: Creating a Program
    - Phase-II&III: Preprocessing and Compiling a 'C' Program
    - Install Visual Studio Code on Windows
- How to design/develop Program
- Structure of 'C' Program
- Compile and Run 'C' Program
- Practice Sessions (Session 1 to Session 5)

**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.

Semester-III

**Course Name: Mathematical physics -II** **Credit: 4**
**Code: PHM-7111**

**Course Objectives:** To familiarize students with basic of concepts of partial differential equations, Lagrange's linear equation and wave equations in various coordinate systems, Define binary operations, groups, semi-groups, and Abelian groups, along with exploring multiplication tables and equivalence classes.

**Block I: Mathematical Methods & Physical Applications: PDEs, Coordinates, and Solutions**
Unit 1: Lagrange's Linear Equation with Multipliers-Lagrange's linear equation, Method of multipliers.
Unit 2: Fundamental Equations in Cartesian Coordinates- Solutions of Laplace, Poisson, Diffusion and wave equations in Cartesian.
Unit 3: PDEs in Spherical and Cylindrical Coordinates- Partial differential equations in spherical and cylindrical co-ordinates.
Unit 4: Practical Applications of Advanced PDE Solutions- Physical applications of the above topics.

**Block II: Advanced Mathematical Techniques & Physical Applications**
Unit 5: Inhomogeneous Equations and Fourier Series Analysis- Inhomogeneous equations, Green's function for a free particle, Fourier series, Dirichlet's conditions, Even and odd functions, Parseval's identity for Fourier series.
Unit 6: Comprehensive Study of Fourier Integrals and Special Functions-Fourier integral, different forms of Fourier integrals, Fourier sine, cosine and complex transform, Parseval's identity for Fourier integrals. Beta and Gamma functions,
Unit 7: Beta and Gamma Functions and Their Interrelations -Different forms of Beta and Gamma functions and relation between them
Unit 8: Applications of Beta and Gamma Functions -Physical applications of the above topics

**Block III: Foundations of Group Theory & Operations**
Unit 9: Introduction to Groups and Binary Operations- Binary operation, Definitions of Group, Semi-Group and Abelian group,
Multiplication table
Unit 10: ECCEC- Equivalence class, Conjugate elements and classes.
Unit 11: IPCC- Invariant subgroups, Permutation group, Cyclic group, Cosets of a subgroup
Unit 12: FIGP- Finite and infinite group, Period of the group

**Block IV : Group Representations & Symmetry Applications**
Unit 13: STReC- Similarity transformations, Representation Character of Trace of the group.
Unit 14: SLOT- Schur's Lemma and the Orthgonality theorem.
Unit 15: CRS -Examples of C2v, Regular representation, Symmetrised basis functions for irreducible representation
Unit 16: DPR-SVP- Direct product of representation. Applications to simple vibrational problems.

**Course Outcomes:** After the completion of the course, student shall be able to:

| COs No. | Course Outcomes (COs) |
|---|---|
| 1 | **Explain** Solve Laplace, Poisson, diffusion, and wave equations in various coordinate systems |
| 2 | **Classify** Explore Fourier integrals, various forms, and transforms, such as Fourier sine, cosine, and complex transforms. |
| 3 | **Understand** the properties and applications of Beta and Gamma functions in various fields |
| 4 | **Describe** concepts such as conjugate elements, invariant subgroups, permutation groups, cyclic groups, and cosets. |

**Books Recommended/Suggested Reading:**


1. Partial Differential Equations for Scientists and Engineers" by Stanley J. Farlow.
2. Partial Differential Equations: An Introduction" by Walter A. Strauss.
3. Partial Differential Equations in Physics" by Arnold Sommerfeld. Fourier Analysis and Its Applications" by Gerald B. Folland
4. Abstract Algebra" by David S. Dummit and Richard M. Foote.

**Course Code: PHM-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 I: Atomic structure**

Unit-1: Quantum Treatment of Hydrogen Atom- Quantum Mechanical Treatment of one-electron Atom, Spin-Orbit interaction and fine structure of hydrogen atom,

Unit 2: Alkali Element Spectra & Helium States- Spectra of alkali elements. Singlet and triplet States of Helium, Central fieldapproximation, Thomas-Fermi field,

Unit 3: Atomic Wavefunctions & Approximations- Atomic wavefunction, Hartree and Hartree–Fock approximations, SpectroscopicTerms: LS and J J coupling schemes for many electron atoms,

Unit 4: Wavefunctions & Multiplet Energies- Wavefunctions and energies of multiplets, Electric dipole and Electric Quadrupole.

**Block II: Molecular structure**

Unit 5: Born-Oppenheimer & H2 Theory -Born - Oppenheimer approximation, Heitler-London theory of H2

Unit 6: Diatomic Molecule Structure -Rotation, vibration and electronic structure of diatomic molecules

Unit 7: Molecular Orbit & Valence Bond in H2- Molecular orbit and valance bond methods for $H2^{+}$and H2

Unit 8: Heteronuclear Correlation Diagrams - Correlation diagram for hetero nuclear molecules

**Block III: Molecular spectra**

Unit 9: Diatomic Molecule Spectra- Rotation, vibration and electronic spectra of diatomic molecules

Unit 10: Franck-Condon & Electron Spin Principles - The Franck-Condon principle, electron spin and Hund's cases

Unit 11: Symmetry in Molecules: Diatomic & Polyatomic- Idea of symmetry elements and point groups and diatomic and poly atomic molecules

Unit 12: Spectroscopic Techniques: IR, Raman, Photoelectron- Infrared Spectroscopy and Raman spectroscopy, Photoelectron Spectroscopy

**Block IV: Spectroscopy**

Unit 13: NMR & ESR Principles: Introduction- Nuclear Magnetic Resonance, Chemical Shift, and Electron Spin Resonance(Introduction and their principles only).

Unit 14: Infrared Spectrophotometer Basics- General description and working of infra-red Spectrophotometer,

Unit 15: Photoelectron & Raman Spectrometers- Photoelectron Spectrometer,
Simple Raman Spectrometer,

Unit 16: NMR & ESR Spectrometers- NMR Spectrometer and ESR Spectrometer.

**Course Outcomes:** At the end of the Atomic and Molecular Physics, student will be able to

| COs No. | Course Outcomes (COs) |
|---|---|
| 1 | **Explain** quantum mechanical treatment of an atom, wave function, electric dipoles and quadrupole. |
| 2 | **Classify** the molecules, molecular energy states, electronic states and spectra. |
| 3 | **Understand** different spectroscopy and resonance |
| 4 | **Describe** the working of various spectrometers. |

**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.

**Course Code: PHM-7113** **Credit:4**
**Course: Condensed Matter Physics**

**Course Objectives:** Knowledge of the role of Solid-State Physics in important technologicaldevelopment.

**Block I:Bonding in crystals**
Unit 1: Crystal Bonding Types & Madelung Constant- Bonding in crystals: covalent, ionic, metallic, hydrogen bond, vander Waal's bondand the Madelung constant.
Unit 2: Crystalline Solids & Lattice Structures- Crystalline solids, unit cell, primitive cell, Bravais lattices, Miller indices, closedpacked structures. Atomic radius, lattice constant and density.
Unit 3: Orbital Symmetry in Crystal Structures- Connection between orbital symmetry and crystal structure. Scattering fromperiodic structures, reciprocal lattice, Brillouin Zones.
Unit 4: Electron Behavior in Solids & Fermi Statistics - Free electrons in solids, density of states, Fermi surface, Fermi gas at T=0K, Fermi statistics, specific heat capacity of electrons in metals, thermionic emission of electrons frommetals.

**Block II: Electronic band structure in solids**
Unit 5: Electronic Band Structure in Solids- Electronic band structure in solids, Electrons in periodic potentials,
Unit 6: Solid State Physics Models- Bloch's Theorem, Kronig-Penney model, nearly free electron model,
Unit 7: Tight-Binding Model & Band Structures- Tight-binding model: density of states, examples of band structures.
Unit 8: Fermi Surfaces in Metals & Semiconductors- Fermi surfaces of metals and semiconductors.

**Block III: Transport properties**
Unit 9: Electron Motion in Bands & Effective Mass -Transport properties: Motion of electrons in bands and the effective mass,
Unit10: Band Currents & Electron Scattering- Currents in bands and holes, scattering of electrons in bands.
Unit 11: Electron Journeys: Boltzmann's Equation & Conductivity- Boltzmann equation and relaxation time, electrical conductivity of metals,
Unit12: Electron Flow and Heat Harmony: Wiedemann-Franz Law- Thermo electric effects, the Wiedemann-Franz Law.

**Block IV: Lattice dynamics of atoms in crystals**
Unit 13: Linear Chain Vibrations: Monoatomic & Diatomic- Vibrations of mono atomic and diatomic linear chains,
Unit 14: Phonon Modes & Thermal Properties- Acoustic and optical phonon modes, density of states, thermal properties ofcrystal lattices,
Unit15: Harmonic Oscillator Thermal Energy & Specific Heat -Thermal energy of the harmonic oscillator, specific heat capacity of the lattice,
Unit16: Debye Theory of Specific Heats -Debye theory of specific heats.

**Course Outcomes:** At the end of the Condensed Matter Physics, student will be able to

| Cos No. | Course Outcomes (COs) |
|---|---|
| 1. | **Tell** the basic symmetry operations performed in crystals and various types of defects that exist in crystals. |
| 2. | **Explain** the band theory and different types of band structures. |
| 3. | **Demonstrate** the transport properties in bands. |
| 4. | **Illustrate** lattice and its thermal properties. |

**Text and Reference Books:**


1. Hook and Hall: Solid State Physics (Manchester Physics Series).
2. Kittel: Introduction to Solid State Physics (John-Wiley).
3. Iba chand 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).

**Course Code: PHM-7114** **Credit: 4**
**Course: Electronics-I**

**Course Objectives:** To understand the basic concepts of Analog and Digital Electronics and apply it in experimental Physics and also for various Engineering Applications

**Block I: RC Wave Shaping: Analysis & Applications**
Unit 1: Linear Wave Shaping with RC Networks: Analysis- Linear Wave Shaping: High Pass and Low Pass RC Networks: Detailed Analysis
Unit 2: Dynamic Responses to Various Input Signals -Response to Sinusoidal, Step, Pulse, Square wave, Exponential and Ramp Inputs.
Unit 3: Applications of RC Circuits: Differentiation and Integration- RC circuits applications High pass RC circuit as a differentiator, Low Pass RC circuit as an Integrator. Criterion for good differentiation and integration.
Unit 4: Laplace Transforms in Circuit Analysis - Laplace Transforms and their application to circuit elements.

**Block II: Amplifiers: Difference & Broadband Techniques**
Unit 5: Differential Amplifiers: Precision in Signal- Amplifiers: Difference Amplifiers.
Unit 6: Expanding Horizons: Broadband Amplification- Broadband Amplifiers, Methods for achieving broad banding
Unit 7: Emitter Follower: High-Frequency Handling- Emitter Follower at High Frequencies
Unit 8: Op Amps: The Heart of Signal Processing -Operational Amplifiers and its Applications.

**Block III: Power Supplies & Digital Circuit Elements**
Unit 9: Electronically Regulated Power Supplies- Power Supplies: Electronically Regulated Power Supplies, Converters and Inverters.
Unit 10: Advanced Voltage Supplies and SCR Applications- High and Low Voltage Supplies, Application of SCR as Regulator, SMPS, .
Unit 11: Transistor Switching Dynamics in Digital Circuits- Elements of Digital Circuit Technology: Transistor as a Switch - Switching times: Definition and Derivation - Rise Time, Fall Time, Storage Time, Delay Time, Turn On Time, Turn Off Time Charge Control Analysis.
Unit 12: Pulse Circuits: Astable, Monostable, Bistable, and Schmitt Trigger -Multivibrators : Astable, Monostable and Bistable, Schmitt Trigger.

Block IV: Flip Flops, Number Systems & Counters
Unit 13: Flip-Flops: Types, Operation, and Features- Flip Flops: RS, RST, JK, T, D, JK M/S Flip flops, Race problem, Preset and Clear functions,
Unit 14: Foundations of Number Systems and Boolean Logic- Number Systems: Binary, Octal and Hexadecimal Number Systems. Binary Arithmetic, Arithmetic Circuits. Binary Codes: Gray, 8421, 2421, 5211. Boolean Variables and Operators, Simplification of Boolean Expressions. Karnaugh Maps.
Unit 15: Counters and Registers: Types and Operations- Counters and Registers : Binary Counters: Up, Down, Parallel. Modulus Counters:
Counter Reset Method, Logic Gating Method. Ring Counter, Shift Registers.
Unit 16: Analog-to-Digital and Digital-to-Analog Conversion- D/A converter and A/D converter. Simultaneous and Counter method of A/D converter, Successive Approximation method

**Course Outcomes:** At the end of the Electronics, student will be able to

| COs No. | Course Outcomes (COs) |
|---|---|
| 1. | **Analyze** and **Design** Combinational Logic Circuit |
| 2. | **Understand** different types of Amplifiers |
| 3. | **Summarize** Power Supplies & Digital Circuit Elements |
| 4. | **Explain** Flip Flops, Number Systems & Counters |

**Reference Books:**


1. Robert L. Boylestad and Louis Nashelsky.: Electronic Devices and Circuit Theory.
2. Adel S. Sedra and Kenneth C. Smith, Microelectronic Circuits.
3. Albert Malvino and David J. Bates : Electronic Principles
4. Ned Mohan, Tore M. Undeland and William P. Robbins, Power Electronics: Converters, Applications, and Design
5. R. Jacob Baker, CMOS: Circuit Design, Layout, and Simulation.

**Course Code: PHM-7115** **Credit : 4**
**Course: Plasma Physics**

**Course Objectives**
Plasma physics is an important subject for a large number of research areas, including space. Plasma physics, solar physics, astrophysics, controlled fusion research, high-power laser. Physics, plasma processing, and many areas of experimental physics. The primary learning. Outcome for this course is for the students to learn the basic principles and main equations of plasma physics, at an introductory level, with emphasis on topics of broad applicability.

**Block I: Plasma Fundamentals and Applications**
Unit 1: Plasma: Properties and Laboratory Production- Definition and properties of plasma, Plasma production in laboratory and diagnostics.
Unit 2: Charged Particle Dynamics in Fields: Microscopic View- Microscopic description, Motion of a charged particle in electric and magnetic fields-curvature, gradient and external force drifts.
Unit 3: Magnetically Confined Fusion Systems- Controlled thermonuclear devices, magnetically confined open and closed systems (linear pinch, mirror machine and
Tokamak).
Unit 4: Inertial Confinement Fusion with Laser-Plasmas- Laser-plasmas: inertially confined system.

**Block II: Statistical Plasma Dynamics: Equations and Transport Coefficients**
Unit 5: Plasma Dynamics Unraveled: BBGKY & Boltzmann-Vlasov- Statistical description of plasmas, B.B.G.K.Y. hierarchy of equations, Boltzmann-Vlasov equation,
Unit 6: Particle Orbits and Vlasov's Vision: Equivalence Explored- Equivalence of particle orbit theory and the Vlasov equation, Boltzmann and landau collision integral H-theorem,
Unit 7: BGK Model: Simplifying Transport Phenomena- B.G.K. model, Fokker-Planck term, Solution of Boltzmann equation (brief outline),
Unit 8: Conductive Currents: Exploring Electrical Conductivity- Transport coefficient-electrical conductivity, diffusion.

**Block III: Plasma Oscillations and Stability Analysis: Theory and Applications**
Unit 9: Plasma Oscillations and Landau Damping- Small amplitude plasma oscillations. Oscillations in warm field free plasma. Landau damping.
Unit 10: Stability Analysis in Plasma Physics- Nyquist method-Penrose criterion of stability. Two stream stability (linear and quasi linear theory).
Unit 11: Magnetized Plasma Theory and Instabilities- Vlasov theory of magnetized plasma. Loss cone instability. Quasilinear theory of gently bump instability.
Unit 12: Nonlinear Electrostatic Waves: BCK Waves- Non-linear electrostatic waves, BCK waves.

**Block IV: Plasma Fluid Dynamics and Magnetohydrodynamics: Theory and Applications**
Unit 13: Fluid Dynamics in Plasmas: Moment Equations- Fluid description of plasmas, Moment equations.
Unit 14: Magneto hydrodynamic Equations and Ohm's Law- MHD equations. Generalized Ohm's law,
Unit 15: Field Decay and Flux Conservation- Flux conservation, Decay of fields.
Unit 16: Pressure-Balanced and Force-Free Fields- Pressure balanced and force free fields.

**Course Outcomes: At the end of the course, students will be able to**

| COs No. | Course Outcomes (COs) |
|---|---|
| 1. | **Tell** using fundamental plasma parameters, under what conditions an ionized gas consisting of charged particles. |
| 2. | **Distinguish** the single particle approach, fluid approach and kinetic statistical approach. |
| 3. | **Demonstrate** the basic transport phenomena such as plasma resistivity, diffusion |
| 4. | **Discuss** MHD equation for plasma, |

**Suggested Readings**


1. Introduction to Plasma Physics, F. F. Chen (Plenum Press, 1984)
2. Principles of Plasma Physics, N. A. Krall and Trivelpiece (San Fransisco Press, 1986)
3. Physics of High temperature Plasmas, G. Schimdt (2ndEd., Academic Press, 1979)
4. The framework of Plasma Physics, R.D. Hazeltine & F.L. Waelbroeck (Perseus.Books, 1998)
5. Introduction to Plasma Physics, R.J. Goldston and P.H. Rutherford (IOP, 1995)

**Course Code: PHM-7116** **Credit: 4**
**Course: Optical Fiber Communication**

**Course Objectives:** provides a broad framework for studying optical fibers and related technologies, covering both theoretical concepts and practical applications, student will be able to

**Block I: Overview of optical fiber communication**
Unit 1:Optical Fiber Communication: Past, Present, and Future- Introduction, Historical development, general system, advantages, disadvantages, and applications of optical fiber communication,
Unit 2: Understanding Optical Fiber Waveguides-optical fiber waveguides, Ray theory, cylindrical fiber (no derivations in article 2.4.4),
Unit 3: Single-Mode Fiber Essentials- single mode fiber, cutoff wave length, mode filed diameter.
Unit 4: Fiber Optics: Materials and Specialty Cables- Optical Fibers: fiber materials, photonic crystal, fiber optic cables specialty fibers.

**Block II: Fundamentals of Optical Components and Devices**
Unit 5: Optical Fiber Losses- Introduction, Attenuation, absorption, scattering losses, bending loss,
Unit 6: Dispersion in Optical Fibers: Types and Effects- dispersion, Intra modal dispersion, Inter modal dispersion.
Unit 7: Essentials of Optical Devices and Photodetection- Introduction, LED's, LASER diodes, Photo detectors, Photo detector noise, Response time,
Unit 8: Double Heterostructure and Photodiode Comparison- double hetero junction structure, Photo diodes, comparison of photo detectors.

**Block III: Optical Fiber Connectivity and Receiver Operation**
Unit 9: Optical Fiber Joints: Alignment and Loss Considerations- Introduction, fiber alignment and joint loss, single mode fiber joints,
Unit 10: Essentials of Fiber Splicing, Connectors, and Couplers - Fiber splices, fiber connectors and fiber couplers. Introduction,
Unit 11: Optical Receiver Essentials: Sensitivity and Performance- Optical Receiver Operation, receiver sensitivity, quantum limit, eye diagrams,
Unit 12: Advanced Optical Receiver Technologies- Coherent detection, burst mode receiver operation, Analog receivers.

**Block IV: Analog and digital links**
Unit 13: Analog Links and Multichannel Transmission Overview- Introduction, overview of analog links, CNR, multichannel transmission techniques,
Unit 14: RF Over Fiber and Microwave Photonics- RF over fiber, key link parameters, Radio over fiber links, microwave photonics.
Unit 15: Point-to-Point Optical Links- Introduction, point–to–point links, System considerations, link power budget, resistive budget
Unit 16: Single Mode Fiber Transmission Dynamics- short wave length band, transmission distance for single mode fibers, Power penalties, nodal noise and chirping.

**Course Outcomes:** At the end of the course, students will be able to

| Cos No. | Course Outcomes (COs) |
|---|---|
| 1. | **Tell** the fundamental principles of light propagation in optical fibers, |
| 2. | **Explain** Identify different types of optical fibers. |
| 3. | **Demonstrate** Gain knowledge of optical fiber communication systems. |
| 4. | **Illustrate** techniques for splicing optical fibers. |

## Text and Reference Books:


1. Optical Fiber Communication – Gerd Keiser, 4th Ed., MGH, 2008.
2. Optical Fiber Communications– – John M. Senior, Pearson Education. 3 rd Impression, 2007.
3. Fiber optic communication – Joseph C Palais: 4th Edition, Pearson Education.

**Course Name: Physics Lab-III** **Credit: 4**
**Course Code: PHM-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 OPAmp.
6. Draw the frequency Response curve of Band pass filter &Band stop filter Using OPAmp.
7. To perform the Square Wave generator and Triangular Wave generator Using OPAmp.
8. Voltage Regulator using Op-Amp.
9. To perform the zero-crossing detector (sine wave to square wave convertor) using Op-Amp.

**Course Code: PHM-7211** **Credit:4**
**Course: Material Sciences**

**Course Objectives** This elective course is designed to give a comprehensive knowledge about the materials observed around us. Apart from their nature, and various properties, we will discuss the synthesis methods adopted in preparation of various materials. It is important to study the properties of materials, since that is the main determining factor governing their applications.

**Block I: Nature of Material Structure and Morphology:**
Unit 1: Material Composition & Crystallinity- Crystalline and amorphous nature of materials, Composition of materials;
Unit 2: Material Morphology & Structure-Property Correlations- Morphology of materials, structure –property correlations.
Unit 3: Characterization Methods for Materials -Methods of characterizing crystalline and amorphous materials (X-ray diffraction,electron microscopy, etc.).
Unit 4: Crystallinity Influence & Industrial Applications- Properties influenced by crystallinity (mechanical, electrical, optical, etc.), Applications and significance in various industries (semiconductors, polymers, ceramics, etc.).

**Block II: Materials Processing**
Unit 5: Powder Technology: Processing Techniques- Powder technology for metallic, non-metallic, ceramics: Compaction, sintering, calcinations, annealing, vitrification reactions, quenching, Chemical (soft) synthesis techniques,Equilibrium and non-equilibrium process,
Unit 6: Thin Film Synthesis Techniques- Synthesis of thin films and surface layers of solids: Ion beam induced phenomena, laserassisted materials synthesis, physical and chemical vapour deposition techniques
Unit 7: Solid Imperfections: Defect Types- Imperfections in Solids: Types of Defects: Point defects, impurities in solids, lineardefects, dislocations, interfacial defects, volumetric defects,
Unit 8: Defect Causes & Material Properties- Causes of defects, Correlation of defects with properties (magnetic, optical andelectrical) of materials

**Block III: Phase Transformation and Rate Processes in Solids:**
Unit 9: Crystallization & Solid Solutions- Crystallization: Nucleation, growth rates, single crystal growth, zone refining, Solidsolutions: Precipitation and dispersion strengthening,
Unit 10: Diffusion & Phase Transitions in Solids- Diffusion Processes: Mechanism of diffusion in solids, steady & non-steady state diffusion, Fick's law , Phase Transitions: Order parameter, liquid-solid transitions, glass transition,
Unit 11: Solid Solutions, Intermetallics & Phase Equilibrium- Solid solutions and intermetallics, Phase Equilibrium Diagrams (with examples): Phaserules and equilibrium, Cooling curves,
Unit 12: Solid Solution Equilibrium & Eutectic Systems- Solid solution equilibrium diagram, Eutectic systems, Gibbs phase rule, Martensitictransformation

**Block IV: Properties of Materials**:
Unit 13: Mechanical & Electrical Properties Overview - Mechanical properties, Electrical properties
Unit 14: Material Conductivity Overview -Conductivity of materials (metals,. semiconductors [elemental and compound],superconductors),
Unit 15: Conductive Materials Diversity- Conducting polymers, ionic and fast ionic conductivity,
Unit 16: Overview: Molecular Electronics, Optical & Magnetic Properties- Introduction to molecular electronics, Optical properties, Magnetic materials and theirproperties, Chemical properties

**Course Outcomes:** At the end of the Electronics, student will be able to

| COs No. | Course Outcomes (COs) |
|---|---|
| 1. | **Explain** Nature and Morphology of material |
| 2. | **Understand** the synthesis techniques |
| 3. | **Discuss** crystallization, diffusion and phase rules |
| 4. | **Explain** Microprocessors: Architecture, Memory, and Programming |

***Text and Reference Books:***


1. Materials Science and Engineering: An Introduction" by William D. Callister Jr. David G. Rethwisch.
2. Principles of Materials Science and Engineering" by William F. Smith Javad Hashemi.
3. Phase Transformations in Metals Alloys" by David A. Porter, Kenneth E. Easterling, and Mohamed Sherif.

**Course Code: PHM-7212** **Credit: 4**
**Course: Electronics-II**

**Course Objectives:** To understand Gain foundational knowledge of amplitude and frequency modulation techniques, including their principles, limitations, and comparison. Understand the concepts and operations of television systems, digital communication, and microprocessors, including their architectures, programming models, and instruction sets.

**Block I: Exploring Modulation Techniques: AM, FM, and Beyond**

Unit 1: Comprehensive Guide to Amplitude and Frequency Modulation Techniques- Amplitude and Frequency Modulation: Introduction, Amplitude Modulation, Spectrum of the modulated signal, Square law Modulator, Balanced Modulator, DSBSC, SSB and vestigial sideband modulation

Unit 2: Exploring AM Limitations and FM Signal Processing-Limitations of Amplitude Modulation, Analysis and frequency Spectrum, Generation and Detection of FM

Unit 3: AM vs. FM: Enhancements and Modulation Techniques- Comparison of AM and FM, Pre-emphasis and De-emphasis, Reactance Modulator. Capture Effect. Varactor Modulator.

Unit 4: FM Receivers and Detection Methods -FM Receiver, Foster Seely Discriminator. Ratio Detector

**Block II: Television**

Unit 5: Advancements in Electronic Image Capture and Scanning Techniques-Electronic image capture, Conventional Camera tubes & Modern Devices, Interlaced Scanning, Synchronization, Resolution.

Unit 6: Composite Video Signal and Vestigial Sideband Modulation Composite Video Signal. Vestigial Sideband Modulation.

Unit 7: Transmitter/Receiver Systems in B/W and Color TV: Components and Circuits - Transmitter/Receiver- B/W TV & Colour TV, Receiver Block Diagram. Sync. Separator. Vertical and Horizontal deflection circuits

Unit 8: Modern Display Technologies: Flat Panels and Smart Windows- Modern Display Technology: Flat Panel Displays(LCD, Plasmas etc.) and their addressing techniques. Smart Windows.

**Block III: Digital Communication Fundamentals and Techniques**

Unit 9: Digital Communication: Fundamentals and Benefits- Digital Communication: Basics of Digital Communications, Advantages of Digital Communication, Typical communication system, .

Unit 10: Mathematical Foundations of Digital Communication-Mathematical Theory of Digital Communication: Classification of signals, unit impulse function, Sampling property of the unit impulse function, unit step function, Analysis and transmission of signals, expression of an aperiodic signal as a continuous sum of exponential functions, unit gate function, Fourier spectrum of the gate pulse, The 'mathematics' of modulation, Impulse train and its Fourier response, ideal and practical filters, Sampling Theorem, Nyquist rate and Nyquist interval.

Unit 11: Signal Reconstruction and Pulse Code Modulation (PCM)- Signal reconstruction: The Interpolation Formula, The Interpolation Function, Practical difficulties in signal reconstruction, Aliasing, Pulse Code Modulation, Basic stages of Generation and Reception of PCM, Quantizing, Compandor, Encoder.

Unit 12: Advanced Digital Data Transmission Techniques-Differential Pulse Code Modulation, Delta Modulation, Principles of Digital data transmission: Amplitude Shift Keying, Frequency Shift Keying. Phase Shift Keying. Differential Phase Shift Keying. Digital Multiplexing.

**Block IV: Microprocessors: Architecture, Memory, and Programming**

Unit 13: Microprocessor Memories and Addressing Techniques- Microprocessors-Architecture and Programming: Volatile and non-volatile memories, magnetic memories, DRO, NDRO system Semiconductor memories RAM, ROM, EPROM Addressing of memories: MAR, MAD & NDR hexadecimal addressing,

Unit 14: Digital Circuitry Essentials and Arithmetic Units-Buffer register, Shift register, Ring Counter shift counter, Controlled shift registers, Tristage switches Tristate register Reduction of Connecting wires, Bus organization Arithmatic unit , Binary addition Half and Full subtractor.
Unit 15: Intel Microprocessors: Evolution and Programming Essentials- Intel Microprocessors: Historical Perspective. Organization of Microprocessor based system. 8085: Programming model. Registers, Accumulator, Flags, Program Counter, Stack Pointer. 8085 Instruction Set: Data Transfer Operation, Arithmetic Operations, Logic Operations, Branching Operations, One, Two- and Three-Byte Instructions, Opcode Format.
Unit 16: Understanding the Intel 8086: Organization and Instructions- Microprocessor 8086, its organization & instructions.

**Course Outcomes:** At the end of the Electronics, student will be able to

| COs No. | Course Outcomes (COs) |
|---|---|
| 1. | **Exploring** Modulation Techniques |
| 2. | **Understand** the working of Television |
| 3. | **Summarize** Digital Communication Fundamentals and Techniques |
| 4. | **Explain** Microprocessors: Architecture, Memory, and Programming |

**Text and Reference Books:**


1. John G. Proakis and Masoud Salehi.: Communication Systems Engineering.
2. K. Blair Benson, Television Engineering Handbook.
3. John G. Proakis: Digital Communications.
4. Ramesh S. Gaonkar: Microprocessor Architecture, Programming, and Applications with the 8085

**Course Code: PHM-7213** **Credit : 4**
**Course: Astrophysics**

**Course Objectives:** To understand Tools of Astronomy and celestial mechanics, to introduce basic astronomical principles in the study of the planets, stars and galaxies.

**Block I: Tools and Techniques of Modern Astronomy**

Unit 1: Exploring the Solar System: Sun, Planets, and Formation-The Sun: Characteristics, Structure, and Dynamics, Physical Processes in the SolarSystem ; Terrestrial Planets: Formation, Composition, and Features; Giant Planets: Characteristics, Moons, and Rings, Formation of Planetary Systems

Unit 2: Stellar Characteristics & Extrasolar Planets- Brightness of Stars: Magnitudes and Flux; Color-Magnitude Diagrams (HR Diagrams): Interpretation and Significance; Luminosities of Stars: Measurement and Comparison, Angular Radii of Stars and Their Determination; Effective Temperatures of Stars: Calculation and Application, Masses and Radii of Stars: Binary Systems and Their Analysis, Search for Extrasolar Planets and Their Detection Methods

Unit 3: Astronomical Observational Techniques- Tools of Astronomy - Observational Techniques: Telescopes: Basic Optics andPrinciples; Optical Telescopes: Types, Designs, and Applications; Radio Telescopes: Functionality and Usage in Astronomy; Infrared, Ultraviolet, X-ray, and Gamma-Ray Astronomy: Detectors and Observatories; Overview of Different Detection Methods andInstruments for Each Wavelength Region

Unit 4: Advanced Detection Techniques in Astronomy- Advanced Detection Techniques in Astronomy- Gravitational Wave Detectors: Principles and Operation; Neutrino Detectors: Detection Mechanisms and Applications in Astrophysics,; All-Sky Surveys: Purpose, Methodologies, and Impact on Astronomical Research; Virtual Observatories: Utilization and Benefits for Astronomical Studies

**Block II: The Solar System and Basic Stellar Parameters**

Unit 5: Our Galaxy: Structure & Size- Our Galaxy: Structure and Dynamics- The Shape and Size of Our Galaxy Interstellar Extinction and Reddening, Galactic Coordinates and Coordinate Systems, Galactic Rotation and Dynamics, Stellar Population in the Milky Way,

Unit: 6 Interstellar Medium & Galactic Environment- Interstellar Medium: Composition and Properties, Galactic Magnetic Field and CosmicRays,

Unit 7: Extragalactic Astronomy Overview- Extragalactic Astronomy- Normal Galaxies: Morphological Classification andKinematics; Expansion of the Universe: Hubble's Law and Cosmological Redshift;

Unit 8: Active Galaxies, Galaxy Clusters & Large-Scale Structure- Active Galaxies: AGNs, Quasars, and Seyfert Galaxies; Clusters of Galaxies: Structures and Dynamics; Large-Scale; Distribution of Galaxies: Galaxy Filaments and Voids; Gamma-RayBursts: Origins and Phenomenology

**Block III: Unveiling Stellar Mysteries: Spectral Classification and Dynamic Phenomena**

Unit 9: Stellar Spectra & Classification- Stellar Spectra and Classification- Spectral Classification of Stars; Understanding StellarSpectra;

Unit 10: Population II Stars & Peculiar Spectra - Population II Stars: Characteristics and Significance; Stars with Peculiar Spectra

Unit 11: Stellar Dynamics & Phenomena- Stellar Dynamics and Phenomena- Stellar Rotation and Its Effects; Stellar Magnetic;Fields: Formation and Influence; Pulsating Stars: Mechanisms and Types;

Unit 12: Explosive Stars & Interstellar Absorption- Explosive Stars: Supernovae and Their Impact; Interstellar Absorption: Causes andEffects

**Block IV: Journey Through the Cosmos: Exploring Our Galaxy and Beyond**

Unit 13: Our Galaxy and Interstellar Matter- Our Galaxy and Interstellar Matter- The Shape and Size of Our Galaxy; InterstellarExtinction and Reddening; Galactic Coordinates and Coordinate Systems;

Unit 14: Galactic Dynamics & Stellar Population- Galactic Rotation and Dynamics; Stellar Population in the Milky Way; InterstellarMedium: Composition and Properties; The Galactic Magnetic Field and Cosmic Rays

Unit 15: Extragalactic Astronomy- Extragalactic Astronomy- Normal Galaxies: Morphological Classification and Kinematics; Expansion of the Universe: Hubble's Law and Cosmological Redshift;

Unit 16: Active Galaxies, Clusters, & Large-Scale Structure- Active Galaxies: AGNs, Quasars, and Seyfert Galaxies; Clusters of Galaxies: Structures and Dynamics; Large-Scale Distribution of Galaxies: Galaxy Filaments and Voids; Gamma-RayBursts: Origins and Phenomenology

**Course Outcomes:** At the end of the course, students' will be able to

| COs No. | Course Outcomes (COs) |
|---|---|
| 1. | **Exploring** the expanse of the universe and the nature of the planets, stars and galaxies |
| 2. | **Understand** how the astronomical observations are done for these celestial objects |
| 3. | **Summarize** 3. Apply mathematical tools and physics laws to understand the nature of planets, stars and galaxies |
| 4. | **Explain** the results of this analyses and interpret the nature of the Solar system, variety of stars and galaxies. |

***Text and Reference Books:***


1. Introduction to Stellar Astrophysics, Volume 1, Basic stellar observations and data, ByErika
2. Bohm-Vitense, Cambridge University Press
3. An Introduction to Modern Astrophysics, Second Edition, By Carroll B.W., Ostlie D.A.,Pearson Addison Wesley.
4. "Astrophysics for Physicists" by Arnab Rai Choudhuri, Cambridge University Press,2010
5. Galactic Astronomy: Structure and Kinematics by Mihalas & Binney, W.H.Freeman &Co Ltd; 2nd Revised edition 1981.

**Course Code: PHM-7214** **Credit: 4**
**Course: Physics of Nanomaterials**

**Course Objectives:** To comprehend the fundamental theory and influence of dimensionality on the properties of nanomaterials with theirprospects in advanced devices. This course will also familiarize the student not only with existing techniques and underlying principles/concepts involved in the fabrication of nanomaterials but also to make them well versed in various characterization techniques.

**Block I: Introduction to Nanomaterials and properties**
Unit 1: Nanomaterials : A Historical Overview- Brief history and overview of nanomaterials;
Unit 2: Nanomaterial Synthesis: Top-down vs. Bottom-up Approaches Synthesis techniques: Top down and Bottom-up approaches (High energy ball milling, Sol-gel process, Chemical bath deposition,
Unit 3: Advanced Nanomaterial Fabrication Techniques-Plasma Arc discharge, Chemical vapor deposition, Sputtering, Pulsed Laser deposition, Molecular beam epitaxy).
Unit 4: Multifaceted Properties of Nanomaterials- Mechanical, Thermal, Electrical, Magnetic and Optical properties

**Block II: Characterization tools and Carbon-based Nanomaterials**
Unit 5: Exploring SPM and Electron Microscopy -Scanning Probe Microscopy (SPM) and Electron Microscopy
Unit 6: Carbon Bonding and Fullerene Structures -Nature of carbon bond, Carbon structures, small carbon clusters; Fullerenes:
Unit 7: Exploring Fullerene Materials, Graphene, and Carbon Nanotubes- Synthesis and Properties, various forms of fullerene materials; Graphene: Synthesis and Applications;Carbon nanotubes: classification,
Unit 8: Diving into Nano Diamond: Synthesis, Properties, and Applications -synthesis, properties (Electrical, Vibrational & Mechanical) and applications, Nano diamond.

**Block III: Quantum Nanostructures and Nanostructured Ferromagnetism**
Unit 9: Exploring Quantum Nanostructures: Fabrication and Properties- Quantum wells, wires and dots, Fabrication of Quantum Nanostructures, Size effect, Conduction electron anddimensionality,
Unit 10: Fermi Gas Dynamics and Partial Confinement -Fermi gas and density of states. Partial confinement,
Unit 11: Single Electron Devices: Theory and Fabrication- Single electron transistor (SET), Single electron capacitor, Quantum effects on SET, Fabrication of SET,
Unit 12: Bulk Nanostructuring and Magnetic Dynamics- Bulk Nano structuring and Magnetic properties, Dynamics of Nanomagnets, Nanopore containment ofmagnetic particles.

**Block IV: Applications**
Unit 13: Exploring Micromechanical Systems and Robotic Innovations -Micromechanical systems - Robots - Ageless materials
Unit 14: Nano-Electronics and Optoelectronics: Advancements- Nanomechanics - Nano electronics - Optoelectronic devices
Unit 15: Illuminating LED Applications and Colorants - LED - Applications - Colourants and pigments -
Unit 16: Nano-Biotechnology: DNA Chips and Drug Delivery- Nano biotechnology - DNA chips - DNA array devices - Drag delivery systems.

**Course Outcomes:** At the end of the course, students' will be able to

| COs No. | Course Outcomes (COs) |
|---|---|
| 1. | **Tell** familiarize about the principles and background to nanotechnology. |
| 2. | **Explain** optimize suitable process to synthesize nanostructures of desired size, shape and surface properties. |
| 3. | **Demonstrate** Perceive the basic theories, properties, characterization techniques. |
| 4. | **Tell** applications of nanomaterials. |

**Text and Reference Books:**


1. Poole Jr., C.P. & Owens, F.J. Introduction to Nanotechnology (Wiley IEdnteerscience)
2. lstein A.S., and Cammarata, R.C. Nanomaterials: Synthesis, Properties and Applications Edn. (Institute ofPhysics Fujita, F.E. Physics of New Materials, Second Edn. (Springer-Verlag)
3. Zhen Guo, Li Tan Fundamentals and Applications of nanomaterials
4. Gaber L. H. Harry F. Tibbals, Joydeep Dutta and John J. Moore Introduction to Nanoscience and Nanotechnology (CRC Press)
5. K.K. Chattopadhyay & A.N. Banerjee Introduction to Nanoscience & Nanotechnology (PHI Learning Pvt.Michael F. Ashby, Paulo J. Ferreira & Daniel L. Schodek
6. John Smith, Nanotechnology: Applications and Advances, Wiley.

**Course Name: Physics Lab-IV** **Credit:** 4
**Course Code: PHM-7251**

**List of Experiments**

1. To interface 8255 P Pi to microprocessor and set port A as input port inMode0.
2. To interface ADC card to microprocessor& generate the digital output.
3. To interface DAC card to microprocessor& generate a square wave on CRO.
4. To study the plateau characteristics of a G-M counter
5. To determine the range of beta-rays
6. To study the energy dependence of the absorption coefficient of aluminum for gamma-rays.
7. To measure the magnetic susceptibility of given samples and calculate their effective Bohr-magnet on number.
8. To measure the Lande'g factor for electrons using Electron Spin Resonance (ESR) technique.
9. Measurement of junction capacitance of p-n Junction and to determine the barrier potential and doping profile of depletion region.

**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 PalSingh | 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.