# MOHAN BABU UNIVERSITY

Sree Sainath Nagar, Tirupati – 517 102

MBU
MOHAN BABU
UNIVERSITY
DREAM. BELIEVE. ACHIEVE

## SCHOOL OF LIBERAL ARTS AND SCIENCES

## B.Sc. - Computer Science

### CURRICULUM AND SYLLABUS

*(For 2022-23 Admitted Students)*

### FULLY FLEXIBLE CHOICE BASED CREDIT SYSTEM (FFCBCS)

# MOHAN BABU UNIVERSITY

## Vision

To be a globally respected institution with an innovative and entrepreneurial culture that offers transformative education to advance sustainability and societal good.

## Mission

- Develop industry-focused professionals with a global perspective.
- Offer academic programs that provide transformative learning experience founded on the spirit of curiosity, innovation, and integrity.
- Create confluence of research, innovation, and ideation to bring about sustainable and socially relevant enterprises.
- Uphold high standards of professional ethics leading to harmonious relationship with environment and society.

# SCHOOL OF LIBERAL ARTS AND SCIENCES

## Vision

To be the ideal culmination for the edification of liberal arts and sciences recognized for excellence, innovation, entrepreneurship, environment and social consciousness.

## Mission

- Infuse the essential knowledge of liberal arts and sciences, skills and an inquisitive attitude to conceive creative and appropriate solutions to serve industry and community.
- Proffer a know-how par excellence with the state-of-the-art research, innovation, and incubation ecosystem to realise the learners' fullest entrepreneurial potential.
- Endow continued education and research support to working professionals in liberal arts and sciences to augment their domain expertise in the latest technologies
- Entice the true spirit of environment and societal consciousness in citizens of tomorrow in solving challenges in liberal arts and sciences.

# DEPARTMENT OF MATHEMATICAL SCIENCES

## Vision

To become a Nation's center of excellence in the field Mathematical Sciences and its allied areas through teaching, training, and research.

## Mission

- Disseminate the knowledge of a diverse group of students by providing solutions through contemporary curriculum.
- Creating a talent pool of faculty in diverse domains through continuous training.
- Domain and transferable skill development for holistic personality of students and employability.
- Inculcating values and Ethics for effective professional practice.

# B.Sc. - Computer Science

## PROGRAM EDUCATIONAL OBJECTIVES

After few years of graduation, the graduates of B.Sc. Computer Science, will:

**PEO1.** Pursue higher education in their core or allied areas of specialization.

**PEO2.** Employed as a productive and valued professional in industry/teaching/ research.

**PEO3.** Engaged in innovation and deployment as a successful entrepreneur.

**PEO4.** Adapt evolving technologies in the core or allied areas by participating in continuing education programs for lifelong learning.

## PROGRAM OUTCOMES

On successful completion of the Program, the graduates of B.Sc. Computer Science will be able to:

**PO1** **Knowledge:** To study as well as apply concepts, theories, and practices across the disciplines to gain the foundational knowledge.

**PO2** **Problem Analysis:** To identify, analyze and evaluate various experiences and perspectives using foundational disciplinary knowledge for substantiated conclusions.

**PO3** **Design/Development of solutions:** To design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO4** **Modern tool usage:** To create, select, and apply appropriate techniques, resources and modern tools with an understanding of the limitations.

**PO5** **Environment and Sustainability:** Understand the issues of environmental contexts and demonstrate the knowledge for sustainable development.

**PO6** **Ethics and Society:** Apply the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities under moral dimensions.

**PO7** **Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, to manage projects and finance in multidisciplinary settings.

**PO8** **Effective Communication:** To develop proficiency and efficiency in

communicating by connecting people, ideas, books, media, and technology.

**PO9** **Life-long learning:** Recognize the need for and acquire the ability to engage in independent and life-long learning in the broadest context of socio-technological changes.

## PROGRAM SPECIFIC OUTCOMES

On successful completion of the Program, the graduates of B.Sc. Computer Science program students will be able to:

**PSO1** Design, implement and test applications for complex computing problems for desired specifications through modern tool usage, appropriate technologies and programming skills

**PSO2** Use managerial and domain Skills of Information Management to model an application's data requirements using domain specific modeling tools, Transaction & Query processing, Indexing & Searching techniques, and extract information for interpreting the datasets for Decision Making.

**PSO3** Apply adaptive algorithms and techniques to develop intelligent systems for solving problems from inter-disciplinary domains. Use appropriate Computer networking models, design and develop secured information systems using appropriate algorithms, standards and principles for efficient data security and communication.

## B.Sc. - Computer Science

## Basket Wise - Credit Distribution

| Sl. No. | Baskets | Credits (Min.- Max.) |
|---|---|---|
| 1 | SCHOOL CORE | 28-36 |
| 2 | PROGRAM CORE | 34-42 |
| 3 | PROGRAM ELECTIVES | 24-30 |
| 4 | INTERDISCIPLINARY MINOR | 18-24 |
| 5 | UNIVERSITY ELECTIVE | 9-12 |
| | **TOTAL CREDITS** | **Min. 120** |

## B.Sc. - Computer Science Honors

## For A.Y:2023-2024

## Basket Wise - Credit Distribution

| Sl. No. | Baskets | Credits (Min.- Max.) |
|---|---|---|
| 1 | SCHOOL CORE | 28-36 |
| 2 | PROGRAM CORE | 46-54 |
| 3 | PROGRAM ELECTIVES | 38-48 |
| 4 | INTERDISCIPLINARY MINOR | 21-30 |
| 5 | UNIVERSITY ELECTIVE | 9-12 |
| | **TOTAL CREDITS** | **Min. 160** |

# School Core (28-36 Credits)

| Course Code | Title of the Course | Lecture | Tutorial | Practical | Project based Learning | Credits | Pre-requisite |
|---|---|---|---|---|---|---|---|
| | | L | T | P | S | C | |
| **School Main Basket (Min. 20 Credits to be earned)** | | | | | | | |
| **22BS101401** | Environmental Studies | 2 | - | - | - | 2 | - |
| **22LG101401** | Personality Development | 2 | - | - | - | 2 | - |
| **22CA105001** | Computer Hardware and System Essentials | - | 1 | 2 | - | 2 | - |
| **22MM101410** | Discrete Mathematics for computer science | 3 | - | - | - | 3 | - |
| **22MM101030** | Matrix Theory | 3 | - | - | - | 3 | - |
| **22MM102001** | Descriptive Statistics and Probability | 3 | - | 2 | - | 4 | - |
| **22MM102004** | Statistical Methods and Inferences | 3 | - | 2 | - | 4 | - |
| **22MM111001** | Internship | - | - | - | - | 2 | - |
| **22MM108001** | Capstone Project | - | - | - | - | 8 | - |
| **Language Basket (Min. 8 Credits to be earned)** | | | | | | | |
| **22LG102405** | General English | 2 | - | 2 | - | 3 | - |
| **22MS101401** | Media and Mass Communication Skills | 3 | - | - | - | 3 | - |
| **22LG102401** | English for Professionals | 2 | - | 2 | - | 3 | - |
| **22LG102406** | Advanced English Grammar and usage | 3 | - | 2 | - | 4 | English for Professionals |

| Course Code | Title of the Course | Lecture | Tutorial | Practical | Project based Learning | Credits | Pre-requisite |
|---|---|---|---|---|---|---|---|
| | | L | T | P | S | C | |
| **22LG101403** | German Language | 2 | - | - | - | 2 | - |
| **22LG101407** | French Language | 2 | - | - | - | 2 | - |
| **22LG101402** | Telugu | 2 | - | - | - | 2 | - |
| **22LG101404** | Sanskrit | 2 | - | - | - | 2 | - |
| **Mandatory Courses (Min. 6 Credits to be earned) Earned Credits will not be considered for CGPA** | | | | | | | |
| **22LG105402** | Soft Skills | - | - | 2 | - | 1 | - |
| **22LG107601** | Professional Ethics and Human Values | 2 | - | - | - | 2 | - |
| **22SS101705** | Indian Tradition and culture | 2 | - | - | - | 2 | - |
| **22CE107602** | Disaster Mitigation and Management | 2 | - | - | - | 2 | - |
| **22LG107602** | Essential Life Skills for Holistic Development | 2 | - | - | - | 2 | - |
| | NCC/NSS Activities | - | - | - | - | 2 | - |
| **22MG107601** | Innovation, Incubation and Entrepreneurship | 2 | - | - | - | 2 | - |
| **22EE107001** | Intellectual Property Rights | 2 | - | - | - | 2 | - |
| **22EE107602** | Fundamentals of Research Methodology | 2 | - | - | - | 2 | - |

# PROGRAM CORE (46–54 Credits)

| Course Code | Title of the Course | Lecture | Tutorial | Practical | Project - based Learning | Credits | Pre-requisite |
|---|---|---|---|---|---|---|---|
| | | L | T | P | S | C | |
| **22MM102002** | Programming with C | 3 | - | 2 | - | 4 | - |
| **22MM101010** | Theory of Computation | 3 | - | - | - | 3 | - |
| **22MM102005** | Object Oriented Programming with C++ | 3 | - | 2 | - | 4 | Programming with C |
| **22MM102006** | Object Oriented Programming with Java | 3 | - | 2 | - | 4 | Programming with C |
| **22MM102003** | Data Structures | 3 | - | 2 | - | 4 | Programming with C |
| **22MM102007** | Database Management Systems | 3 | - | 2 | - | 4 | - |
| **22MM101011** | Software Engineering | 3 | - | - | - | 3 | Database Management Systems |
| **22AI102001** | Operating Systems | 3 | - | 2 | - | 4 | |
| **22MM102009** | Web Technologies | 3 | - | 2 | - | 4 | - |
| **22CS101002** | Computer Organization and Architecture | 3 | - | - | - | 3 | - |
| **22MM101012** | Software Quality Assurance/Testing | 3 | - | - | - | 3 | Software Engineering |
| **22MM102010** | Phyton Programming | 3 | - | 2 | - | 4 | |
| **22MM101009** | Artificial Intelligence | 3 | - | - | - | 3 | - |
| **22MM101017** | Internet of things | 3 | - | - | - | 3 | |
| **22MM101018** | Introduction to information retrieval Systems | 3 | - | - | - | 3 | |

| Course Code | Title of the Course | Lecture | Tutorial | Practical | Project - based Learning | Credits | Pre-requisite |
|---|---|---|---|---|---|---|---|
| | | L | T | P | S | C | |
| **22MM101014** | Introduction to Cyber Security | 3 | - | - | - | 3 | |

# PROGRAM ELECTIVE (38–48 Credits)

| Course Code | Title of the Course | Lecture | Tutorial | Practical | Project-based Learning | Credits | Pre-requisite |
|---|---|---|---|---|---|---|---|
| | | L | T | P | S | C | |
| **22MM101003** | Data Communication and Networking | 3 | - | - | - | 3 | - |
| **22MM101004** | Design and Analysis of Algorithms | 3 | - | - | - | 3 | |
| **22MM101013** | Computer Graphics | 3 | - | - | - | 3 | - |
| **22MM102011** | Object Oriented System Design | 3 | - | 2 | - | 4 | Software Engineering |
| **22MM101015** | Data Warehousing and Data Mining | 3 | - | - | - | 3 | Database Management Systems |
| **22MM102012** | Big Data Technologies Using R | 3 | - | 2 | - | 4 | Database Management Systems |
| **22MM102013** | Advance Java Script | 3 | - | 2 | - | 4 | Web Technologies |

| Course Code | Title of the Course | Lecture | Tutorial | Practical | Project-based Learning | Credits | Pre-requisite |
|---|---|---|---|---|---|---|---|
| | | L | T | P | S | C | |
| **22MM101005** | Computer Networks | 3 | - | - | - | 3 | Data Communication and Networking |
| **22MM101016** | Software Project Management | 3 | - | - | - | 3 | Software Engineering |
| **22MM101019** | Block chain Technologies | 3 | - | - | - | 3 | |
| **22MM101020** | Cyber Security Essentials | 3 | - | - | - | 3 | |
| **22MM101001** | Fundamentals of Digital Electronics and Logic Design | 3 | - | - | - | 3 | |
| **22CA101015** | Cloud Computing | 3 | - | - | - | 3 | |
| **22AI101015** | AI for Robotics | 3 | - | - | - | 3 | |
| **22AI102007** | Soft Computing | 3 | - | 2 | - | 4 | Python Programming |

## Interdisciplinary Minor (21-30 Credits)

## (Mathematics)

| Course Code | Title of the Course | Lecture | Tutorial | Practical | Project-based Learning | Credits | Pre-requisite |
|---|---|---|---|---|---|---|---|
| | | L | T | P | S | C | |
| **22MM101002** | Single Variable Calculus | 3 | - | - | - | 3 | - |

| Course Code | Title of the Course | Lecture | Tutorial | Practical | Project - based Learning | Credits | Pre-requisite |
|---|---|---|---|---|---|---|---|
| | | L | T | P | S | C | |
| **22MM101006** | Ordinary Differential Equations | 3 | - | - | - | 3 | Single Variable Calculus |
| **22MM101007** | Multi Variable Calculus | 3 | - | - | - | 3 | Single Variable Calculus |
| **22MM101021** | Partial Differential Equations | 3 | - | - | - | 3 | Multi Variable Calculus |
| **22MM101008** | Integral Transforms | 3 | - | - | - | 3 | - |
| **22MM101022** | Number Theory and Algebra | 3 | - | - | - | 3 | - |
| **22MM101023** | Group Theory | 3 | - | - | - | 3 | - |
| **22MM101024** | Rings and Fields | 3 | - | - | - | 3 | - |
| **22MM101025** | Linear Algebra | 3 | - | - | - | 3 | - |
| **22MM101026** | Numerical Analysis | 3 | - | - | - | 3 | - |

## University Elective (9-12 Credits)

| Course Code | Title of the Course | Lecture | Tutorial | Practical | Project based Learning | Credits | Pre-requisite |
|---|---|---|---|---|---|---|---|
| | | L | T | P | S | C | |
| **22ME101704** | Managing Innovation and Entrepreneurship | 3 | - | - | - | 3 | - |
| **22ME101703** | Management Science | 3 | - | - | - | 3 | - |
| **22ME101702** | Human Resource Management | 3 | - | - | - | 3 | - |
| **22LG101701** | Business Communication and Career Skills | 3 | - | - | - | 3 | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **22MG101701** | Entrepreneurship for Micro, Small and Medium Enterprises | 3 | - | - | - | 3 | - |
| **22SS101704** | Indian History | 3 | - | - | - | 3 | - |
| **22SS101706** | Women Empowerment | 3 | - | - | - | 3 | - |
| **22CE101703** | Planning for Sustainable Development | 3 | - | - | - | 3 | - |
| **22CM101701** | Banking and Insurance | 3 | - | - | - | 3 | - |
| **22CM101702** | Cost Accounting and Financial Management | 3 | - | - | - | 3 | - |
| **22SS101702** | Gender and Environment | 3 | - | - | - | 3 | - |
| **22SS101703** | Indian Economy | 3 | - | - | - | 3 | - |
| **22SS101701** | Constitution of India | 3 | - | - | - | 3 | - |
| **22ME101701** | Global Strategy and Technology | 3 | - | - | - | 3 | - |
| **22EE101704** | Green Technologies | 3 | - | - | - | 3 | - |
| **22CB10172** | Introduction to Ethical Hacking | 3 | - | - | - | 3 | - |

**Note**

If any student has chosen a course or equivalent course from the above list in their regular curriculum then, he/she is not eligible to opt the same course/s under University Elective.

The student can choose courses from other disciplines offered across the schools of MBU satisfying the Pre-requisite other than the above list.

# SCHOOL CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22BS101401** | **ENVIRONMENTAL STUDIES** | 2 | - | - | - | 2 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** This course provides a detailed discussion on multidisciplinary nature of environmental studies, scope and importance of environmental education, ecosystems, ecology, renewable and non-renewable energy resources. Biodiversity and its conservation. Environmental pollution and its control measures, global environmental issues and Acts. Green Chemistry and its tools.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Understand the natural environment, and to realize the importance of the renewable energy sources.

**CO2.** Acquire knowledge of various sources of water pollution and the management of municipal and Industrial wastewater.

**CO3.** Summarize the various environmental pollution and its control measures.

**CO4.** Get familiarized on climate and social issues arising due to environmental disorders.

**CO5.** Gain awareness on Green technology and its tools.

**CO-PO-PSO Mapping Table:**

| Course Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 |
| **CO1** | 3 | - | - | - | 3 | 2 | - | - | - | - | - | - |
| **CO2** | 3 | - | - | - | 3 | 2 | - | - | - | - | - | - |
| **CO3** | 3 | - | - | - | 3 | 3 | - | - | - | - | - | - |
| **CO4** | 2 | - | - | - | 3 | 3 | - | - | 2 | - | - | - |
| **CO5** | 3 | - | - | 2 | 3 | - | - | - | 2 | - | - | - |
| **Course Correlation Mapping** | **3** | **-** | **-** | **2** | 3 | **3** | **-** | **-** | 2 | - | - | - |

*Correlation Levels: 3: High; 2: Medium; 1: Low*

## COURSE CONTENT

**Module 1: ENERGY SOURCES** ***(06 Periods)***

***Renewable energy Resources:*** Solar energy - solar cells, wind energy, tidal energy.
***Non-renewable energy resources:*** Natural gas, coal gas, biogas.

**Module 2: WATER POLLUTION** ***(06 Periods)***

Potable water, Sources of water, impurities in water and their consequences, Eutrophication, Effect of Hardness of water, Municipal and Industrial wastewater management.

**Module 3: ENVIRONMENTAL POLLUTION AND ITS CONTROL MEASURES** ***(06 Periods)***

Definition, causes, effects and control measures of: Air, Water (thermal and marine pollution), Land pollution, Radiation pollution and Nuclear hazard, Noise pollution, Overgrazing, effects of modern agriculture – fertilizer and pesticides.

**Module 4: ENVIRONMENTAL AND SOCIAL ISSUES** ***(06 Periods)***

***Climate changes:*** global warming, acid rain, ozone layer depletion, nuclear accidents. ***Social Issues:*** Population growth, variation among nations and population explosion. Urban problems related to Water conservation, rain water harvesting and watershed management.

**Module 5: GREEN TECHNOLOGY** ***(06 Periods)***

Introduction, principles of green chemistry, tools of green chemistry, Green Computing, green construction, Green manufacturing Systems.

***Total Periods: 30***

## EXPERIENTIAL LEARNING

1. Submit a document on your plan of action in maintaining the sustainable environment.
2. Visit the Tirupathi Municipal corporation water treatment plant and submit a report on your observations
3. List any two major environmental issues in Tirupathi and make a report with solutions using your expertise.
4. Submit your ideas on the importance of Environmental Education for technical students.
5. How do unequal urban planning and green space distribution affect temperatures in a city?
6. How are water sources affected by urbanization?

## RESOURCES

**TEXT BOOKS:**

1. Anubha Kaushik and C. P. Kaushik, Perspectives in Environmental Studies, New Age International (P) Ltd. Publications, 6 th Edition, 2018.
2. Erach Barucha, Environmental Studies, Orient Blackswan, 2nd Edition, 2013.

**REFERENCE BOOKS:**


1. Benny Joseph, Environmental Studies, Tata McGraw-Hill, 2nd Edition, 2009.
2. Cunningham W.P. and Cunningham M.A., Principles of Environmental Science, Tata McGraw-Hill Publishing Company, New Delhi, 8th Edition,2016.


**VIDEO LECTURES:**

1. https://study.com/academy/lesson/what-is-environmental-science-definition-and-scope-of-the-field.html
2. https://www.youtube.com/watch?v=Y5B1nWYle40
3. https://www.digimat.in/nptel/courses/video/127105018/L26.html

**Web Resources:**

1. https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf
2. https://www.hzu.edu.in/bed/E%20V%20S.pdf
3. https://cpcb.nic.in/7thEditionPollutionControlLawSeries2021.pdf
4. https://www.clearias.com/environmental-laws-india/

# SCHOOL CORE

| Course Code | | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22LG101401** | **PERSONALITY DEVELOPMENT** | 2 | - | - | - | 2 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION**: This course gives awareness to students about the various dynamics of personality developments.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Demonstrate knowledge of leadership qualities by examining and applying personality traits through Positive self esteem, Open Communication and Self-Righteousness.

**CO2.** Analyze the limitations of Attitudes by applying and demonstrating communication traits through decision Making, Ethics and Self Actualization.

**CO3.** Apply appropriate Analyzing techniques for comprehending different personalities by examining Positive and Negative Characteristic Traits and demonstrating through Leadership Styles, Mentoring and Behaviour Modification.

**CO4.** Apply appropriate techniques in Solving Problems by examining and demonstrating Time Management, Stress Management and Anger Management.

## CO-PO Mapping Table:

| Course Outcomes | Program Outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** |
| **CO1** | 2 | 1 | - | 3 | | - | - | 1 | - |
| **CO2** | 2 | 3 | - | 3 | | - | - | 1 | - |
| **CO3** | 2 | 2 | - | 3 | | - | - | 2 | - |
| **CO4** | 3 | 1 | - | 2 | | - | - | 3 | - |
| **Course Correlation Mapping** | **2** | **2** | **-** | **3** | | **-** | **-** | **2** | - |

*Correlation Levels: 3: High; 2: Medium; 1: Low*

## COURSE CONTENT

**Module 1: PERSONALITIES AND LEADERSHIP QUALITIES** ***(06 Periods)***

Introduction: Different Personalities **-** Personality Analysis **-** Freudian Analysis **–** Vedantic Concept: Swamy Vivekananda **-** Personality Begets - Types- Leadership Qualities – Decision Making **-** Case Studies: Personalities, - Exercises.

**Module 2: SELF ESTEEM AND SELF DEVELOPMENT** ***(06 Periods)***

**Know Yourself**: Self Image - Positive Self Esteem -Turn Failure into Success - Be Sensitive to Feedback - Build Self Confidence – Self Actualization - Set Goals - Action Plans - Accountability – Behavior Modification – Mentoring - Learning- Counseling – Challenge yourself with Aptitude Tests and Internships, - Exercises.

**Module 3 ATTITUDE** ***(06 Periods)***

Importance – Difference between Behavior and Attitude - Changing Negative Attitude- Impact of Attitudes on others - Unproductive Attitudes –Assess your Behaviour - Exercises.

**Module 4 COMMUNICATION RELATIONSHIP** ***(06 Periods)***

Introduction – Positive and Negative Characteristic Traits - Grapevine Communication – Open Communication; Team Player - Leadership styles – Performance Expectations - Electronic Communication; Text Messaging – Voicemail – e-Mail, - Exercises.

**Module 5 CRITICAL WORK SKILLS AND ETHICS** ***(06 Periods)***

Time Management - Balancing Life and Work - Stress Management - Anger Management - Making Decisions and Solving Problems - Developing Creativity - Ethics and Self-Righteousness – Being Judgemental in the Real World - Striving for Integrity, - Exercises.

***Total Periods: 30***

## EXPERIENTIAL LEARNING

1. List out the positive traits in you on the charts and explain in detail.
2. Discuss different famous personalities and their leadership styles.
3. What do you know about values and beliefs discuss elaborately.
4. Illustrate the morals that you follow in your that you practice in your life.
5. Interpret the role of different personalities in *Bhagavad Gita.*

## RESOURCES

**TEXTBOOK:**

1 Harold R. Wallace and L. Ann Masters, *Personal Development for Life and Work*, Cengage Learning, Delhi, 10th edition Indian Reprint, 2011. (6th Indian Reprint 2015)

2 Barun K. Mitra, *Personality Development and Soft Skills,* Oxford University Press, 2011.

**REFERENCE BOOKS:**

1. K. Alex, *Soft Skills*, S. Chand & Company Ltd, New Delhi, 2nd Revised Edition, 2011.
2. Stephen P. Robbins and Timothy A. Judge*, Organizational Behaviour*, Prentice Hall, Delhi, 16th edition, 2014

**VIDEO LECTURES:**

1. https://www.youtube.com/watch?v=6Y5VWBLi1es
2. https://www.youtube.com/watch?v=H9qA3inVMrA

**Web Resources:**

1. https://www.universalclass.com/.../the-process-of-perso...
2. https://www.ncbi.nlm.nih.gov/pubmed/25545842
3. https://www.youtube.com/watch?v=Tuw8hxrFBH8

# SCHOOL CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22CA105001 | COMPUTER HARDWARE AND SYSTEM ESSENTIALS | - | 1 | 2 | - | 2 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** This course provides a detailed discussion and hands-on experience on internal components of a computer, assemble a computer system, install an operating system, and troubleshoot using system tools and diagnostic software. Students will also be able to understand various network cables, connectors and TCP/IP networks, and work group.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Identify different hardware components on personal computer and peripheral devices.

**CO2.** Create network architecture using TCP and UDP protocols for data transmission.

**CO3.** Devise the solutions for the problems occurred in personal computer in Operating Systems.

**CO4.** Implement the functionalities of different peripheral devices and networks by configuring multi-functional devices.

### CO-PO-PSO Mapping Table:

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | | | | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 3 | - | 1 | 1 | - | - | - | - | | | | - | - | 3 |
| CO2 | 3 | - | 3 | - | 1 | - | - | - | - | | | | - | - | 3 |
| CO3 | 3 | - | 3 | 1 | 2 | - | - | - | - | | | | - | - | 3 |
| CO4 | 3 | 2 | 3 | 1 | - | - | - | - | - | | | | - | - | 3 |
| **Course Correlation Mapping** | **3** | **3** | **3** | **1** | **1** | **-** | **-** | **-** | **-** | | | | **-** | **-** | **3** |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

## EXPERIENTIAL LEARNING

### LIST OF EXERCISES:

### HARDWARE CONFIGURATION

Peripherals of the computer

1. Implement the following activities:
   a) Configure settings using BIOS/UEFI tools on a PC.
   b) Identify different components of mother board
   c) Analyze various RAM types, PC extensions cards and storage devices
2. Implement the following activities:
   a) Identify various CPU's, cooling methods and PC connection interfaces
   b) Identification of various power supply, display devices and common PC Connectors
   c) Install and configure common peripheral devices and SOHO multi-function device

### PC Networking using Packet Tracer

Network Types and Components, Topologies, Wired and Wireless Transmission, Protocols.

3. a) Identify various types of network cables and connectors and characteristics
   b) Implement the following characteristics of TCP/IP
      i)IPv4 and IPv6 ii)Client side DNS Settings
4. a) Identify following TCP and UDP Ports
      i)21-FTP ii)443-HTTPS iii)80-HTTP iv)Telnet
   b) Analyze the following TCP and UDP protocols
      i)SMD ii)SNMP iii)DHCP
5. a) Configure the following network types
      i) LAN ii) WAN iii) WLAN
   b) Configure network architecture using the following
      i) HUB ii) Switch iii) Router

### OPERATING SYSTEMS

Introduction to Operating System, Characteristics of Operating System, Types of Operating System and its components

6. Installation of Windows Operating System
7. Installation of Application and Device Drivers management

### TROUBLE SHOOTING

Introduction to trouble shooting, Hardware and Software Trouble shooting

8. a) Study the common problems related to the following
      i) Mother Board ii) RAM iii) CPU iV) Power
   b) Troubleshoot the following failures
      i) Read/Write Failure ii) Slow Performance iii) Failure to boot
9. Trouble Shoot the following symptoms of Video, projector and display issues
   i) VGA Mode ii) No Image of Screen iii) Dead Pixels iv) Color patterns
10. Trouble shoot the following issues of wired, wireless and mobile devices
    i) No Connectivity ii) IP conflict iii) Ghost Cursor iv) Stiking Keys

## RESOURCES

**REFERENCES:**


1. David Anfinson, Allan Johnson and Kathleen Czurda, *IT Essentials v7 Companion Guide*, CISCO Press, 2020
2. Brian W. Kernighan, *Understanding the Digital World: What You Need to Know about Computers, the Internet, Privacy, and Security*, Second Edition, Princeton University Press, 2021
3. Kavin Wilson, *Exploring Computer Systems: The Illustrated Guide to Understanding Computer Systems, Hardware &Networks*, Elluminent Press, 2019


**SOFTWARE/TOOLS:**

1. Windows 8/10 operating systems
2. Cisco Packet Tracer

**VIDEO LECTURES:**

1. https://www.edx.org/course/computer-hardware-and-operating-systems
2. https://www.coursera.org/learn/computer-hardware-software

**WEB RESOURCES:**

1. https://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/configuration/15-s/ir-15-s-book.pdf
2. https://www.certexams.com/comptia/a+/cert-notes-aplus-networking.htm
3. https://www.rcboe.org/cms/lib/GA01903614/Centricity/Domain/4399/Network%20n10-007.pdf
4. https://www.tutorialsweb.com/CertNotes/CompTIA-cert/A+/aplus-prac-10.htm

## SCHOOL CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM101410** | **DISCRETE MATHEMATICS FOR COMPUTER SCIENCE** | 3 | - | - | - | 3 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** This course will discuss fundamental concepts such as sets, proof techniques, functions, relations, counting principles, mathematical logics and graph theoretical approaches with applications to computer science.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Identify the mathematical logic through the algebraic skills of expressions, tables and normal forms.

**CO2.** Demonstrate the basic concepts of Mathematical systems to analyse the proof techniques in mathematical induction.

**CO3.** Apply the techniques of counting, permutations and combinations for solving various practical problems.

**CO4.** Apply the concepts of graph theory to solve structural and graphical designs.

### CO-PO-PSO Mapping Table:

| Course Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 |
| **CO1** | 3 | 2 | 3 | - | - | - | - | - | - | | - | - |
| **CO2** | 3 | 3 | 3 | - | - | - | - | - | - | | - | - |
| **CO3** | 3 | 3 | 3 | - | - | - | - | - | - | | - | - |
| **CO4** | 3 | 3 | 3 | - | - | - | - | - | - | | - | - |
| **Course Correlation Mapping** | **3** | **3** | **3** | **-** | **-** | **-** | **-** | **-** | **-** | | **-** | **-** |

*Correlation Levels: 3: High; 2: Medium;1: Low*

## COURSE CONTENT

**Module 1: Mathematical Logic** ***(08 Periods)***

Propositions and Logical Operations, Truth Tables, Equivalence, Implications, Laws of Logic, Normal Forms: Conjunctive Normal Form, Disjunctive Normal Form, Principle Disjunctive Normal Form, Principle Conjunctive Normal Form.

**Module 2: Set Theory** ***(09 Periods)***

Sets and Elements , Subsets , Venn Diagrams , Set Operations, Algebra of Sets , Finite Sets , Counting Principle , Classes of Sets , Power Sets , Partitions , Mathematical Induction.

**Module 3 Relations and Functions** ***(10 Periods)***

Relations , Operations on Relations , Equivalence Relation , Partitions and Equivalence Classes , Functions , One-One and Onto Functions , Special Type of Functions , Invertible Functions , Compositions of Functions , Recursively Defined Functions.

**Module 4 Techniques of Counting** ***(09 Periods)***

Basic Counting Principles, Permutations, Combinations, Generalized Permutations and Combinations, Pigeonhole Principle, Generalized Pigeonhole Principle, Inclusion Exclusion Principle.

**Module 5 Graphs** ***(09 Periods)***

Definition of a Graph, Graph Terminology and special Types of Graphs, Handshaking Theorem, Finite and Infinite graphs, Incidence and Degree, Null graph, Sub graphs, Walks, Paths and Circuits in a graph, Connected graphs.

***Total Periods: 45***

## EXPERIENTIAL LEARNING

1. Let a > 1 be a positive integer. Pretend you want to divide n people into some number of teams, each of size a or a + 1. Show that this is possible provided n is larger than values in the Fibonacci polynomial a2 −a−1 = a(a−1)−1.
2. Identify the relations on the set of bits B = {0, 1} that are partial orders and those that are equivalence relations.
3. Pretend you are writing traffic accident software and want to categorize accidents by the day of the week on which they occur. Pretend there are n accident reports to categorize.
   (a) What is the size of the sample space? That is, in how many ways can the n accident reports be distributed over 7 days?
   (b) In how many ways can all n accidents occur on one single day?
   (c) In how many ways can all n accidents occur on only two days?
   (d) Let's looks at the other end: In how many ways can all n accidents occur on seven, and no less, days.

## RESOURCES

**TEXT BOOKS:**

1. Kenneth H. Rosen, *Discrete Mathematics and its Applications,* Tata McGraw Hill, 8th Edition, 2019.

2. Jon Pierre Fortney, Discrete Mathematics for Computer Science, CRC Press, Taylor & Francis Group, 1st Edition, 2021.

**REFERENCE BOOKS:**

1. Richard Johsonbaugh, Discrete Mathematics, Prentice Hall,8th Edition, 2019.

2. NarasingDeo, Graph Theory with application to Engineering and Computer Science, Prentice Hall India 2016.

3. J.P. Trembly and R. Manohar, *Discrete Mathematical Structures with Applications to Computer Science,* Tata McGraw Hill, 37th Edition, 2017

**VIDEO LECTURES:**

1. https://nptel.ac.in/courses/106106183
2. https://nptel.ac.in/courses/106106094

**Web Resources:**

1. https://www.coursera.org/learn/discrete-mathematics
2. https://people.cs.pitt.edu/~milos/courses/cs441/
3. https://web.stanford.edu/class/cs103x/cs103x-notes.pdf

# SCHOOL CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22MM101030 | **MATRIX THEORY** | 3 | - | - | - | 3 |

**Pre-Requisite**

**Anti-Requisite**

**Co-Requisite**

**COURSE DESCRIPTION:** This course provides a detailed discussion on Matrix theory, Rank, inverse , determinants,solution of system of equations. Also, detailed analysis on Eigen values and Eigen vectors, Cayley Hamilton theorem, Diagnolization, Quadratic forms.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO5.** Use elementary transformations to reduce matrices to echelon form, normal form and hence find the rank of the matrix.

**CO6.** Make use of inverse and determinants to solve simultaneous equations.

**CO7.** Apply Cayley Hamilton theorem to problems for finding the inverse of a matrix and higher powers of matrices without using routine method.

**CO8.** Apply knowledge to select appropriate matrix theory in computer graphics to project three dimensional image onto a two-dimensional screen.

### CO-PO-PSO Mapping Table:

| Learning Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | | | | PSO1 | PSO2 | PSO3 |
| **CO1** | 3 | 3 | 2 | - | - | - | - | - | - | | | | - | - | - |
| **CO2** | 3 | 3 | 3 | - | - | - | - | - | - | | | | - | - | - |
| **CO3** | 3 | 3 | - | - | - | - | - | - | - | | | | - | - | - |
| **CO4** | 3 | 3 | 3 | - | - | - | - | - | - | | | | - | - | - |
| **Course Correlation Mapping** | **3** | **3** | **3** | **-** | **-** | **-** | **-** | **-** | - | | | | **-** | - | **-** |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**UNIT-1:DETERMINANTS (08 Periods)**

Introduction-Expansion by cofactors-Properties of determinants-Pivotal Condensation-Inversion by Cramer's Rule.

**UNIT-2: THE INVERSE (07 Periods)**

Introduction-Calculating Inverses by Row reduced form-Simultaneous equations- by matrix inversion-Properties of the inverse-LU decomposition.

**UNIT-3**: **SIMULTANEOUS LINEAR EQUATIONS (10 Periods)**

Linear System-Solution by substitution-Gaussian Elimination-Pivoting Strategies-Linear Independence-Rank-Row reduced Echelon-Normal form-Theory of Solutions

**UNIT- 4: EIGEN VALUES AND EIGEN VECTORS (10 Periods)**

Eigen values-Eigen vectors-properties -Linearly independent Eigen vector-Power methods-Cayley Hamilton methods-Calculating inverse and powers of a matrix

**UNIT-5: QUADRATIC FORMS (10 Periods)**

Quadratic forms upto three variables-Rank, Index, Signature and Nature of Quadratic forms-Quadratic forms to Canonical form by Linear and Orthogonal transformation.

***Total Periods: 45***

## EXPERIENTIAL LEARNING

1 Use the power method to estimate the largest Eigen values of the following matrix,
$A = \begin{bmatrix} 1 & 3 \\ 2 & 2 \end{bmatrix}$
2 Explain the role of Eigen values and Eigen vectors in image processing.
3 List any five practical applications of vector spaces and explain briefly.
4 Explain how the matrix theory is used in robotics and auto machines.
5 Explain any five applications of linear algebra in different branches of engineering?

## RESOURCES

**TEXT BOOKS:**


1. Richard Bronson,Gabriel B.Costa, Matrix Methods, 4th Edition, Academic Press, 2020.
2. Gregory Hartman, Fundamentals of Matrix Algebra, 3rd Edition, Virginia Military Institute, 2017.


**REFERENCE BOOKS:**

1. Linear Algebra by Kenneth Hoffman and Ray Kunze, published by Pearson Education (low priced edition), New Delhi
2. Text book of Linear Algebra & Matrices by A.R.Vasishta, Hari Kisan, Published by Krishna Prakashan.

**VIDEO LECTURES:**

1. https://nptel.ac.in/courses/111108157

2. https://ncert.nic.in/textbook/pdf/lemh103.pdf

**Web Resources:**

1. https://www.khanacademy.org/math/algebra-home/alg-matrices
2. https://courses.smp.uq.edu.au/MATH2301/linalglecturenotes.pdf

## SCHOOL CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22MM102001 | DESCRIPTIVE STATISTICS AND PROBABILITY | 3 | - | 2 | - | 4 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:**

This course provides a detailed discussion on the Measures of central tendency and dispersion and also discussion on Probability.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Knowledge of Statistics, scope of statistics and importance in different areas such as Medical, Engineering, Agricultural and Social Sciences etc. and also evaluation of summary measures such as measures of central tendency.

**CO2.** Knowledge on measures of dispersion, moments, Skewness and kurtosis etc.

**CO3.** Knowledge of probability including concepts of independence, mutually exclusive, equally likely, favorable outcomes and also knowledge on real life problems.

**CO4.** Knowledge on random variables, its types and distribution functions, bivariate random variable etc. Knowledge on mathematical expectation, correlation, regression analysis.

**CO-PO-PSO Mapping Table:**

| Course Outcomes | Program Outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 |
| CO1 | 3 | 2 | 3 | - | - | - | - | - | - |
| CO2 | 3 | 3 | 3 | - | - | - | - | - | - |
| CO3 | 3 | 3 | 3 | - | - | - | - | - | - |
| CO4 | 3 | 3 | 3 | - | - | - | - | - | - |
| **Course Correlation Mapping** | **3** | **3** | **3** | **-** | **-** | **-** | **-** | **-** | - |

*Correlation Levels: 3: High; 2: Medium; 1: Low*

**COURSE CONTENT:**

**Module1: Introduction to Statistics** ***(08 Periods)***

**Introduction to Statistics**: Concepts of primary and secondary data. Questionnaire Diagrammatic and graphical representation of data: Histogram, frequency polygon, Ogives, Pie chart.

**Module2: Measures of Central tendency** ***(09 Periods)***

Measures of Central Tendency: Mean, Median, Mode, Geometric Mean and Harmonic Mean and simple problems.

**Module 3 Measures of Dispersion** ***(08 Periods)***

**Measures of Dispersion**: Range, Quartile Deviation, Mean Deviation and Standard Deviation, Variance. Central and Non-Central moments and their interrelationship. Sheppard's correction for moments. Skewness and kurtosis and simple problems.

**Module 4 Introduction to Probability** ***(10 Periods)***

**Introduction to Probability**: Basic Concepts of Probability, random experiments, trial, outcome, sample space, event, mutually exclusive and exhaustive events, equally likely and favourable outcomes. Mathematical, Statistical, axiomatic definitions of probability. Conditional Probability and independence of events, Addition and multiplication theorems of probability for 2 ,3 and for n events. Boole's inequality and Baye's theorem and its applications in real life problems.

**Module 5 Random variable** ***(10 Periods)***

**Random variable:** Definition of random variable, discrete and continuous random variables, functions of random variable. Probability mass function. Probability density function, Distribution function and its properties. Simple Problems Bivariate random variable - meaning, joint, marginal and conditional Distributions, independence of random variables and simple problems.

***Total Periods: 45***

**EXPERIENTIALLEARNING:**

**LIST OF EXERCISES:**

1. Sub Divided and Percentage Bar Diagrams
2. Pie or circular Diagrams (for two graphs)
3. Construction of Histogram and frequency polygon
4. Construction of Ogive curves
5. Computation of Mean, Median and Mode for grouped data
6. Computations of Geometric Mean and Harmonic mean for grouped data
7. Computation of Quartile Deviation and Range for grouped data
8. Computation of Mean deviation, Standard Deviation and coefficient of variation for grouped data

9. Determination of Consistency (For two types of grouped data)

10. Computation of Karl Pearson's and Bowley's coefficient of skewness

11. Computation of non-central, central moments, β1 , β2,ϒ1 and ϒ2 for grouped data.

12. Computation of non-central, central moments, β1 , β2,ϒ1 and ϒ2 and Sheppard's corrections for grouped data.

**RESOURCES**

**TEXTBOOKS:**

1. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics
2 Willam Feller: Introduction to Probability theory and its applications. Volume –I

**REFERENCEBOOKS:**

1. Goon AM, Gupta MK, Das Gupta B : Fundamentals of Statistics , Vol-I, the World Press Pvt.Ltd.,Kolakota.
2. Hoel P.G: Introduction to mathematical statistics, Asia Publishing house.
3 M. Jagan Mohan Rao and Papa Rao: A Text book of Statistics Paper-I.
4 Sanjay Arora and Bansi Lal: New Mathematical Statistics: Satya Prakashan New Delhi

**SOFTWARE/TOOLS:**

1. MS-Excel

**VIDEOLECTURES:**

1. https://www.youtube.com/watch?v=cOyVnjrbJyw
2. https://youtu.be/woKWdy2DRGM?list=PLP1OdTlavJNsgM-cOuuAlqdBjhq2iC44o

**WEBRESOURCES:**

1. https://gacbe.ac.in/pdf/ematerial/18MPS23C-U4.pdf
2. https://azslide.com/download/bng-202-biomechanics-lab-descriptive-statistics-and-probability-distributions-i_59bb65671723ddc26e176f41.html

# SCHOOL CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22MM102004 | STATISTICAL METHODS AND INFERENCE | 3 | - | 2 | - | 4 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:**

This course provides a detailed discussion on Correlation between the variables to analyze the real-life problems, Regression Lines of x & y variable, Testing of Hypothesis, large sample tests (Z-test), small sample tests (t-test, F-test, chi-square test) and non-parametric tests. These techniques play an important role in many fields like pharmaceutical, agricultural, medical etc.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Ability to distinguish between variables both correlation and regression.

**CO2.** Knowledge about test of hypotheses and associated concepts.

**CO3.** Ability to difference between variables attributes and also examine conditions for the consistency of given set of data

**CO4.** Students can understand basics concepts on sampling theory and sampling distributions

**CO5.** Knowledge about concept about non-parametric method and some important non-parametric tests

**CO-PO-PSO Mapping Table:**

| Course Outcomes | Program Outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 |
| CO1 | 3 | 2 | 3 | - | - | - | - | - | - |
| CO2 | 3 | 3 | 3 | - | - | - | - | - | - |
| CO3 | 3 | 3 | 3 | - | - | - | - | - | - |
| CO4 | 3 | 3 | 3 | - | - | - | - | - | - |
| CO5 | 3 | 3 | 3 | - | - | - | - | - | - |
| **Course Correlation Mapping** | **3** | **3** | **3** | **-** | **-** | **-** | **-** | **-** | - |

Correlation Levels: 3: High; 2: Medium;1: Low

**COURSE CONTENT:**

**Module 1: Correlation** ***(08 Periods)***

**Correlation:** Meaning, Types of Correlation, Measures of Correlation: Scatter diagram, Karl Pearson's Coefficient of Correlation, Rank Correlation Coefficient (with and without ties).

**Module 2: Regression** ***(09 Periods)***

**Regression:** Concept of Regression, Linear Regression: Regression lines, Regression coefficients and it's properties, and simple problems. Correlation vs regression.

**Module 3 Testing of Hypothesis** ***(08 Periods)***

**Testing of Hypothesis**: Concepts of statistical hypotheses, null and alternative hypothesis, critical region, two types of errors, level of significance and power of a test. One and two tailed tests. Neyman- Pearson's lemma. Examples in case of Binomial, Poisson, Exponential and Normal distributions.

**Module 4 Parametric Tests** ***(10 Periods)***

**Large sample Tests:** Large sample test for single mean and difference of two means, confidence intervals for mean(s). Large sample test for single proportion, difference of proportions.

**Small Sample tests:** t-test for single mean, difference of means and paired t- test. Chi Square test for goodness of fit and independence of attributes. F-test for equality of variances.

**Module 5 Non-parametric tests** ***(10 Periods)***

**Non-parametric tests:** Non- Parametric Test and their advantages and disadvantages, comparison with parametric tests. Two independent sample tests: Median test, Wilcoxon – Mann-Whitney U test, Wald Wolfowitz's runs test. Sign test for large sample case

***Total Periods: 45***

**EXPERIENTIAL LEARNING:**

## LIST OF EXPERIMENTS:

1. Calculation of Correlation coefficient for un groped data (Direct method)
2. Calculation of Rank correlation coefficient with and without ties
3. Construction of two regressions lines for un grouped data
4. Difference between two means test for Large samples
5. Difference between tw standard deviations test for Large samples
6. Difference between two Proportions test for large samples
7. Difference between two Correlation coefficients test for large samples
8. Single mean test for Small samples
9. Paired t- test for two dependent variables.
10. F-Test or Difference between two variances test for small samples
11. Chi– Square Test for single sample variance
12. Chi – Square Test for goodness of fit of B.D
13. Chi– Square Test for independence of attributes
14. Sign test for two dependent variables.

15 Run test for two independent random samples.

16 Median test for two independent random samples.

## RESOURCES

### TEXT BOOKS:


1. Statistical Methods, R.J.Freund, W.J. Wilson and D.L Mohr, (Ed 3) Elsevier.
2. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, NewDelhi.
3. Outlines of statistics, Vol II: Goon Guptha, M.K.Guptha and Das Guptha B
4. Hoel P.G: Introduction to mathematical statistics, Asia Publishing house.
5. Hogg Tanis Rao: Probability and Statistical Inference. 7thedition.Pearson


### REFERENCE BOOKS:


1. Applied Statistics with Microsoft Excel By Gerald Keller
2. Statistics Made simple Do it yourself on PC By K.V.S. Sarma
3. Sanjay Arora and Bansi Lal: New Mathematical Statistics: Satya Prakashan , NewDelhi.


### VIDEO LECTURES:

1. https://archive.nptel.ac.in/courses/111/105/111105042/
2. https://archive.nptel.ac.in/courses/111/102/111102112/
3. https://archive.nptel.ac.in/courses/111/105/111105043/

### Web Resources:

1. https://www.jmp.com/en_us/statistics-knowledge-portal/what-is-correlation.html
2. https://www3.cs.stonybrook.edu/~cse521/19Regresion.pdf
3. https://study.com/academy/lesson/hypothesis-testing-large-independent-samples.html
4. https://saylordotorg.github.io/text_introductory-statistics/s12-04-small-sample-tests-for-a-popul.html
5. https://www.analyticssteps.com/blogs/non-parametric-statistics-types-tests-and-examples

# SCHOOL CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22LG102405** | **GENERAL ENGLISH** | 2 | - | 2 | - | 3 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** This course deals with selected literary works of eminent writers, exercises on speaking, reading comprehensions for skimming and scanning, vocabulary, grammar, pronunciation, and conversation practice.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Demonstrate knowledge of literary works of various pieces of eminent writers.

**CO2.** Adapt general and technical vocabulary in communication.

**CO3.** Apply grammatically correct English in writing.

**CO4.** Analyse texts using reading techniques.

**CO5.** Apply different communication styles in various situations.

### CO-PO-PSO Mapping Table:

| Course Outcomes | Program Outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** |
| **CO1** | 3 | - | - | - | - | - | - | 2 | 2 |
| **CO2** | 3 | 2 | - | - | - | - | - | 2 | 2 |
| **CO3** | 2 | 3 | - | - | - | - | - | 2 | 2 |
| **CO4** | 2 | 3 | - | 2 | - | - | - | 2 | 2 |
| **CO5** | 2 | 2 | - | 3 | - | - | - | 2 | 2 |
| **Course Correlation Mapping** | **2** | **3** | **-** | **3** | **-** | **-** | **-** | **2** | **2** |

*Correlation Levels: 3: High; 2: Medium; 1: Low*

## COURSE CONTENT

**Module 1: 'A snake in the Grass' short story by R.K. Narayan.** ***(06 Periods)***
A Snake in the Grass – A Short Story, Reading Comprehension, Grammar, Vocabulary, Pronunciation, and Conversation Practice.

**Module 2: 'On saying Please 'short essay by A. G. Gardiner** ***(06 Periods)***
On Saying Please – A Short Essay, Reading Comprehension, Grammar Vocabulary, Pronunciation, and Conversation Practice.

**Module 3: 'If You Forget Me 'poem by Pablo Neruda** ***(06 Periods)***
If you Forget Me - A Poem, Reading Comprehension, Grammar, Pronunciation, and Conversation Practice.

**Module 4: 'After the Sunset' short story by Bhoopal** ***(06 Periods)***
After the Sunset – A Short Story, Reading Comprehension, Grammar, Pronunciation, and Conversation Practice.

**Module 5: 'Man's Peril 'essay by Bertrand Russel** ***(06 Periods)***
Man's Peril - An Essay, Reading Comprehension, Vocabulary, Grammar, Pronunciation, and Conversation Practice.

***Total Periods: 30***

**EXPERIENTIAL LEARNING**

**List of Exercises**

1. In rainy seasons a lot of snakes are found crawling around. Prepare a write-up on the reactions of people when they found snakes.
2. India is now for entrepreneurs and the government announced a lot of startup programmes for that. Prepare a presentation on recent entrepreneurs.
3. Small courtesies play a major role in creating an impression on other people. List out a few examples.
4. Prepare a PowerPoint presentation on the present scenario in higher education and jobs in India.
5. Being a shopkeeper and persuading a customer to buy a product which is introduced newly in the market. Prepare a conversation.
6. The English language has a rich vocabulary. List out the homophones and homonyms and write down the pronunciation and meaning of those words.
7. Describe a situation in your college where teamwork is needed and explain the strategies to manage the team effectively.
8. India is a country of unity in diversity. List out the existence of different racial and religious people and bring out reasons for the harmonious relationship among the people.
9. Forget and forgive are the most important quality of any human being. Prepare a write-up on any two experiences which come across in your life where you forgive or forget to maintain good relationships with friends or relatives.
10. Make a case study on the problems of second language learners of English and suggest solutions to overcome them.
11. How do you feel that the role of science and technology in nation-building?

*Above all will be detailed in CHO.*

**RESOURCES**

**TEXTBOOKS:**

1. G. Damodar "*English Language for Undergraduate Students*", Cambridge University-2019.

**REFERENCE BOOKS:**

1. https://www.researchgate.net/publication/331773456_RK_Narayan's_A_Snake_in_the_Grass_and_Stephen_Leacock's_With_the_Photographer_-_A_Comparative_Study
2. https://smartenglishnotes.com/2020/07/17/on-saying-please-summary-analysis-and-questions-and-answers/

**VIDEO LECTURES:**

1. https://www.youtube.com/watch?v=WnOOKO0CdaM
2. https://www.youtube.com/watch?v=H6Nlz8qmcFc
3. https://www.youtube.com/watch?v=-lTliZO85YM
4. https://www.youtube.com/watch?v=048YjXwgHWE
5. https://www.youtube.com/watch?v=XLLQm7Grmcc

**WEB RESOURCES:**

1. https://www.researchgate.net/publication/331773456_RK_Narayan's_A_Snake_in_the_Grass_and_Stephen_Leacock's_With_the_Photographer_-_A_Comparative_Study
2. https://smartenglishnotes.com/2020/07/17/on-saying-please-summary-analysis-and-questions-and-answers/
3. http://www.emcp.com/product_catalog/school/litLink/Grade09/U09-04forgetme/
4. https://englishlanguage-lit.blogspot.com/2021/05/after-sunset-short-story-by-bhoopal.html
5. https://www.taylorfrancis.com/chapters/mono/10.4324/9781003090359-31/man-peril-bertrand-russell?context=ubx&refId=1d767e2d-ceb1-4537-9de5-6417eab47d1e

**SCHOOL CORE**

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22FA101401** | **MEDIA AND MASS COMMUNICATION SKILLS** | 3 | - | - | - | 3 |
| **Pre-Requisite** | ---- | | | | | |
| **Anti-Requisite** | ---- | | | | | |
| **Co-Requisite** | ---- | | | | | |

**COURSE DESCRIPTION:** The course aims at providing a basic understanding of Media and Mass Communication Skills. The student can better know, understand, and appreciate the theoretical nuances of Media and Mass Communication Skills. As a result, in the day-to-day media application and developments, they can better relate the theoretical foundations to the media tools used in the creation of media content and, accordingly, analyse and understand the regular media praises.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Understand the need for and importance of communication

**CO2** Explain various theories of communication

**CO3** Describe the functions of mass communication

**CO4** Assess the impact of media on society

**CO5** Using new media communication tools and creating content for social media

**CO-PO-PSO Mapping Table:**

| Learning Outcomes | Program Outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** |
| **CO1** | 3 | | | 1 | | 3 | 1 | 2 | 1 |
| **CO2** | 3 | | | 1 | | 3 | 2 | 2 | 1 |
| **CO3** | 3 | 1 | | 3 | | 2 | 3 | 3 | 1 |
| **CO4** | 3 | 1 | | 1 | | 3 | 2 | 1 | 1 |
| **CO5** | 3 | 2 | 3 | 3 | | 2 | 2 | 2 | 1 |
| **Course Correlation Mapping** | **3** | **1** | **1** | **2** | | **3** | **2** | **2** | **1** |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

**COURSE CONTENT**

**Module 1 HUMAN COMMUNICATION AND PRESENTATION SKILLS *09 Periods)***

Verbal Communication/Human communication: The act or process of using words, sounds, signs or behaviours to exchange information or to express particular ideas, thoughts, feelings, etc. Informal Communication: Informal communication is defined as communication that moves spontaneously between two people or two groups of people without any formal restrictions. Electronic Communication: This process of sending/sharing information to a person or to a group of people by the means of internet, modern technology and modern software applications is called electronic communication. For example, social media, radio, televisions, mobile phones, laptops etc.

**Module 2 INTRODUCTION TO COMMUNICATION *(09 Periods)***

Meaning, definition and forms (intra-personal, inter-personal, group & mass), Concepts and characteristics of mass, mass society, mass media & mass communication, Communication process – source, message, channel, receiver, feedback &noise, Encoding & Decoding process.

**Module 3 MASS COMMUNICATION *(09 Periods)***

Meaning of Mass Communication, Functions of Mass Communication, Elements of Mass Communication, Audio and/or Visual Communication: Photographs, Films, Radio, Television & New Media, Folk Media, Intercultural Communication, Public opinion – definition, Role of mass media in public opinion information, influence of mass media on society

**COMMUNICATION MODELS *(09 Periods)***

**Module 4**

Basic model, model of differential agenda-setting, criticism, Uses & Gratifications perspective: basic model, Rosengren's model, criticism, Neuman's Spiral of Silence model, Shannon and Weaver Model, Wilbur Schramm Model, McLuhan's Media Determinism, concepts of Global Village and hot & cool media

**Module 5 QUEUING MODELS *(09Periods)***

**Scope and nature, New Media , audiences,** technological changes, ICT/Media Technologies, trends, Social Media: YouTube, Blogs, Podcasts, Facebook, Twitter, WhatsApp, Instagram, latest new media platforms, internet advertising, Audiences, mobile communications, Problems and Prospects for the Future of Media, issues and ethics.

***Total Periods: 45***

**EXPERIENTIAL LEARNING**

1. Play several fun games as defined in this article
2. Practice communication through power-point presentations on current affair topic.

3. Watch Movie “The Extra-Terrestrial” and discuss how communications play an important part with Aliens:

**RESOURCES**

**TEXT BOOKS:**


1. West, R., Turner, L. H, An Introduction to Communication. United Kingdom: Cambridge University Press, 2018.
2. Dimbleby, R., Burton, G. More Than Words: An Introduction to Communication. United Kingdom: Taylor & Francis, 2020.
3. Kumar, K. J. Mass Communication in India. India: Jaico Publishing House, 2012.


**REFERENCE BOOKS:**


1. Quinn, A. Virtue Ethics and Professional Journalism. Germany: Springer International Publishing, 2018.
2. Journalism and Mass Communication.: Arihant Publications India limited, 2020.
3. Hasan, S. Mass Communication: Principles and Concepts. India: CBS PUB & DIST PVT Limited INDIA, 2020.


**VIDEO LECTURES:**

1. Effective Communication Skills: https://www.youtube.com/watch?v=u16EPwFmdis
2. The Art of Effective Communication:https://www.youtube.com/watch?v=2Yw6dFQBklA

**Web Resources:**

1. Introduction to Communication: https://www.skillsyouneed.com/docs/communication-skills-PV.pdf
2. Communication in Real World: https://open.lib.umn.edu/communication/

# SCHOOL CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22LG102401** | **ENGLISH FOR PROFESSIONALS** | 2 | - | 2 | - | 3 |

**Pre-Requisite** -
**Anti-Requisite** -
**Co-Requisite** -

**COURSE DESCRIPTION:** This course deals with listening strategies, reading comprehension, grammar, vocabulary, pronunciation, Written, Verbal and Non-verbal communication, Channels of communication, Barriers to communication, Modes of technology-based communication, and Technical Communication

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Understand the basics of Reading, Writing, Listening, and Speaking skills.
**CO2.** Analyzethe rules of English grammar in speaking and writing.
**CO3.** Demonstrate knowledge of English pronunciationin speaking.
**CO4.** Apply the knowledge of reading strategies and vocabulary in communication.
**CO5.** Apply the strategies of writing in preparing a report.

**CO-PO Mapping Table:**

| Learning Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | 3 | - | - | - | - | - | - | - | - | 3 | - | 2 |
| CO2 | - | 3 | 2 | - | - | - | - | - | - | 3 | - | 2 |
| CO3 | 3 | 2 | - | - | - | - | - | - | - | 3 | - | 2 |
| CO4 | - | - | - | - | 3 | - | - | - | - | 3 | - | 2 |
| CO5 | - | - | - | - | 3 | - | - | - | - | 3 | - | 2 |
| Course Correlation Mapping | 3 | 2 | 2 | - | 3 | - | - | - | - | 3 | - | 2 |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1: SUPER HEROES – THE SCIENCE BEHIND SUPER HEROES** ***(06 Periods)***

Reading for Comprehension, Grammar, Speaking, Listening, Vocabulary, Writing, Verbal and Non-verbal communication.

**Module 2: ALIENS – THE CYLINDER OPENS** ***(06 Periods)***

Reading for comprehension, Grammar, Vocabulary, Writing, Listening, and Channels of communication.

**Module 3: INVENTORS – THE RAMAN EFFECT** ***(06 Periods)***

Reading comprehension, Listening, Writing, Grammar, Speaking, Pronunciation, and communication barriers.

**Module 4: HEALTH AND NUTRITION – WHAT SHOULD YOU BE EATING** ***(06 Periods)***

Reading comprehension, Listening, Speaking, Grammar,Writing, Pronunciation, and Modes of technology-based communication.

**Module 5: NEW-AGE ENTREPRENEURS – HOW A CHINESE** ***(06 Periods)***

**BILLIONAIRE BUILT HER FORTUNE**

Reading comprehension, Vocabulary, Listening, Grammar, Writing, and Technical Communication

***Total Periods: 30***

## EXPERIENTIAL LEARNING

**PART-A**

**Any six modules among the following:**

1. Conversation starters and role play
2. Reading comprehension
3. Listening comprehension
4. Vocabulary Building (business and job-related vocabulary)
5. Describing people, places, objects, and Events
6. Phonetics - Accent/ Rhythm/ Intonation
7. Tenses
8. Proposal Writing

**PART-B**

**Any four modules among the following:**

1. Communicating effectively is important to become successful in any business. Prepare a Case study of successful business personnel regarding communication competence.
2. Prepare a PowerPoint presentation on an orator and analyze the voice dynamics.
3. People face situations to convince or agree with the points they have. The college arranges a 5-day tour program to Goa. Prepare a video on persuasive talk and convince parents to get permission.
4. Write an article on the famous clichés of our time.
5. Prepare a poster on the effects of social media on youth.
6. Give a short talk on the importance of inventors and their role in present socio, political and economic changes.
7. Prepare a collage of entrepreneurs' pictures and their achievements.
8. NASA released recent photos of the universe with the help of the James Webs Space Telescope. Write down the expected impact on the existing theory on planets and the universe.
9. Obesity is the most common problem for people. List out the reasons for the problem and prepare food habits to overcome.
10. Epics of India deals with superheroes of those days. Compare the weapons used in the battles of Mahabharata with modern weapons.
11. Write a report on your recently invented product so that it should be sold as a hot cake in the market.
12. Illustrate the essential rules for good precis writing.

## RESOURCES

**TEXTBOOK:**

1. N.P. Sudharshana and C.Savitha, *English for Technical Communication*, Cambridge University Press. 2016.

**REFERENCE BOOKS:**


1. Kline, J. A. *Speaking effectively: Achieving excellence in presentations. Upper Saddle River,* NJ: Pearson/Prentice Hall, 2004.
2. Kuiper. S, *Contemporary business report writing,* Cincinnati, OH: Thomson/South, Western, 3rd Edition, 2007.
3. Locker, K. O. & Kaczmarek, *S*. K. Business communication: Building critical skills, New York: McGraw, Hill/Irwin, 3rd Edition, 2007.
4. Mascull. B, *Business vocabulary in use: Advanced. Cambridge,* Cambridge University Press, 2004.

5. Matthews, C. B. and Matthews,*Quicksteps to winning business presentations: Make the most of your PowerPoint presentations*, McGrawHill, 2007.
6. Marsh. C,*Strategic writing: Multimedia writing for public relations, advertising, sales and marketing, and business communication*, Pearson/Ally and Bacon, 2005.
7. Munter. M, and Russell. L,*Guide to presentations*, Pearson/Prentice Hall, 2nd Edition, 2008.
8. Reardon. K. K,*The skilled negotiator: Mastering the language of engagement*, Jossey, Bass, 2004.
9. Stiff. J. B, *Persuasive communication*, Guilford Press. Engagement, Jossey, Bass, 2nd Edition, 2003.

**VIDEO LECTURES:**

1. https://learnenglish.britishcouncil.org/general,english/video,zone/the,day,elizabeth,became,queen
2. https://www.youtube.com/watch?v=CscHc8qSn1A

**WEB RESOURCES:**

1. https://galgotiacollege.edu/assets/pdfs/study,material/Notes,english.pdf
2. https://lecturenotes.in/subject/183
3. https://www.fluentu.com/blog/english/professional,english/
4. https://learnenglish.britishcouncil.org/business,english

## SCHOOL CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22LG102406** | **Advanced English Grammar and usage** | 3 | - | 2 | - | 4 |

**Pre-Requisite** English for Professionals

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** This course helps to improve the Students to have some foundational knowledge of English grammar. It helps students to improve their grammar, expand their vocabulary, and become more confident in following and expressing themselves in English.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** understand the basics of good writing.

**CO2.** Analyze the most common purpose in academic writing is to persuade, synthesize, and inform.

**CO3.** Analyze some idea to describe an object, place, or activity.

**CO4.** improve more critical and reflective in his writing.

## CO-PO-PSO Mapping Table:

| Learning Outcomes | Program Outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 |
| CO1 | 3 | 2 | - | - | - | - | - | 2 | 2 |
| CO2 | 2 | 3 | - | - | - | - | - | 2 | 2 |
| CO3 | 2 | 3 | - | - | - | - | - | 2 | 2 |
| CO4 | 2 | 3 | - | - | - | - | - | 2 | 2 |
| Course Correlation Mapping | 2 | 3 | - | - | - | - | - | 2 | 2 |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

## COURSE CONTENT

**Module 1: BASICS OF GRAMMAR** **(09 Periods)**

Introduction to grammatical analysis, Grammatical terms, Punctuations.

**Module 2: STRUCTURES** **(09 Periods)**

Subjects and predicates Coordination and subordination, Clause structure/sentence types

**Module 3: VERB & DETERMINERS** **(09 Periods)**

Verb types Thematic roles, Nouns & determiners Pronouns, Modifiers Post-modifiers, Nominal elements

**Module 4: LINKERS & MODIFIERS** **(09 Periods)**

Prepositions and more Adverbs, Adverbials

**Module 5: STRUCTURES & GENRES** **(09 Periods)**

Information structures, Language and authorial style/genre

**Total Periods: 45**

## EXPERIENTIAL LEARNING

1. Grammar CD – Intense Learning Mastering and K- Van Solutions
2. English in Mind – 1 to 3
3. English Mastery A, B and C Levels

## RESOURCES

**TEXTBOOKS:**

1 Grammar for Academic Writing by Tony Lynch and Kenneth Anderson (revised & updated by Anthony Elloway) 2013. Publishers:English Language Teaching Centre University of Edinburgh.

**REFERENCE BOOKS:**

1. Raimes A. Grammar Trouble spots: A guide for Student Writers, Cambridge University Press, 2004.
2. Trappes-Lomax H. Oxford Learner's Wordfinder Dictionary , Oxford University Press, 1997.
3. Murphy R. English Grammar in Use, Cambridge University Press
4. Hewings M. Advanced Grammar in Use, Cambridge University Press.
5. Carter R. and McCarthy M. Cambridge Grammar of English, Cambridge University Press.

**VIDEO LECTURES:**

1 https://www.youtube.com/watch?v=Yiy0BfxIBnU

2 https://www.youtube.com/watch?v=VLU5nvP8CQA

**Web Resources:**

1 www.uefap.com, maintained by Andy Gillett (from the *UEfAP* home page, select *Links*, then *Language*).

## SCHOOL CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22LG101403 | GERMAN LANGUAGE | 2 | - | - | - | 2 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Oral communication; Basic grammar; Basic writing; Berufsdeutcsch (Business German)

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Demonstrate basic knowledge of the German language and verb conjugation.

**CO2.** Comprehend and apply the knowledge of vocabulary and phrases in day-to-day real-life conversation.

**CO3.** Apply the various sentence structures by examining the rules of grammar in speaking and writing.

**CO4.** Analyze the various verb structure of English and German languages effectively in professional writing

**CO5.** Apply the various verb structure of English and German languages effectively in professional writing

**CO-PO Mapping Table:**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | | | |
| CO1 | 3 | - | - | - | - | - | - | 2 | - | | | |
| CO2 | 3 | - | - | - | - | - | - | 2 | - | | | |
| CO3 | 3 | - | - | - | - | - | - | 2 | - | | | |
| CO4 | 3 | - | - | - | - | - | - | 2 | - | | | |
| CO5 | 3 | - | - | - | - | - | - | 2 | - | | | |
| Course Correlation Mapping | 3 | - | - | - | - | - | - | 2 | - | | | |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

### Module 1: INTRODUCTION *(06 Periods)*

Introduction - German alphabet, numbers, days in a week, names of months, seasons. Grammar: Nouns –(i)Nominative case and (ii) Nominative personal pronouns, simple sentence, Verb Conjugation 1st and 2nd type, verb Conjugation 3rd type, 'Wh' questions (simple sentences) Nominative (definite and indefinite) Articles

### Module 2: CITY AND FOOD *(06 Periods)*

In the city: naming places and buildings, means of transport, basic directions. Food: drink, groceries and meals. Apartments: rooms, furniture, colours.
Grammar: Nouns-articles negation–(kein and nicht); imperative and the accusative case; Nominative Possessive Pronouns.

**Module 3: DAY-TO-DAY CONVERSATIONS** ***(06 Periods)***

Everyday life, telling time, making appointments, leisure activities, and celebrations. Different types of professions, Health and the body, holidays and weather, Clothes and

**Module 4: BASIC GRAMMAR** ***(06 Periods)***

Grammar: Possessive articles, Prepositions (am, um, von. bis); Modal verbs, Separable verbs, accusative, past tense of 'to have' and 'to be', imperative sentences, dative case, perfect tense.

**Module 5: BASIC WRITING** ***(06 Periods)***

Translation from English to German and German to English, Contacts, Writing letters and Email Writing.

***Total Periods: 30***

## EXPERIENTIAL LEARNING

1. Prepare a report on the importance of the German language in India
2. Why is German taught in Indian schools?

*(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)*

## RESOURCES

**TEXTBOOKS:**

1. Stefanie Dengler, Paul Rusch, Helen Schmitz, Tana Sieber, *Netzwerk Deutsch als Fremdsprache, Arbeitsbuch A1*, Goyal Publishers and Distributors Pvt. Ltd. 2015.

**VIDEO LECTURES:**

1. https://www.youtube.com/watch?v=o4GvYa-3BmY
2. https://www.youtube.com/watch?v=mrF9BizWmgk
3. https://www.youtube.com/watch?v=mojirClzQEs
4. https://www.youtube.com/watch?v=0osSyX0MmCM
5. https://www.youtube.com/watch?v=mMDOtG5ucHA

**Web Resources:**

1. https://learngerman.dw.com/en/beginners/c-36519789
2. https://storylearning.com/learn/german/german-tips/basic-german-phrases
3. https://study.com/academy/lesson/how-to-write-a-letter-in-german.html

## SCHOOL CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22LG101407 | FRENCH LANGUAGE | 2 | - | - | - | 2 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Oral communication; Basic writing; Basic grammar

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Demonstrate basic knowledge of the French language.

**CO2.** Comprehend and apply the knowledge of the alphabet in day-to-day real-life conversation.

**CO3.** Apply the various styles of greetings in speaking and writing.

**CO4.** Analyze the various conversations in French languages

**CO5.** Apply the French words for date and time.

**CO-PO Mapping Table:**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | 3 | - | - | - | - | - | - | 2 | - | - | - | - |
| CO2 | 3 | - | - | - | - | - | - | 2 | - | - | - | - |
| CO3 | 3 | - | - | - | - | - | - | 2 | - | - | - | - |
| CO4 | 3 | - | - | - | - | - | - | 2 | - | - | - | - |
| CO5 | 3 | - | - | - | - | - | - | 2 | - | - | - | - |
| Course Correlation Mapping | 3 | - | - | - | - | - | - | 2 | - | - | - | - |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1: INTRODUCTION** ***(06Periods)***

Introduction – Introduction, History of the French Language, Extent of the French Language,
Reasons To Learn French, Book Organization, Learning French, Advice on Studying French

**Module 2: THE ALPHABET** ***(06 Periods)***

Letters, Punctuation, Acute Accent, Grave Accent, Tonic Accent, Stress

**Module 3: GREETINGS** ***(06 Periods)***

Greetings, Good-byes, Names, Vous vs. tu, Courtesy, Formal Speech Titles, Asking For One's Name

**Module 4: CONVERSATIONS & NUMBERS** ***(06 Periods)***

How are you?, Asking How One Is Doing,
Cardinal Numbers and Ordinal Numbers

**Module 5: THE DATE & TIME** ***(06 Periods)***

Numbers 01-31, Seasons, Days of the week, Months of the Year, Numbers 30-60, Times of Day, Asking for the time.

***Total Periods: 30***

## EXPERIENTIAL LEARNING

1. Prepare a report on the importance of the French language in India
2. Why is French taught in Indian schools?

*(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)*

## RESOURCES

### TEXTBOOKS:

1. The current, editable version of this book is available in Wikibooks, the open-content textbooks collection, at http://en.wikibooks.org/wiki/French

### VIDEO LECTURES:

1. https://www.bing.com/videos/riverview/relatedvideo?&q=video+lecture+on+THE+ALPHABET+in+french&qpvt=video+lecture+on+THE+ALPHABET+in+french&mid=D123409C16604E0FDE26D123409C16604E0FDE26&&FORM=VRDGAR
2. https://www.youtube.com/watch?v=hd0_GZHHWeE

### Web Resources:

1. https://vdocument.in/french-lecture-notespdf.html?page=2

# SCHOOL CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22LG101402 | తెలుగు | 2 | - | - | - | 2 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** తుమ్మల సీతారామమూర్తి-ఎక్కట్లు, తిక్కన-నాడీజంఘోపాఖ్యానం, పోతన-ధ్రువోపాఖ్యానం, దువ్వూరి రామిరెడ్డి - కృషీ వలుడు, మరియు తెలుగు వ్యాకరణం మీద అవగాహన.

**COURSE OUTCOMES:** కోరుస్నిజయవంతంగాపూర్తిచేసినతరాత్ర,విదార్థులువీటినిచేయగలరు:

**CO1.** విద్యార్థులలో మానవీయ విలువలు పెరిగి నైతిక వలువలతో జీవించడం

**CO2.** సమాజంలో మనకు చేతనైన సాయం చెయ్యడం ప్రతి మనిషి బాధ్యత అనే సందేశం

**CO3.** త్రికరణ శుద్ధితో కృషి చేస్తే ఏదైనా సాధించ వచ్చు అనే సందేశం

**CO4.** వ్యవసాయ రంగం గూర్చి విద్యార్థులలో అవగాహన కలగడం

**CO5.** తెలుగు వ్యాకరణం

**CO-PO-PSO Mapping Table:**

| Course Outcomes | Program Outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 |
| CO1 | 3 | - | - | - | - | - | - | - | - |
| CO2 | 3 | - | - | - | - | - | - | - | - |
| CO3 | 3 | - | - | - | - | - | - | - | - |
| CO4 | 3 | - | - | - | - | - | - | - | - |
| CO5 | 3 | - | - | - | - | - | - | - | - |
| **Course Correlation Mapping** | **3** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |

*Correlation Levels: 3: High; 2: Medium; 1: Low*

## పాఠ్య ప్రణాళిక

**Module 1:** **ఎక్కట్లు** – తుమ్మల సీతారామమూర్తి ***(06 Periods)***

సత్ప్రవర్తన, సచ్ఛీలత, సన్మార్గం, సమసమానత్వం గూర్చి వివరించడం.

**Module 2:** **నాడీజంఘోపాఖ్యానం** – తిక్కన ***(06 Periods)***

సహాయం చేసినివారిని మరచి పోరాదు. చేసిన మేలు మరచిన వారి జీవితం ఎంత హీనంగా ఉంటుందో తెలియజేయడం.

**Module 3:** **ధ్రువోపాఖ్యానం** – పోతన ***(06 Periods)***

ఎటువంటి కష్టాలకు సమస్యలకు కుంగి పోకుండా దీక్షతో పట్టుదలతో కృషితో అనుకున్నది సాధించాలని తెలియజేయడం.

**Module 4:** **కృషీ వలుడు** – దువ్వూరి రామిరెడ్డి ***(06 Periods)***

సమాజానికి వెన్నెముక అయిన రైతు యొక్క కష్టాలను త్యాగాలను వివరించడం.

**Module 5:** **సంధులు, సమాసాలు, అలంకారాలు.** ***(06 Periods)***

తెలుగు భాష యొక్క మూలాలను తెలుసుకోవడం.

***Total Periods: 30***

## RESOURCES

**TEXT BOOKS:**

1. **ఎక్కట్లు – కవి తుమ్మల సీతారామమూర్తి చౌదరి.**
2. **నాడీజంఘోపాఖ్యానం – కవి తిక్కన. (మహాభారతం – శాంతి పర్వం – తృతీయా శ్వాసం – 472 నుండి 511 పద్యాల** వరకు).
3. **ధ్రువోపాఖ్యానం** – కవి పోతన (ఆంధ్ర మాహాభాగవతం – చతుర్థ స్కంధం – 216 నుండి 277 పద్యాల వరకు)
4. కృషీ వలుడు – కవి దువ్వూరి రామిరెడ్డి

**VIDEO LECTURES:**

1. https://www.youtube.com/watch?v=5jX20h6HWzg
2. https://www.youtube.com/watch?v=FFtPSPByBmk
3. https://www.youtube.com/watch?v=nQHF_pgTfL8
4. https://www.youtube.com/watch?v=IEERKL3Q2Cs

**Web Resources:**

1. http://teluguvignanamvinodam1.blogspot.com/2021/06/maha-bharatam-in-telugu-pdf-free-download_25.html
2. https://www.freegurukul.org/blog/ramayanam-pdf/

# SCHOOL CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22LG101404** | **SANSKRIT** | 2 | - | - | - | 2 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** अस्मिन् पाठ्यक्रमे संस्कृत गद्य, पद्य, व्याकरमेन सह महाभारतम् अपि च रामायणस्य कान्श्चन खण्डानां मेलनं भवति। अयं पाठ्यक्रमः छात्राणां कृते विभिन्न संस्कृत ग्रन्थानां अपि च साहित्यस्य समालोचनात्मक विश्लेषण करणमपि शिक्षयति। संपूर्ण पाठ्यक्रमे अस्मिन्, छात्राः देवनागरी लिपेः लिखनं अधिगच्छति, संस्कृतस्य शब्दानां उच्चारणं तथा हृदिस्थं करिष्यति, अपि च प्राथमिक व्याकरण पठिष्यति तेन ते संस्कृते सरल वाक्यानां निर्माणं कर्तुं प्रभवन्ति।

**COURSE OUTCOMES**: पाठ्यक्रमस्य सफलसमाप्तेः अनन्तरं छात्राः

**CO1** कर्तव्यपरक शैक्षणिक वृत्तिपरक तथा शोधकर्तृणां निर्माणार्थं छात्राणां संज्ञानात्मक, प्रभावशाली तथा व्यवहारिक क्षमतानां आकार प्रदानार्थं सहायतां करोति।

**CO2** सामाजिक परिवर्तने भागग्रहणार्थं सक्षमाः भवितुं छात्रेषु सेवायाः धारणा संचारः करोति।

**CO3** समकालीन समस्या-समाधान स्थितिषु प्राचीन भारतीय ज्ञानस्य अनुप्रयोगस्य ज्ञानप्राप्तिः। सामान्य रूपेण तथा विशेष रूपेण अभ्यसने तथा तस्य मूल्यांकनस्य संदर्भे च नैतिक उपयुक्ततायाः एकः दृढतर भावनायाः विकासनार्थम्।

**CO4** प्राचीन साहित्यतः प्राथमिक जीवनं तथा अवधारणानां ज्ञानप्रदानं यत् कालातीतः जातः तथापि इदानीमपि समाजाय अनुवर्तते।

आवेदनस्य प्रमुख क्षेत्रेषु प्राथमिक कौशलस्य अधिग्रहणे सुगमकरणम् उदा- नेतृत्वे, संचारे, अनुसंधान योग्यतायां, व्यवहार संशोधने इत्यादि।

**CO5** सामाजिक विविधतायाः कृते सम्मान-विकसितं करनं तथा सामाजिक अपि च सांस्कृतिक प्रासंगिकतायाः अध्ययने अभिवृद्धि करनम्।

**CO-PO Mapping Table:**

| Course Outcomes | Program Outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 |
| **CO1** | 3 | - | - | - | - | - | - | - | - |
| **CO2** | 3 | - | - | - | - | - | - | - | - |
| **CO3** | 3 | - | - | - | - | - | - | - | - |
| **CO4** | 3 | - | - | - | - | - | - | - | - |
| **CO5** | 3 | - | - | - | - | - | - | - | - |
| **Course Correlation Mapping** | **3** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |

*Correlation Levels: 3: High; 2: Medium; 1: Low*

**COURSE CONTENT**

**Module-1:** प्राचीन पद्यसाहित्यम् **(06 Periods)**

1.आर्य पादुका पट्टाभिषेकः - वल्मीकिः – श्रीमद्रामायणम्

2. यक्षप्रश्नाः - वेदव्यासः – महाभारतम्

**Module-2:** चम्पूकाव्यम् **&** आधुनिक पद्यकाव्यम् **(06 Periods)**

3.गङ्गावतरणम् - भोजराजः - चम्पूरामायणम्

4. मोहापनोदः - श्री पमिडिपाटि पट्टाभिरामारावः – मूलकथा-'धर्मसौहृदम्' इति संस्कृत पद्यकाव्यम्

**Module-3:** गद्यसाहित्यम् **(06 Periods)**

5. अत्युत्कटैः पापपुण्यैः इहैव फलमश्नुते - नारायणपण्डितः - हितोपदेशः

6. शूद्रकवीरवरकथा - हितोपदेशः

**Module-4:** शब्दाः **(6 Periods)**

देव, कवि, भानु, पितृ, धातृ, गो, रमा, मति

**Module 5:** महाकवि, शास्त्रकाराः **(6 Periods)**

1.पाणिनिः 2.कौटिल्यः 3.भरतमुनिः 4.भारविः 5.माघः 6.भवभूतिः 7.शङ्कराचार्यः 8.दण्डी

***Total Periods: 30***

**RESOURCES**

**TEXT BOOKS:**

1.विश्वभारती 2,संस्कृत भारती 3.अमृतवाणी

**REFERENCE BOOKS:**

1.रामायणम् 2.महाभारतम् 3.अष्टाध्यायी 4.अमरकोशः

**VIDEO LECTURES:**

1. https://www.youtube.com/watch?v=bh-14xfMeYk
2. https://www.youtube.com/watch?v=6xFkoOpzsvs

**Web Resources:**

1. https://www.forum.universityupdates.in/threads/ou-sanskrit-2nd-semester-study-material.33659/
2. https://cbpbu.ac.in/study_mat_sanskrit.php

# SCHOOL CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22LG105402** | **SOFT SKILLS** | - | - | 2 | - | 1 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co - Requisite** -

**COURSE DESCRIPTION:** This course deals with an understanding of the fundamental soft skills and their practical social and workplace usage. It helps participants to communicate effectively and to carry themselves confidently and in harmony with their surroundings. They also learn how to identify and overcome the barriers in interpersonal relationships, and to employ oral and written communication, teamwork, leadership, problem-solving, and decision-making skills, to gain the best results.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Demonstrate knowledge of career skills by analyzing the strategies of Goal Setting, Thinking Skills, interpersonal skills, and etiquette.

**CO2.** Analyzevarious situations by applying Assertive communication and Non-verbal forms in developing Interpersonal Skills.

**CO3.** Apply appropriate managerial strategies by analyzing the conflicts in various situations.

**CO4.** Demonstrate various communication styles by analyzing and applying Thinking Skills in diverse teams as an individual and a team member and during Interviews and Group Discussions.

**CO5.** Analyze and apply appropriate strategies of emotional intelligence and adaptability skills for personal and professional success.

## CO-PO Mapping Table:

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 2 | 2 | - | 2 | - | 2 | - | - | - | - | 2 |
| **CO2** | 3 | 3 | 2 | - | 2 | - | 2 | - | - | 2 | - | 2 |
| **CO3** | 2 | 2 | 2 | - | 3 | - | 2 | - | - | - | - | 2 |
| **CO4** | 3 | 2 | 2 | - | 2 | - | 2 | - | 3 | 2 | 3 | 2 |
| **CO5** | 2 | 2 | 2 | - | 3 | - | 3 | - | - | 2 | - | 3 |
| **Course Correlation Mapping** | **3** | **2** | **2** | **-** | **3** | **-** | **2** | **-** | **3** | **2** | **3** | **2** |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

## EXPERIENTIAL LEARNING

## COURSE CONTENT

**Module 1: BODY LANGUAGE**

Body language basics, Types of Body Language, Facial Expressions and their messages, Eye Contact Insights, Body Posture, Hand gestures, and finger movements

**Module 2: ASSERTIVENESS**

Communication Styles, Benefits, Asserting yourself, Tips, and Role Play

**Module 3: GOALSETTING**

Seven Steps of Goal Setting, Self-Motivation, Personal Goal Setting, and Setting Career Goals

**Module 4: THINKING SKILLS**

Positive Thinking, Creative Thinking, Lateral Thinking, Logical Thinking, and Intuitive Thinking

**Module 5: TEAM BUILDING**

Learning Activities, Management Essentials, and Team Building Scenarios

**Module 6: CONFLICT MANAGEMENT**

Ways of Resolving Conflict, Personality Types and Conflict, Conflict Resolution Process, and Team Conflict

**Module 7: EMOTIONAL INTELLIGENCE**

Definition, understanding emotions, Identifying emotional intelligence, and self-assessment

**Module 8: ADAPTABILITY SKILLS**

Understanding organizational communication, Identifying adaptability skills, and self-assessment.

**Module 9: GROUP DISCUSSIONS**

Types of GD, Dos, and Don'ts, Dynamics of GD, Intervention, and Summarization Techniques

**Module 10: INTERVIEW SKILLS**

Planning, Opening Strategies, Answering Strategies, Teleconferencing, Videoconferencing, Practice questions, and Dress code

**Module 11: INTERPERSONAL SKILLS**

Starting a Conversation, Responding to a Conversation, Conversation Examples, Body Language, and Role Play

**Module 12: ETIQUETTE**

Basic Social Etiquette, Telephone Etiquette, Dining Etiquette, Conference Etiquette, and Email Etiquette

***Any ten modules are mandatory**

## RESOURCES

**REFERENCES:**


1. Manual…
2. Dr. K. Alex, *Soft Skills*, S. Chand & Company LTD, Latest Edition, New Delhi, 2018.
3. R. C. Sharma & Krishna Mohan, *Business Correspondence and Report Writing*, Tata McGraw,Hill Publishing Company Limited, 3rd Edition, New Delhi, 2012.
4. S.P. Dhanavel, English and Soft Skills, Orient Black Swan Private Limited, 2010.


**SOFTWARE/TOOLS:**

1. K-VAN Solutions.
2. Learning to Speak English 8.1, The Learning Company, 4 CDs.
3. English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
4. Language in Use 1, 2 & 3.
5. Cambridge Advanced Learner's Dictionary, 3rd Edition.

6. Let's Talk English, Regional Institute of English South India

**VIDEO LECTURES:**

1. http://nptel.ac.in/courses/106102064
2. http://nptel.ac.in/courses/106106127/

**WEB RESOURCES:**

1. http://psydilab.univer.kharkov.ua/resources/ucheba/softskills/Chapter_1_Introduction.PDF
2. https://learning.tcsionhub.in/courses/tcs,ion/introduction,to,soft,skills/
3. https://goo.gl/laEHOY (dealing with complaints)
4. http://www.adm.uwaterloo.ca/infocecs/CRC/manual/resumes.html
5. https://goo.gl/FEMGXS
6. http://www.career.vt.edu/interviewing/TelephoneInterviews.html
7. http://job,search,search.com/interviewing/behavioral_interviews
8. https://www.thebalancecareers.com/what,are,soft,skills,2060852

# SCHOOL CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22LG107601** | **PROFESSIONAL ETHICS AND HUMAN VALUES** | 2 | - | - | - | 2 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** This course deals with personal conviction, and ethics and describes the accepted principles and standards of conduct regarding moral duties and virtues as applied to an organization. Codes of professional ethics guide the stakeholders of an organization about the desirable and undesirable acts related to the profession.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Demonstrate the principles of ethics, professional values, and social responsibility.

**CO2.** Analyze the problems in the implementation of moral autonomy and use ethical theories in resolving moral dilemmas.

**CO3.** Develop suitable strategies to resolve problems that arise in practicing professional ethics and Industrial standards.

**CO4.** Function as a member, consultant, manager, advisor and leader in multi-disciplinary teams.

**CO5.** Provide solutions to complex problems associated with professional ethics using analysis and interpretation.

**CO-PO Mapping Table:**

| Learning Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | | | |
| **CO1** | 3 | - | - | - | - | 2 | 2 | 2 | 2 | | | |
| **CO2** | 2 | 3 | 2 | - | 2 | 2 | 2 | 2 | 2 | | | |
| **CO3** | 2 | - | 3 | - | 2 | 2 | 2 | 2 | 2 | | | |
| **CO4** | 2 | - | - | - | - | 2 | 2 | 2 | 2 | | | |
| **CO5** | 2 | 2 | 3 | 2 | - | 3 | 2 | 2 | 2 | | | |
| **Course Correlation Mapping** | 2 | 3 | - | - | 2 | 2 | 2 | 2 | 2 | | | |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1: PROFESSIONAL ETHICS** ***(06 Periods)***

Scope and aim of ethics, Senses of ethics, Variety of moral issues, Types of inquiry, Moral dilemmas, Moral autonomy-Kohlberg's theory, Gilligan's theory, Consensus, and controversy.

**Module 2: PROFESSIONAL IDEALS AND VIRTUES** ***(06 Periods)***

Theories on virtues and ideals, Professions, Professionalism, Characteristics, Expectations, Professional responsibility, Integrity, Self-respect, Sense of responsibility, Self-interest, Customs and religion, Self-interest and ethical egoism, Customs and ethical relativism, Religion and divine command ethics, Use of ethical theories, Resolving moral dilemmas and moral leadership.

**Module 3: SOCIAL EXPERIMENTATION** ***(06 Periods)***

Experimentation, Similarities to standard experiments, Learning from the past and knowledge gained, responsible experimenters, Conscientiousness, Moral autonomy and accountability, The challenger case, Codes of ethics and limitations, Industrial standards and Problems with the law of engineering.

**Module 4: RESPONSIBILITIES AND RIGHTS** ***(06 Periods)***

Collegiality and loyalty, Respect for authority, Collective bargaining, Confidentiality, Conflict of interests, Occupational crime, Rights of engineers, Professional rights, Whistle-blowing, The BART case, Employee rights, and discrimination.

**Module 5: HARMONY WITH PROFESSIONAL ETHICS** ***(06 Periods)***

Acceptance of human values; Ethical Human Conduct; Basis for Humanistic Education, Constitution, and Universal Order; Competence in professional ethics; Case studies: Holistic technologies, Management Models and Production Systems; Transition from the present state to Universal Human Order: socially and ecologically responsible engineers, technologists and managers - enriching institutions and organizations.

***Total Periods: 30***

## EXPERIENTIAL LEARNING

1. Demonstrate orally using your experiences of what is naturally acceptable in a relationship – Feeling of respect or disrespect and what is naturally acceptable is to nurture or exploit others.
2. Identify community partners and discuss with a community partner or organization. Prepare a report by identifying and analysing the issues or opportunities.
3. Field experiences may be directed to include a range of time-intensive endeavours that require varying levels of student interaction. Prepare a report on visiting a Juvenile home.
4. Students read a speech in the classroom by former United Nations Secretary-General Kofi Annan on human values.
5. Students are encouraged to bring a daily newspaper to class or to access any news related to the need for human values and note down the points.
6. Bring out the relevance of engineering ethics theory and practice with relevance to current trends.
7. Professional ideals and virtues are important to everyone. Prepare a case study on the professional ideals and virtue of any one of the famous sports personalities from India.
8. Compare the present to the past in engineering experimentations concerning the change in professionalism.
9. Make a study on occupational crime and the role of modern technology in finding solutions.

10. Prepare a case study on how to maintain harmony with different cultural people using professional ethics.

**RESOURCES**

**TEXTBOOKS:**


1. Gaur R R, Sangal R & G P Bagaria, Human Values and Professional Ethics, Excel Books, New Delhi, 2010.
2. Govindarajan, M., Nata Govindarajan, M., Natarajan, S. and Senthilkumar, V. S., *Engineering Ethics*, Prentice Hall of India, 2004.
3. Mike W. Martin and Roland Schinzinger, *Ethics in Engineering*, Tata McGraw-Hill, 3rd Edition, 2007.


**REFERENCE BOOKS:**


1. S. Kannan and K. Srilakshmi, *Human Values and Professional Ethics*, Taxmann Allied Services Pvt Ltd., 2009.
2. Edmund G. Seebauer and Robert L. Barry, *Fundamental of Ethics for Scientists and Engineers*, Oxford University Press, 2001.
3. Charles F. Fledderman, *Engineering Ethics*, Pearson Education, 2nd Edition, 2004.
4. R. Subramanaian, *Professional Ethics*, Oxford Higher Education, 2013.


**VIDEO LECTURES:**

1. https://www.youtube.com/watch?v=jfGIq_EiXzI
2. https://www.youtube.com/watch?v=QFHOtH54oUc
3. https://www.youtube.com/watch?v=JJshY11nX14
4. https://www.youtube.com/watch?v=TyP09S0UEzA
5. https://www.youtube.com/watch?v=0QMwjV_ZVtc

**Web Resources:**

1. https://siiet.ac.in/wp-content/uploads/2020/09/7.1.10-professional-ethics-manual.pdf
2. https://soaneemrana.org/onewebmedia/Professional%20Ethics%20and%20Human%20Values%20by%20R.S%20NAAGARAZAN.pdf
3. https://india.oup.com/productPage/5591038/7421214/9780199475070

## School Core

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22SS101705 | **INDIAN TRADITION AND CULTURE** | 3 | - | - | - | 3 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Basic traits of Indian Culture; Humanistic Reforms under Jainism and Buddhism; Culture in the medieval period; Socio Religious reforms in Indian Culture; Reform movements for harmonious relations.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Demonstrate knowledge of Vedic and Upanishadic culture and society to consider human aspirations, values and theories.

**CO2** Understand the contributions of Buddhism and Jainism to Indian culture.

**CO3** Examine the cultural conditions and achievements of India under Mouryas and Guptas.

**CO4** Analyze social religious reforms and reform movements.

## CO-PO Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | | | |
| CO1 | 3 | - | - | - | - | 1 | - | - | - | | | |
| CO2 | 3 | - | - | - | - | 1 | - | - | - | | | |
| CO3 | 2 | - | - | - | - | 3 | - | - | - | | | |
| CO4 | 2 | - | - | - | - | 3 | - | - | - | | | |
| **Course Correlation Mapping** | **3** | **-** | **-** | **-** | **-** | **2** | **-** | **-** | **-** | | | |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1: BASIC TRAITS OF INDIAN CULTURE** ***(08 Periods)***

Meaning and definition and various interpretations of culture - Culture and its features - The Vedic and Upanishad culture and society - Human aspirations and values in these societies - Chaturvidha purushardhas, Chaturashrma and Chaturvarna theory.

**Module 2: HUMANISTIC REFORMS UNDER JAINISM AND BUDDHISM** ***(09 Periods)***

Salient features of Jainism - contributions of Jainism to Indian culture - Contributions of Aachaarya and Mahaapragya - Buddhism as a humanistic culture - The four noble truths of Buddhism - Contributions of Buddhism to Indian culture.

**Module 3: CULTURE IN THE MEDIEVAL PERIOD** ***(09 Periods)***

Unifications of India under Mouryas and Guptas and their cultural achievements - Cultural conditions under satavahanas - Contributions to Pallavas and cholas to art and cultural achievements of Vijayanagara rulers

**Module 4: SOCIO RELIGIOUS REFORMS IN INDIAN CULTURE** ***(09 Periods)***

Western impact on India - Introduction of Western education - social and cultural awakening and social reform movements of Rajaramohan Roy - Dayanandha Saraswathi - Anne Besant (theosophical society).

**Module 5: REFORM MOVEMENTS FOR HARMONIOUS RELATIONS** ***(09 Periods)***

Vivekananda, Eswarchandravidyasagar and Veeresalingam - emancipation of women and struggle against caste - Rise of Indian nationalism - Mahatma Gandhi – Non-violence and satyagraha and eradication of untouchability.

***Total Periods: 45***

## EXPERIENTIAL LEARNING

1. Identify different cultural festivals of Indian States and prepare a write-up on their uniqueness.
2. India has a rich history with numerous architectural wonders. Prepare a report on any three famous architectural wonders in India.
3. Explore the diverse flavors of Indian cuisine and prepare a poster on the different dishes and their distinctiveness.
4. India is a country of Unity in Diversity. Make a PowerPoint presentation on different traditional dresses of various cultural people.

*(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)*

## RESOURCES

**TEXT BOOKS:**

1. Valluru Prabhakaraiah, *Indian Heritage and Culture*, Neelkamal Publications Pvt. Ltd. Delhi, 1/e, reprint 2015.

**REFERENCE BOOKS:**

1. L. P. Sharma, *History of Ancient India*, Konark Publishers, Pvt. Ltd. New Delhi, 2010.
2. L. P. Sharma, *History of Medieval India*, Konark Publishers, Pvt. Ltd. New Delhi, 2010.
3. The Cultural Heritage of India Vol-I, II, III, IV, V, The Ramakrishna Mission Institute of Culture, Calcutta

# SCHOOL CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22CE107602** | **DISASTER MITIGATION AND MANAGEMENT** | 2 | - | - | - | 2 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** This course provides a detailed discussion on disasters, earthquakes, floods, cyclones, droughts, landslides and disaster management.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO9.** Analyze the vulnerability of an area to natural and man-made disasters/hazards as per the guidelines to solve complex problems using appropriate techniques ensuring safety, environment and sustainability.

**CO10.** Propose appropriate mitigation strategies for earthquake and tsunami impacts as per code of practice using suitable techniques ensuring safety, environment and sustainability besides communicating effectively in graphical form.

**CO11.** Analyze the causes and impacts of floods, cyclones and droughts using appropriate tools and techniques and suggest mitigation measures ensuring safety, environment and sustainability besides communicating effectively in graphical form.

**CO12.** Analyze the causes and impacts of landslides using appropriate tools and techniques and suggest mitigation measures ensuring safety, environment and sustainability.

**CO13.** Design disaster management strategies to solve pre, during and post disaster problems using appropriate tools and techniques following the relevant guidelines and latest developments ensuring safety, environment and sustainability besides communicating effectively in graphical form.

**CO-PO Mapping Table:**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | | | |
| **CO1** | 3 | 3 | - | 2 | 2 | 2 | 2 | 2 | - | - | - | - |
| **CO2** | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | - | | | |
| **CO3** | 3 | 3 | - | 2 | 2 | 2 | 2 | - | - | | | |
| **CO4** | 3 | 3 | - | 3 | 2 | 2 | 2 | - | - | | | |
| **CO5** | 3 | 2 | 3 | 2 | 2 | 2 | 1 | 2 | 2 | | | |
| **Course Correlation Mapping** | **3** | **3** | **3** | **3** | **2** | **2** | **2** | **2** | **2** | | | |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

## COURSE CONTENT

**Module 1: DISASTERS** ***(06 Periods)***

Types of disasters - Natural disasters; Impact of disasters on environment, infrastructure and development; Concepts of hazards and vulnerability analysis, Hazard Assessment, Guidelines for hazard assessment and vulnerability analysis, Basic principles and elements of disaster mitigation.

**Module 2: EARTHQUAKES** ***(06 Periods)***

Introduction to earthquake, Intensity scale (MSK–64), Seismic zones and activity in India, Action plan for earthquake disaster preparedness, Elements at risk, Recovery and rehabilitation after earthquake, Concepts of Earthquake resistant design and construction of buildings; Tsunami – Onset, Types and causes, Warning, Elements at risk, Typical effects, Specific preparedness and mitigation strategies, Case studies.

**Module 3: FLOODS, CYCLONES AND DROUGHTS** ***(07 Periods)***

**Floods and Cyclones:** Onset, Types, Causes, Warnings, Elements at risk, Typical effects, Indian floods and cyclones, Hazard zones, Potential for reducing hazards, Mitigation strategies and community based mitigation, Case studies.

**Droughts:** Onset, Types and warning; Causes, Impact, Early warning and response mechanisms, Mitigation strategies, Droughts in India, Case studies.

**Module 4: LANDSLIDES** ***(06 Periods)***

Onset, Types and warning; Causes, Elements at risk, Indian landslides, Hazards zones, Typical effects, Mitigation strategies and community based mitigation, Case studies.

**Module 5: DISASTER MANAGEMENT** ***(05 Periods)***

Disaster management organization and methodology, Disaster management cycle, Disaster management in India – Typical cases and Cost–benefit analysis, Disaster management programs implemented by NGOs and Government of India, Usage of GIS and Remote sensing techniques in disaster management, Leadership and Coordination in Disaster management, Emerging trends in disaster management.

***Total Periods: 30***

## EXPERIENTIAL LEARNING

1. Perform hazard assessment and vulnerability analysis for any nearby town/city and prepare a detailed report of possible impacts of various disasters on environment, infrastructure and development.
2. Prepare a detailed report on the causes and effects of Tsunami that was occurred in the year 2004. Also discuss various advancements in Tsunami warning systems.
3. Identify the major causes of urban floods in cities like Chennai, Hyderabad & Mumbai and submit a report along with various mitigation strategies to reduce the impact of floods.
4. Prepare a detailed report on how various man-made activities are directly/indirectly related to the occurrence of landslides that occurred in recent days in India.
5. Visit AP State Disaster Response and Fire Services Department and record about various methods used by them in mitigating disasters and their management.

## RESOURCES

**TEXT BOOKS:**

1. Sharma V. K., *Disaster Management, Medtech Publishing*, 2nd Edition, 2013.
2. Anand S. Arya, Anup Karanth, and Ankush Agarwal, *Hazards, Disasters and Your Community: A Primer for Parliamentarians*, GOI–UNDP Disaster Risk Management Programme, Government of

India, National Disaster Management Division, Ministry of Home Affairs, New Delhi, Version 1.0, 2005

**REFERENCE BOOKS:**


1. Donald Hyndman and David Hyndman, *Natural Hazards and Disasters*, Cengage Learning, USA, 5th Edition, 2015.
2. *Disaster Management in India,* A Status Report, Ministry of Home Affairs, Govt. of India, May 2011.
3. Rajendra Kumar Bhandari, *Disaster Education and Management: A Joyride for Students, Teachers, and Disaster Managers*, Springer India, 2014.
4. Singh R. B., *Natural Hazards and Disaster Management*, Rawat Publications, 2009.


**VIDEO LECTURES:**

1. https://nptel.ac.in/courses/105104183
2. https://www.digimat.in/nptel/courses/video/124107010/L01.html

**WEB RESOURCES:**

1. https://egyankosh.ac.in/handle/123456789/25093
2. https://www.egyankosh.ac.in/handle/123456789/25912
3. https://www.nios.ac.in/media/documents/333courseE/12.pdf
4. https://ndmindia.mha.gov.in/images/public-awareness/Primer%20for%20Parliamentarians.pdf

# SCHOOL CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22LG107602 | ESSENTIAL LIFE SKILLS FOR HOLISTIC DEVELOPMENT | 2 | - | - | - | 2 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION**: This course deals with different types of thinking skills, self-awareness, coping with stress and emotion, transformational skills, group and team dynamics, and leadership.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Understand different life skills required in personal and professional life.

**CO2** Analyze well-defined techniques to cope with emotions and stress.

**CO3** Apply appropriate thinking and problem-solving methods to solve problems.

**CO4** Function effectively in a team and as an individual.

**CO5** Demonstrate the qualities of an effective leader.

**CO-PO Mapping Table:**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | | | |
| CO1 | 3 | - | - | - | - | - | - | - | - | | | |
| CO2 | 2 | 3 | - | - | 2 | - | - | - | - | | | |
| CO3 | 2 | 3 | - | - | 2 | - | - | - | - | | | |
| CO4 | 2 | 2 | - | - | 2 | - | - | - | 3 | | | |
| CO5 | 2 | 2 | - | - | - | - | - | - | - | | | |
| Course Correlation Mapping | 2 | 3 | 2 | - | 2 | - | - | - | 3 | | | |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

## COURSE CONTENT

**Module 1: OVERVIEW OF LIFE SKILLS** ***(06 Periods)***

Meaning and significance of life skills, Life skills identified by WHO: Self-awareness, Empathy, Critical thinking, Creative thinking, Decision making, problem-solving, Effective Communication, interpersonal relationships, coping with stress, coping with emotion.
Ethics, Moral & Professional Values: Human Values, Civic Rights, Engineering Ethics, Engineering as Social Experimentation, Environmental Ethics, Global Issues, Code of Ethics like ASME, ASCE, IEEE.

**Module 2: STRESS MANAGEMENT** ***(06 Periods)***

**Stress Management**: Stress, reasons, and effects, identifying stress, stress diaries, the four A's of stress management, techniques, **Approaches**: action-oriented, emotion-oriented, acceptance oriented, resilience, Gratitude Training, **Coping with emotions**: Identifying and managing emotions, harmful ways of dealing with emotions, PATH method, and relaxation techniques.

**Module 3 TRANSFORMATIONAL SKILLS** ***(06 Periods)***

Creativity, Critical Thinking, Collaboration, Problem Solving, Decision Making, Need for Creativity in the 21st century, Imagination, Intuition, Experience, Sources of Creativity, Lateral Thinking, Myths of creativity, Critical thinking Vs Creative thinking, Functions of Left Brain & Right brain, Convergent & Divergent Thinking, Critical reading & Multiple Intelligence.

**Module 4 GROUP AND TEAM DYNAMICS** ***(06 Periods)***

Introduction to Groups: Composition, formation, Cycle, thinking, Clarifying expectations, Problem Solving, Consensus, Dynamics techniques, Group vs Team, Team Dynamics, and Virtual Teams. Managing team performance and managing conflicts, Intrapreneurship.

**Module 5 LEADERSHIP** ***(06 Periods)***

Leadership framework, entrepreneurial and moral leadership, vision, cultural dimensions. Growing as a leader, managing diverse stakeholders, crisis management. Types of Leadership, Traits, Styles, VUCA Leadership, Levels of Leadership,Transactional vs Transformational Leaders, Leadership Grid, Effective Leaders.

***Total Periods: 30***

## EXPERIENTIAL LEARNING

1. Prepare an attitude test and measure the attitudes of your class.
2. Prepare a Case study on the Campus Interview pressure and stress of students using SWOT analysis.
3. Record and prepare videos of various cultural people and make a comment on their accents.
4. Prepare a short film of a leader of your choice and list out the best qualities.
5. Prepare a presentation on the impact of social media on leadership management.

6. 'Knowledge of present technologies helps us to live a harmonious life.'
   Make a video to justify the statement.
7. Identify life skills needed in our day-to-day life and explain their importance.
8. Come up with strategies to become successful in professional life.
9. Find methods and solutions to overcome the self-pity of a person.
10. Identify the persons who are irregular to class. Find out their problems and come up with solutions.

*(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)*

## RESOURCES

**TEXTBOOK:**


1. Dr. K Alex, "*Soft Skills"*. S Chand & Company Pvt.Ltd.2013.
2. Monmohan Joshi, "*Soft Skills*". Boolkboon.com, First Edition, 2017.


**REFERENCE BOOKS:**


1. Barun K. Mitra. "Personality Development & Soft Skills", First Edition; Oxford Publishers. 2011.
2. Kalyana. "Soft Skill for Managers"; First Edition; Wiley Publishing Ltd. 2015.
3. Shalini Verma. "Development of Life Skills and Professional Practice"; First Edition; Sultan Chand (G/L) & Company, 2014.
4. John C. Maxwell. "The 5 Levels of Leadership", Centre Street, A division of Hachette Book Group Inc. 2014.
5. Daniel Goleman, "Emotional Intelligence"; Bantam, 2006.
6. Remesh S., Vishnu R.G. "Life Skills for Engineers", Ridhima Publications, First Edition, 2016.
7. Butterfield Jeff. "Soft Skills for Everyone", Cengage Learning India Pvt Ltd; 1 edition, 2011.
8. Training in Interpersonal Skills: Tips for Managing People at Work, Pearson Education, India; 6 edition, 2015.
9. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success, Pearson Education; 1 edition, 2013.


**VIDEO LECTURES:**

1. https://www.youtube.com/watch?v=xM0fajUl7Bg
2. https://www.youtube.com/watch?v=HwLK9dBQn0g
3. https://www.youtube.com/watch?v=sxX5LoojdJw
4. https://www.youtube.com/watch?v=xJBgqW9-lzc
5. https://www.youtube.com/watch?v=QVwTVM1Iv1c

**Web Resources:**

1. https://www.clarke.edu/campus-life/health-wellness/counseling/articles-advice/developing-a-positive-attitude/
2. https://www.skillsyouneed.com/ps/personal-swot-analysis.html
3. https://ecampusontario.pressbooks.pub/profcommsontario/chapter/cross-cultural-

communication/

4. https://thepeakperformancecenter.com/educational-learning/thinking/#:~:text=There%20are%20several%20core%20thinking,storing%20and%20then%20retrieving%20information.
5. https://www.webmd.com/anxiety-panic/guide/stage-fright-performance-anxiety
6. https://www.ktunotes.in/ktu-syllabus-life-skills/

# SCHOOL CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22MG107601 | INNOVATION, INCUBATION, AND ENTREPRENEURSHIP | 2 | - | - | - | 2 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** To sensitize students on the prospects, opportunities, and challenges in entrepreneurship and the potential for value creation from prospective idea

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Understand the basics of generating new business ideas
**CO2** Explain the concept of design thinking and product innovation.
**CO3** Illustrate the roles of digital technology in entrepreneurship.
**CO4** Understand the need for startup economics and market conditions
**CO5** Evaluate the reasons for successful entrepreneurship.

## CO-PO Mapping Table:

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | | | |
| CO1 | 2 | 1 | 2 | 1 | - | - | - | - | - | | | |
| CO2 | 1 | 1 | 1 | - | - | - | - | | 1 | | | |
| CO3 | 2 | 2 | 1 | - | - | - | - | 1 | - | | | |
| CO4 | 3 | 1 | 1 | - | - | - | - | - | - | | | |
| CO5 | 2 | 2 | - | - | - | 1 | - | - | - | | | |
| **Course Correlation Mapping** | **2** | **2** | **1** | **1** | **-** | **1** | **-** | **1** | 1 | | | |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

## COURSE CONTENT

**Module 1: Introduction** ***(06 Periods)***

Concept & Definition, Taking product or service ideas to creating value: Why should one choose
to become an entrepreneur, Entrepreneurial mind-set, Intrapreneurship

**Module 2: Product Innovation** ***(06 Periods)***

Product innovation process, engineering design process and the concept of frugal engineering for developing innovative affordable products, effective user-interface.

**Module 3: Digital Technology Entrepreneurship** ***(06 Periods)***

Industry 4.0 landscape and innovations using digital technologies like AI, IOT, AR/VR, Cloud, SAAS, User Applications.

**Module 4: Startup Economics & Market considerations** ***(06 Periods)***

Economic consideration for starting a venture, Understanding Feasibility analysis, Understanding market, targeting customer and positioning product

**Module 5: Successful Business Incubation** ***(06 Periods)***

Business model innovation, Business process management , competitive advantages, Business model canvas, Bootstrapping.

***Total Periods: 30***

## EXPERIENTIAL LEARNING

1. Create and present a prototype of a new product of your choice.
2. Present at least three cases of successful business Ideas in recent times
3. Discuss in the group Entrepreneurship opportunities in terms of Orientation and Develop mentation.

*(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)*

**RESOURCES**
**TEXT BOOKS:**

1. Robert D. Hisrich, *Entrepreneurship*,
2. Kuratko & Hodgetts, *Entrepreneurship- Theory, Process & Practice*, Thompson South-Western Publication

**REFERENCE BOOKS:**

1. Peter Drucker, *Innovation and Entrepreneurship*, Harper Collins
2. Thomas N. Duening, Robert D. Hisrich and Michael A. Lechter, *Technology Entrepreneurship Taking Innovation to the Marketplace*, Elsevier
3. Prof. Nigel Cross, *Bloomsbury Design Thinking Understanding How Designers Think and Work*, 2019 Edition

**VIDEO LECTURES:**

1. https://onlinecourses.nptel.ac.in/noc21_mg63/preview
2. https://onlinecourses.nptel.ac.in/noc22_de08/preview

**Web Resources:**

1. nhttps://ciie.iitism.ac.in/files/CIIE-POLICY.pdf
2. https://www.nios.ac.in/media/documents/249_Enterpreneurship/English_pdf/249_Enterpreneurship_Lesson_16.pdf

# SCHOOL CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22EE107602 | FUNDAMENTALS OF RESEARCH METHODOLOGY | 2 | - | - | - | 2 |

**Pre-Requisite** --
**Anti-Requisite** --
**Co-Requisite** --

**COURSE DESCRIPTION:** The course is developed for the students to understand the underlying concepts of research methodology and a systematic approach for carrying out research in the domain of interest. The course is emphasized on developing skills to recognize and reflect on the strength and limitations of different types of research; data collection methods, and methods of Processing and analyzing data. The course also emphasizes interpreting the findings and research articulating skills.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Understands the underlying concepts of research methodology, types of research and the systematic research process.

**CO2** Understand the philosophy of research design, types of research design and develop skills for a good research design.

**CO3** Understand the philosophy of formulation of a research problem, methods of data collection, review of literature and formulation of working hypothesis.

**CO4** Understand various data processing and analyzing techniques and their significance in the research.

**CO5** Develop skills to interpret the findings and research articulating skills along with the ethics of research.

## CO-PO Mapping Table:

| Course Outcome | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | | | |
| CO1 | 3 | -- | -- | -- | -- | - | -- | -- | -- | | | |
| CO2 | 3 | -- | 1 | -- | -- | - | -- | -- | -- | | | |
| CO3 | 3 | -- | -- | -- | 2 | 1 | - | -- | -- | | | |
| CO4 | 3 | 2 | -- | -- | 3 | 1 | -- | -- | -- | | | |
| CO5 | 3 | -- | -- | -- | -- | -- | -- | -- | 3 | | | |
| Course Correlation Level | 3 | 2 | 1 | -- | 3 | 1 | -- | -- | 3 | | | |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1: INTRODUCTION TO RESEARCH METHODOLOGY (06 Periods)**

Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research and Scientific Method, Research Process, Criteria of Good Research.

**Module 2: RESEARCH DESIGN (06 Periods)**

Research design—Basic Principles, Need of research design, Features of good design, Important concepts relating to research design, Different research designs, Basic principles of experimental designs, Developing a research plan.

**Module 3: RESEARCH FORMULATION (06 Periods)**

Defining and formulating the research problem - Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem – Data

collection – Primary and secondary sources; Critical literature review – Identifying gap areas from literature review, Development of working hypothesis.

**Module 4: PROCESSING AND ANALYSIS OF DATA (06 Periods)**

Processing Operations, Elements/Types of Analysis, Statistics in Research, Measures of Central Tendency, Measures of Dispersion, Measures of Relationship, Simple Regression Analysis.

**Module 5: INTERPRETATION AND REPORT WRITING (06 Periods)**

**Interpretation**: Meaning of interpretation; Techniques of interpretation; Precautions in Interpretation.
**Report Writing**: Significance, Different Steps, Layout, Types of reports, Mechanics of Writing a Research Report, Precautions in Writing Reports.

**Total Periods: *30***

## EXPERIENTIAL LEARNING:

1. Should conduct a survey based on a hypothesis, analyze the data collected and draw inferences from the data.
2. Should review the literature on the given topic and should identify the scope/gaps in the literature and develop a research hypothesis.
3. Should study a case, formulate the hypothesis and identify an appropriate testing technique for the hypothesis.
4. Study an article and submit a report on the inferences and should interpret the findings of the article.

*(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)*

## RESOURCE

**TEXT BOOKS:**


1. C.R. Kothari, *Research Methodology: Methods and Techniques, New Age International Publishers*, 2nd revised edition, New Delhi, 2004.
2. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. *An introduction to Research Methodology*, RBSA Publishers.


**REFERENCE BOOKS:**


1. R. Panneerselvam, *Research Methodology*, PHI learning Pvt. Ltd., 2009.
2. Singh, Yogesh Kumar. *Fundamental of research methodology and statistics*. New Age International, 2006.


**VIDEO LECTURES:**

1. https://nptel.ac.in/courses/121106007
2. https://onlinecourses.nptel.ac.in/noc22_ge08/preview
3. https://www.youtube.com/watch?v=VK-rnA3-41c

**Web Resources:**

1. https://www.scribbr.com/category/methodology/
2. https://leverageedu.com/blog/research-design/
3. https://prothesiswriter.com/blog/how-to-formulate-research-problem
4. https://www.formpl.us/blog/hypothesis-testing
5. https://www.datapine.com/blog/data-interpretation-methods-benefits-problems/
6. https://leverageedu.com/blog/report-writing/

# SCHOOL CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22EE107001** | **INTELLECTUAL PROPERTY RIGHTS** | 2 | - | - | - | 2 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** The course is designed to provide comprehensive knowledge to the students regarding the general principles of intellectual property rights, Concept and Theories, Criticisms of Intellectual Property Rights, International Regime Relating to IPR. The course provides an awareness on how to protect ones unique creation, claim ownership, knowledge of what falls under the purview of someone's rights and what doesn't, and safeguard their creations and gain a competitive edge over the peers.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Understand the need and the concepts of intellectual property right and avenues for filling intellectual property rights.
**CO2.** Understand the legislative practices and protocols for acquisition of trademark and the judicial consequences for violating laws of trademark protection.
**CO3.** Understand the legislative practices and protocols for acquisition of copyrights and the judicial consequences for violating laws of copyrights protection.
**CO4.** Understand the fundamentals of patent laws, legislative practices and protocols for acquisition of trade secrets and the judicial consequences for violating laws of trade secrets protection.
**CO5.** Understand the importance of geographical indications and various laws and protocols for protecting geographical indications.

## CO-PO Mapping Table:

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | | | |
| **CO1** | 3 | - | - | - | - | - | - | - | 2 | | | |
| **CO2** | 3 | - | - | - | 1 | - | - | 3 | 2 | | | |
| **CO3** | 3 | - | - | - | 1 | - | - | 3 | 2 | | | |
| **CO4** | 3 | - | - | - | 1 | - | - | 3 | 2 | | | |
| **CO5** | 3 | - | - | - | 1 | - | - | 3 | 2 | | | |
| **Course Correlation Level** | **3** | **-** | **-** | **-** | **1** | **-** | **-** | **3** | **2** | | | |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

## COURSE CONTENT

**Module 1: INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS** ***(06 Periods)***

Introduction and the need for intellectual property rights (IPR); types of intellectual property- Design; International organizations, agencies and treaties.

**Module 2: TRADEMARKS** ***(06 Periods)***

Introduction to trademark, Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

**Module 3: LAW OF COPYRIGHTS** ***(06 Periods)***

Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

**Law of patents:** Foundation of patent law, patent searching process, ownership rights and transfer.

**Module 4: TRADE SECRETS** ***(06 Periods)***

Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

**Unfair competition:** Misappropriation right of publicity, false advertising.

**Module 5: GEOGRAPHICAL INDICATIONS** ***(06 Periods)***

The Geographical indications law in India, The objectives and features, the registry of geographical indications powers and functions. Types of goods offered. Protection: Agriculture goods, manufactured goods and natural goods. Registration of indications and the requirements. Prohibition of misleading use of indications of geographical origins, prohibition of dilution of geographical origins.

***Total Periods: 30***

## EXPERIENTIAL LEARNING

1. Should conduct a survey based on the real scenario, where IPR is misused or unethically used and present an article.
2. Prepare an article on the registration processes of IPR practically (copy right/trade mark/ patents).
3. Should study a case of conflict on trademarks/patents and should produce an article mentioning the circumstances and remedial measures.
4. Prepare an article on the latest development in the international intellectual property rights.

*(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)*

## RESOURCES

**TEXT BOOKS:**


1. Deborah, E. Bouchoux, *Intellectual property: The law of Trademarks, Copyright, Patents, and Trade Secrets,* Cengage learning, 4th Edition, 2013.
2. Prabuddha Ganguli, *Intellectual property right - Unleashing the knowledge economy*, Tata McGraw Hill Publishing Company Ltd.
3. Marsha AEchols, *Geographical Indications for Food Products*, Wolters, 2008

**REFERENCE BOOKS:**


1. Neeraj P., & Khusdeep D, *Intellectual Property Rights*, PHI learning Private Limited. 1st Edition 2019.
2. Nithyananda, K V. *Intellectual Property Rights: Protection and Management*, Cengage Learning India Private Limited, 2019


**VIDEO LECTURES:**

1. https://nptel.ac.in/courses/110105139

**Web Resources:**


1. Subramanian, N., & Sundararaman, M. (2018). *Intellectual Property Rights – An Overview*. Retrieved from http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf
2. World Intellectual Property Organisation. (2004). *WIPO Intellectual property Handbook*. Retrieved from https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf
3. Cell for IPR Promotion and Management (http://cipam.gov.in/)
4. World Intellectual Property Organisation (https://www.wipo.int/about-ip/en/)
5. Office of the Controller General of Patents, Designs & Trademarks (http://www.ipindia.nic.in/)

## PROGRAM CORE

| Course Code | | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22MM102002 | PROGRAMMING WITH C | 3 | - | 2 | - | 4 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION**: Introduction to algorithms, programming languages and overview of C Programming; Operators and Expressions; Input and Out put Functions; Control Structures; Problem Solving Aspects; Arrays and Strings; Functions; Pointers; Structures and Unions; File Handling.

**COURSEOUTCOMES:** After successful completion of the course ,students will be able to:

**CO1.** Demonstrate knowledge on algorithm and C programming constructs to develop Programs.

**CO2.** Design algorithms using problem-solving techniques for given problems.

**CO3.** Apply functions and Arrays to enhance reusability and data manipulation.

**CO4.** Use pointers to manage the memory effectively.

**CO5.** Apply Structures, Unions and File handling concepts to develop societal applications.

**CO6.** Work independently and communicate effectively oral and written forms.

**CO-PO-PSO Mapping Table:**

| Course Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 3 | 3 | - | 2 | 3 | - | 3 | - | 3 | - | - |
| CO2 | 3 | 3 | 3 | - | 1 | 3 | - | 3 | - | 3 | - | - |
| CO3 | 2 | 3 | 3 | - | 2 | 3 | - | 3 | - | 3 | - | - |
| CO4 | 3 | 3 | 3 | - | 3 | 3 | - | 3 | - | - | - | - |
| CO5 | 3 | 3 | 3 | - | 2 | 3 | - | 3 | - | - | - | - |
| CO6 | - | - | - | | - | 3 | - | 3 | - | - | - | |
| **Course correlation Mapping** | **3** | **2** | **2** | | **2** | **3** | **-** | **3** | - | **3** | **-** | **-** |

*Correlation Levels: 3: High; 2: Medium; 1: Low*

**COURSECONTENT**

**Module1: INTRODUCTION TO ALGORITHMS AND PROGRAMMING LANGUAGE AND INTRODUCTION TO C** ***(10 Periods)***

**Introduction to Algorithms and Programming Languages:** Algorithm, Key features of Algorithms, Some more Algorithms, Flow Charts, Pseudocode Generations of Programming Languages, Structured Programming Language.

**Introduction to C:** History of C, Importance of C, Basic Structure of C Programs ,Programming Style,Character Set,C Tokens,Keywords and Identifiers,Symbolic Constants,Declaring a variable as a constant, overflow and underflow of data.

**Operators and Expressions:** Arithmetic, relational, logical, assignment operators, increment and decrement operators, conditional operators, bitwise operators, special operators, Arithmetic Expressions, Evaluation of Expressions, Precedence of Arithmetic Operators, Type Conversions in Expressions, Operator Precedence and Associativity, Mathematical functions.

**Module2: MANAGING I/O OPERATIONS AND CONTROL STRUCTURES** ***(07 Periods)***

**Managing I/O Operations*:*** Reading and Writing a Character, Formatted Input, Output

**CONTROL STRUCTURES:** if statement, if else statement, Nesting of if else statements, else if ladder, switch statement, the ?: operator ,goto statement ,the while statement, do statement, the for statement ,jumps in loops.

**Module 3 ARRAYS AND STRINGS** ***(10 Periods)***

**Arrays:** Introduction, Declaration of Arrays, Accessing elements of the Array, Storing Values in Array, Calculating the length of the Array , Operations on Array, one dimensional array for inter function communication, Two dimensional Arrays, Operations on Two Dimensional Arrays, Dynamic Arrays, Initialization

**Strings:** Declarations, Initialization of string variables, reading and writing strings, string handling functions.

**Module 4 FUNCTIONS,STRUCTURES AND UNIONS** ***(10 Periods)***

**Functions:** Concept of Function, Using Functions, elements of user defined functions, definition, return values and their types, function calls, declaration, category, all types of arguments and return values, nesting of functions, Call-by-Value Vs Call-by-reference, passing arrays, strings to functions ,Scope of Variables ,Storage Classes, and Recursion.

**Structures and Unions:** Defining a structure , declaring a structure variable , accessing structure members, initialization, copying and comparing, operation on individual members , array of structures , arrays within structures , structures within structures ,structures and functions, unions, sizeof structures, Structures verses Unions, Enumeration Types.

**Module 5 POINTERS AND FILES** ***(08 Periods)***

**Pointers:** Introduction , Advantages and Disadvantages of Pointers ,Address of Operator(&), declaring and initialization of pointer variables ,Accessing a variable through its pointer , chain of pointers , pointer increments and scale factors ,Pointers and character Strings ,Pointers to Pointers, Array of Pointers ,pointers as function arguments –pointers and structures, Dynamic Memory Allocation.

**File**s: Introduction, Defining, opening, closing a file , I/O Operations on files , Error handling during I/O operations , command line arguments , Working with Text Files –Working with Binary Files, Random Access to Files of Records.

***Total Periods: 45***

## EXPERIENTIALLEARNING

**LIST OF EXERCISES:**

1. Write a program to check whether the given number is Armstrong or not.
2. Write a program to find the sum of individual digits of a positive integer.
3. Write a program to generate the first n terms of the Fibonacci sequence.
4. Write a program to find both the largest and smallest number in a list of integer values.
5. Write a program to demonstrate refection of parameters in swapping of two integer values using Call by Value and Call by Address.
6. Write a program that uses functions to add two matrices.
7. Write a program to calculate factorial of given integer value using recursive functions.
8. Write a program for multiplication of two NXN matrices.
9. Write a program to perform various string operations
10. Write a program to search an element in a given list of values.
11. Write a program to sort a given list of integers in ascending order.
12. Write a program to calculate the salaries of all employees using Employee (ID, Name, Designation, Basic Pay, DA, HRA, Gross Salary, Deduction, Net Salary) structure.
    a. DA is30 % of Basic Pay
    b. HRA is 15% of Basic Pay
    c. Deduction is 10% of (Basic Pay + DA)
    d. Gross Salary= Basic Pay+DA+HRA. Net Salary=Gross Salary–Deduction.
13. Write a program to illustrate pointer arithmetic.
14. Write a program to read the data character by character from a file.
15. Write a program to create Book (ISBN, Title, Author, Price, Pages, Publisher) structure and store book details in a file and perform the following operations.
    a. Add book details
    b. Search a book details for a given ISBN and display book details ,if available.
    c. Update a book details using ISBN
    d. Delete book details for a given ISBN and display list of remaining Books.

## RESOURCES

**TEXTBOOKS:**

1. E Balaguruswamy, - Programming in ANSIC, 7th Edition ,Tata McGraw Hill Publishing Company,2017.

**REFERENCEBOOKS:**

1. Yashavant Kanetkar–LetUs‘C’ –BPB Publications.
2. Byron S Gottfried and Jitender Kumar Chhabra, Programming with C, Fourth Edition, McGraw Hill Education,2019.

**SOFTWARE/TOOLS:**

1. Turbo C compiler, Notepad plus, Editplus.

**VIDEO LECTURES:**

1. https://nptel.ac.in/courses/106104128
2. https://onlinecourses.nptel.ac.in/noc19_cs42/preview
3. https://onlinecourses.nptel.ac.in/noc22_cs40/preview

**WEB RESOURCES:**

1. Learn C Programming –https://www.programiz.com/c-programming
2. Learn C Programming–https://www.tutorialspoint.com/cprogramming/index.htm
3. C Programming Exercises, Practice, Solution – https://www.w3resource.com/cprogramming-exercises/
4. BasicprogrammingexercisesandsolutionsinC-https://codeforwin.org/2015/05/basic-programming-practice-problems.html

## PROGRAM CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM101010** | **THEORY OF COMPUTATION** | 3 | - | - | - | 3 |

**Pre-Requisite**

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Finite automata; Nondeterministic Finite automata; Regular expressions; Applications of the pumping lemma; Context-Free Grammars; Normal forms for context-free grammars; pushdown automata; Chomsky hierarchy of languages; Turing machines.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Design finite state machines to recognize formal languages.

**CO2** Analyze formal languages using automata.

**CO3** Identify different types of grammars in formal languages.

**CO4** Construct context free grammars for context free languages

**CO5** Develop Turing machine for different computational problems.

**CO-PO-PSO Mapping Table:**

| Course Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 |
| **CO1** | 3 | 3 | - | 3 | - | - | - | 3 | - | - | - | 3 |
| **CO2** | 3 | 3 | - | 3 | - | - | - | - | - | - | - | 3 |
| **CO3** | 3 | 3 | - | - | - | - | - | - | - | - | - | 3 |
| **CO4** | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 |
| **Course Correlation Mapping** | **3** | **2** | **-** | **3** | **-** | **-** | **-** | **3** | - | **-** | - | **3** |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

**COURSE CONTENT**

**Module 1:** **FINITE AUTOMATA** ***(09 Periods)***

Introduction to Finite automata, the central concepts of automata theory, Deterministic finite automata, Nondeterministic Finite automata, the equivalence of DFA and NDFA, Finite automata with epsilon-transitions, Conversion of epsilon-NFA to NFA and DFA, Mealy and Moore models.

**Module 2:** **REGULAR EXPRESSIONS AND LANGUAGES** ***(07 Periods)***

Regular expressions, Identity rules, Finite automata and Regular expressions, Applications of regular expressions, Pumping lemma for regular languages, Applications of the pumping lemma, Closure properties of regular languages, Equivalence of two regular expressions, Equivalence of two finite automata and minimization of automata.

**Module 3:** **CONTEXT-FREE GRAMMARS** ***(09 Periods)***

Context-Free Grammars, Parse trees, Applications of context free grammars, Ambiguity in grammars and languages, Normal forms for context-free grammars, the pumping lemma for context-free languages

**Module 4:** **PUSH DOWN AUTOMATA** ***(10 Periods)***

Definition of the pushdown automaton, the languages of a PDA, Equivalence of PDA's and CFG's, Deterministic pushdown automata, Chomsky hierarchy of languages, the model of linear bounded automaton, Recursive and recursively enumerable languages (REL), properties of recursive and recursively enumerable languages.

**Module 5:** **TURING MACHINE** ***(10 Periods)***

Turing machine model, Representation of Turing machine, Language acceptability by Turing machine, Design of Turing machine, Techniques for Turing machine construction, Variants of Turing machines, Universal Turing machine, Undesirability

***Total Periods: 45***

**EXPERIENTIAL LEARNING**

**List of Exercises**

1. Describe the application of FA in building Lexical Analyzer for compilers.

2. Why a FA is deterministic? Justify your answer

3. For the alphabet set Σ = {*a,b*} construct DFAs for each of the following languages.
(a) All strings with exactly one $a$.
Ans. Regex: $a$
(b) All strings with at least one $a$.
Ans. Regex: $a(a + b)^*$
(c) All strings with no more than three *b*'s.

4. Describe the language accepted by the automaton corresponding to the transition diagram given in figure. Also, give its regular expression.

5. Design a finite automaton for controller for a swing door with a front pad and rear pad. There are two states corresponding to door on and closed, and four possible inputs: front, rear, neither, and both.

**RESOURCES**

**TEXTBOOKS:**

**1.** K.L.P. Mishra and N.Chandrasekaran, *Theory of Computer Science: Automata Languages and Computation*, PHI Learning, 3rdEdition, 2009.

**REFERENCE BOOKS:**

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D Ullman, *Introduction to Automata Theory, Languages and Computation*, Pearson Education, 3rdEdition, 2011.

2. John C Martin, *Introduction to Languages and the Theory of Computation*, TMH, 4thEdition, 2010.

**VIDEO LECTURES:**

1. **NPTEL :: Computer Science and Engineering - NOC:Theory of Computation**

**WEB RESOURCES:**

1. https://nptel.ac.in/courses/106/104/106104148/

# PROGRAM CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22MM102005 | OBJECT ORIENTED PROGRAMMING WITH C++ | 3 | - | 2 | - | 4 |

**Pre-Requisite** 22MM102002-Programming with C

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Introduction to Object Oriented concepts and Fundamental Concepts of C++; Decision Making Statements, Looping Statements and Functions; Arrays, Pointers & References and Strings; Classes & Objects and Overloading Operators; Composition & Inheritance, Templates, Iterators & Generics and File Handling;

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Demonstrate knowledge on object oriented programming concepts - Object, Class, Inheritance, Polymorphism, Encapsulation, Abstraction and Message passing.

**CO2.** Identify object oriented concepts for code reusability and optimization.

**CO3.** Design and develop solutions for given specifications.

**CO4.** Demonstrate problem solving skills to provide software solutions to real world problems.

**CO5.** Develop C++ programming to provide solutions to complex engineering problems using object oriented concepts.

### CO-PO-PSO Mapping Table:

| Learning Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 3 | 3 | - | - | - | - | 3 | - | 3 | 2 | - |
| CO2 | 3 | 3 | 3 | - | - | - | - | 3 | - | 3 | 3 | - |
| CO3 | 3 | 3 | - | - | - | - | - | 3 | - | 3 | 3 | - |
| CO4 | 2 | 3 | 3 | - | - | - | - | 3 | - | 3 | 3 | - |
| CO5 | 3 | 2 | 2 | - | - | - | - | 3 | - | 3 | 3 | - |
| **Course Correlation Mapping** | **3** | **3** | **3** | **-** | **-** | **-** | - | **3** | - | **3** | **3** | - |

Correlation Levels: 3: High; 2: Medium; 1: Low

**COURSE CONTENT**

**Module 1: INTRODUCTION TO OBJECT ORIENTED PROGRAMMING** ***(08 Periods)***

Programming Language generations, Object Oriented Paradigm, Basics of OOPS, Benefits and Applications of OOP, Object Oriented Languages, Difference between OOP and POP.

Introduction to C++, General Structure of a C++ program, cin and cout objects, Tokens in C++: Keywords, identifiers, Constants, variables

**Module 2: CONTROL STRUCTURES, FUNCTIONS AND ARRAYS** ***(08 Periods)***

Data types in C++, Operators: Types of Operators, Control structures: Conditional statements and Looping statements, Functions with default arguments, inline functions, function overloading, reference variables, Arrays: Single and multidimensional arrays

**Module 3 CLASSES AND OBJECTS** ***(10 Periods)***

Object and Classes-Structure and Class, Defining a class, defining member functions, member function with object as arguments and argument as return type, array of objects,. Constructor and destructors, characteristics of constructor, constructor types-default, parameterized, copy and dynamic, constructor overloading, static data members and static member functions, friend function and friend class

**Module 4 OVERLOADING AND INHERITANCE** ***(10 Periods)***

Operator overloading, defining operator function, overloading unary, binary and relational operators. Inheritance, benefits of inheritance, types of inheritance, methods overriding, virtual functions.

**Module 5 C++ STREAMS AND FILE HANDLING** ***(09 Periods)***

C++ Streams and File handling Stream class, unformatted I/ O operations, formatting of Output, ios class functions and flags, manipulators, Files: File classes, file types, file functions. Error handling in files, file operations, command line arguments.

***Total Periods: 45***

**LIST OF EXERCISES:**

1. Write a program to print the sum of digits of a given number.
2. Write a program to check whether the given number is Armstrong or not.
3. Write a program to check whether the given string is Palindrome or not.
4. Write a program to read the student name, roll no, marks and display the same using class and object.
5. Write a program to demonstrate array of objects.
6. Write a program to demonstrate types of constructor and destructor.
7. Write a program to implement friend function and friend class.
8. Write a program to to demonstrate operator overloading for unary operators
9. Write a program to to demonstrate operator overloading for binary operators
10. Write a program to demonstrate Hierarchical inheritance.
11. Write a program to demonstrate Multiple inheritances.
12. Write a program to demonstrate Hybrid inheritances.
13. Write a program to demonstrate read and write operation on file in C++.
14. Write a program to create a copy of file in C++.

**RESOURCES**

**TEXT BOOKS:**

1. Object Oriented Programming with C++ - E. Balagurusamy, 4th Edition, Tata Mc Graw Hill Publication
2. Object Oriented Programming with C++ - M. T. Somashekara, D. S. Guru, H.S. Nagendraswamy, K.S. Manjunatha, PHI 2nd Edition

**REFERENCE BOOKS:**

1. Object Oriented Programming in C++ - Robert Lafore, 4th Edition, Pearson Education
2. Object-Oriented Programming with ANSI and Turbo C++ - Ashok Kamthane – Pearson

**SOFTWARE/TOOLS:**

1. Turbo C++, Notepad Plus, Edit plus

**VIDEO LECTURES:**

1. https://nptel.ac.in/courses/106105151
2. https://nptel.ac.in/courses/106101208

**WEB RESOURCES:**

1. This site offers tools and libraries for C/C++. http://www.programmersheaven.com/zone3/cat155/index.htm
2. This site includes a step-by-step tutorial that includes sample code. http://www.cprogramming.com/tutorial.html
3. This site contains a list of tutorial topics. Tutorial levels range from beginner to expert. http://www.programmersheaven.com/zone3/cat34/index.htm
4. This site is a good reference for users with C/C++ knowledge. Topics are accompanied by detailed explanations and example code. http://www.glenmccl.com/tutor.htm

## PROGRAM CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22MM102006 | OBJECT ORIENTATED PROGRAMMING WITH JAVA | 3 | - | 2 | - | 4 |

**Pre-Requisite** **22MM102002-Programming with C**

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Introduction to Object Oriented Programming, Classes and Objects; Inheritance, Packages, Interfaces; Exception handling, Multithreading; Collection Classes; Files, Connecting to a Database, Swings, Event handling.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Demonstrate the basic programming constructs of Java and OOP concepts to develop Java programs for a given scenario.

**CO2.** Design solutions to the problems by using control statements, interfaces, utility classes and Packages.

**CO3.** Solve real time problems using object oriented programming features – polymorphism, inheritance, exception handling and multithreading.

**CO4.** Apply multithreading mechanism to enhance the performance of a system.

**CO5.** Develop user interfaces using GUI programming techniques and Work Independently and Communicate Effectively in Oral and Written forms.

**CO-PO-PSO Mapping Table:**

| Learning Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 3 | 3 | - | - | 3 | - | 3 | - | 3 | - | - |
| CO2 | 3 | 3 | 3 | - | - | 3 | - | 3 | - | 3 | - | - |
| CO3 | 3 | 3 | 3 | - | - | 3 | - | 3 | - | 3 | - | - |
| CO4 | 3 | 3 | 3 | - | - | 3 | - | 3 | - | | 3 | - |
| CO5 | 3 | 3 | 3 | - | - | 3 | - | 3 | - | | 3 | - |
| **Course Correlation Mapping** | **3** | **3** | **3** | **-** | **-** | **3** | - | **3** | - | **2** | **2** | - |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

## COURSE CONTENT

**Module 1: FUNDAMENTALS OF OBJECT ORIENTED PROGRAMMING AND INTRODUCTION TO JAVA PROGRAMMING** ***(10 Periods)***

Fundamentals of Object Oriented Programming: Introduction Object Oriented paradigm, Basic Concepts of OOP, Benefits of OOP, Applications of OOP.

Overview of Java Language: Introduction, Java features, Simple Java program structure, Java tokens, Java Statements, Implementing a Java Program, Java Virtual Machine, Command line arguments.

Constants, Variables & Data Types: Introduction, Constants, Variables, Data Types, Declaration of Variables, Giving Value to Variables, Scope of variables, Symbolic Constants, Type casting, Getting Value of Variables, Standard Default values; Operators & Expressions.

**Module 2: Control Structures, Class, Object and Methods** ***(10 Periods)***

**DECISION MAKING & BRANCHING:** Introduction, Decision making with if statement, Simple if statement, if. Else statement, Nesting of if. else statements, the else if ladder, the switch statement, the conditional operator. **LOOPING**: Introduction, The While statement, the do-while statement, the for statement, Jumps in loops.

**CLASSES, OBJECTS & METHODS**: Introduction, Defining a class, Adding variables, Adding methods, Creating objects, Accessing class members, Constructors, Method overloading, Static members, Nesting of methods;

**Module 3 ARRAYS, STRINGS AND VECTORS, INHERITANCE, INTERFACES** ***(07 Periods)***

**ARRAYS, STRINGS AND VECTORS:** Arrays, One-dimensional arrays, Creating an array, Two – dimensional arrays, Strings, Vectors, Wrapper classes;

**INHERITANCE**: Extending a class, Overloading methods, Final variables and methods, Final classes, Abstract methods and classes;

**INTERFACES:** Introduction, Defining interfaces, Extending interfaces, Implementing Interfaces, Assessing interface variables.

**Module 4 MULTITHREADED PROGRAMMING, MANAGING ERRORS AND EXCEPTIONS** ***(08 Periods)***

**MULTITHREADED PROGRAMMING:** Introduction, Creating Threads, Extending the Threads, Stopping and Blocking a Thread, Lifecycle of a Thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization, Implementing the 'Runnable' Interface.

**MANAGING ERRORS AND EXCEPTIONS:** Types of errors: Compile-time errors, Run-time errors, Exceptions, Exception handling, Multiple Catch Statements, Using finally statement.

**Module 5 APPLET PROGRAMMING, PACKAGES, MANAGING INPUT/OUTPUT FILES IN JAVA** ***(10 Periods)***

**APPLET PROGRAMMING:** local and remote applets, Applets and Applications, Building Applet code, Applet Life cycle: Initialization state, Running state, Idle or stopped state, Dead state, Display state.

**PACKAGES:** Introduction, Java API Packages, Using System Packages, Naming conventions, Creating Packages, Accessing a Package, using a Package.

**MANAGING INPUT/OUTPUT FILES IN JAVA:** Introduction, Concept of Streams, Stream classes, Byte Stream Classes, Input Stream Classes, Output Stream Classes, Character Stream classes: Reader stream classes, Writer Stream classes, Using Streams, Reading and writing files.

***Total Periods: 45***

**List of Experiments:**

| | |
|---|---|
| 1. | Write a Program in Java to Display Odd Number from 1 to 100. |
| 2. | Write a Program in Java to Determine Whether a Number Input from Keyboard is Prime Number Or Not |
| 3. | Write a Program in Java to Calculate the Factorial of a Number. |
| 4. | Write a program on class and object in java |
| 5. | Write a Program in Java to illustrate Multilevel Inheritance. |
| 6. | Write a Program in Java to Check Given String is Palindrome String Or Not in Java. |
| 7. | Write a program to perform various string operations. |
| 8. | Write a program to illustrate Function Overloading & Function Overriding methods in Java |
| 9. | Write a program to illustrate the implementation of abstract class |
| 10. | Write a program to implement Exception handling |
| 11. | Write a program to create packages in Java |
| 12. | Write a program on interface in java |
| 13. | Write a program to Create Multiple Threads in Java |
| 14. | Write a program to draw the various polygons using applets. |
| 15. | Write a program to assign priorities to threads in java . |

**RESOURCES**

**TEXT BOOKS:**


1. Core Java: An Integrated Approach, Authored by Dr. R. Nageswara Rao & Kogent Learning Solutions Inc.
2. E.Balaguruswamy, Programming with JAVA, A primer, 3e, TATA McGraw- Hill Company.
3. John R. Hubbard, Programming with Java, Second Edition, Schaum's outline Series, TMH.
4. Deite and Deitel. Java TM: How to Program, PHI (2007)


**REFERENCE BOOKS:**


1. Y. Daniel Liang ,2003, An Introduction to JAVA Programming, Prentice-Hall of India Pvt.Ltd.
2. Cay S. Horstmann and Gary Cornell,2005, Core JavaTM2 Volume I-Fundamentals, 7th Edition- Pearson Education.
3. Ken Arnold, James Gosling and David Holmes,2003, The JavaTM Programming Language,3rd Edition, Pearson Education
4. Peter Norton, "Java Programming", Techmedia Publications.
5. Joseph Weber, "Using Java 1.2", PHI, ISBN -81-203-1558-8.

**VIDEO LECTURES:**

1. https://docs.oracle.com/javase/tutorial/index.html.
2. https://nptel.ac.in/courses/106105191
3. https://onlinecourses.nptel.ac.in/noc22_cs47/preview

**WEB RESOURCES:**

1. https://www.w3schools.com/java/
2. https://www.javatpoint.com/java-tutorial
3. https://www.tutorialspoint.com/java/index.htm
4. https://docs.oracle.com/javase/tutorial/
5. https://www.iitk.ac.in/esc101/share/downloads/javanotes5.pdf

# PROGRAM CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22MM102003 | DATA STRUCTURES | 3 | - | 2 | - | 4 |

**Pre-Requisite** 22MM102002 - Programming with C

**Anti-Requisite** -

**Co-Requisite** -

**Course Description:** This course data Structures using java includes explanation of various data structures with coding examples, provided with detail explanation of code side by side with concept building. Algorithms for implementing Abstract Data Type; Implementation of Stack, Queue, LIST, Graph, Tree ADT's and its applications; Implementation of Sorting and Searching techniques; Implementation of Binary Search Tree and its applications. Most important Data Structures like Linked List, Binary Search Tree(BST), stack, Queue are explained in detail with concepts made easy to understand.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Gain knowledge in linear and non-linear data structures to solve computing problems.

**CO2.** Identify and analyze the usage of various data structures, operations and associated algorithms

**CO3.** Design and develop variety of algorithms and programs in order to solve computing problems.

**CO4.** Choose the appropriate data structure and algorithm design method to get an optimal solution for complex real world problem

**CO5.** Apply searching, sorting, tree traversal and graph traversal techniques to optimize the complexities of an application.

**CO-PO-PSO Mapping Table:**

| Course Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 3 | 3 | - | - | 3 | - | - | - | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 2 | - | 3 | - | - | - | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | - | - | 3 | - | - | - | 3 | 3 | 3 |
| CO5 | - | - | - | - | - | 3 | - | - | - | 3 | 3 | 3 |
| **Course Correlation Mapping** | **3** | **3** | **3** | **3** | **-** | **3** | **-** | **-** | - | **3** | **3** | **3** |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

**COURSE CONTENT**

**Module 1: Introduction to Data Structures (9 Hours)**

**Introduction to Data Structures:** Introduction to the Theory of Data Structures, Data Representation, Abstract Data Types, Data Types, Primitive Data Types, Data Structure and Structured Type, Atomic Type, Difference between Abstract Data Types, Data Types, and Data Structures, Refinement Stages

**Principles of Programming and Analysis of Algorithms:** Program Design, Algorithms, Different Approaches to Designing an Algorithm, Complexity, Big 'O' Notation, Algorithm Analysis, Structured Approach to Programming, Recursion, Tips and Techniques for Writing Programs in 'C'

**Module 2: Arrays & Linked List (10 Hours)**

**Arrays:** Introduction to Linear and Non- Linear Data Structures, One- Dimensional Arrays, Array Operations, Two- Dimensional arrays, Multidimensional Arrays, Pointers and Arrays, an Overview of Pointers

**Linked Lists:** Introduction to Lists and Linked Lists, Dynamic Memory Allocation, Basic Linked List Operations, Doubly Linked List, Circular Linked List, Atomic Linked List, Linked List in Arrays, Linked List versus Arrays

**Module 3: Stacks and Queues (10 Hours)**

**Stacks:** Introduction to Stacks, Stack as an Abstract Data Type, Representation of Stacks through Arrays, Representation of Stacks through Linked Lists, Applications of Stacks, Stacks and Recursion

**Queues:** Introduction, Queue as an Abstract data Type, Representation of Queues, Circular Queues, Double Ended Queues- Deques, Priority Queues, Application of Queues

**Module 4: Binary Trees (9 Hours)**

**Binary Trees:** Introduction to Non- Linear Data Structures, Introduction Binary Trees, Types of Trees, Basic Definition of Binary Trees, Properties of Binary Trees, Representation of Binary Trees, Operations on a Binary Search Tree, Binary Tree Traversal, Counting Number of Binary Trees, Applications of Binary Tree

**Module 5: Searching and Sorting and Graphs (7 Hours)**

**Searching and sorting:** Sorting – An Introduction, Bubble Sort, Insertion Sort, Merge Sort, Searching – An Introduction, Linear or Sequential Search, Binary Search, Indexed Sequential Search

**Graphs:** Introduction to Graphs, Terms Associated with Graphs, Sequential Representation of Graphs, Linked Representation of Graphs, Traversal of Graphs, Spanning Trees, Shortest Path, Application of Graphs

**Total Hours: 45**

## LIST OF EXPERIMENTS:

1. Write a program to read 'N' numbers of elements into an array and also perform the following operation on an array
    a. Add an element at the begging of an array.
    b. Insert an element at given index of array.
    c. Update a element using a values and index.
    d. Delete an existing element
2. Write a program using stacks to convert a given
    a. postfix expression to prefix
    b. prefix expression to postfix
    c. infix expression to postfix
3. Write Programs to implement the Stack operations using Liked List.
4. Write Programs to implement the Queue operations using an array.
5. Write Programs to implement the Queue operations using Liked List
6. Write a program for arithmetic expression evaluation.
7. Write a program for Binary Search Tree Traversals
8. Write a program to implement dequeue using a doubly linked list.
9. Write a program to search an item in a given list using the following Searching Algorithms
    a. Linear Search
    b. Binary Search.
10. Write a program for implementation of the following Sorting Algorithms
    a. Bubble Sort
    b. Insertion Sort
    c. Quick Sort
11. Write a program to find out shortest path between given Source Node and Destination Node in given graph using Dijkstrar's algorithm.
12. Write a program to implement Depth First Search graph traversals algorithm
13. Write a program to implement Breadth First Search graph traversals algorithm

## RESOURCES

### TEXT BOOKS:


1. Debasis Samanta " Classic Data Structures" 2nd Edition, Prentice Hall India Learning Private Limited.
2. Data Structures using C", ISRD group Second Edition, TMH


### REFERENCE BOOKS:


1. Data Structures through C", YashavantKanetkar, BPB Publications.
2. Data Structures Using C" Balagurusamy E. TM


### VIDEO LECTURES:

1. https://www.scaler.com/topics/data-structures/
2. Data Structures and Algorithms for Beginners - YouTube
3. https://in.coursera.org/learn/data-structures

4. https://www.edureka.co/blog/c-data-structures/

**Web Resources:**

1. https://www.geeksforgeeks.org/data-structures/
2. https://www.programiz.com/dsa/data-structure-types
3. https://www.tutorialspoint.com/data_structures_algorithms/index.htm

## PROGRAM CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22MM102007 | DATABASE MANAGEMENT SYSTEMS | 3 | - | 2 | - | 4 |

**Pre-Requisite** --

**Anti-Requisite** --

**Co-Requisite** --

**COURSE DESCRIPTION:** Introduction to database systems; Database design; Relational model; Relational algebra; SQL queries; Constraints and triggers; PL/SQL; Schema refinement and normal forms; Transaction management; Concurrency control; Overview of storage and indexing.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Apply the concepts of ER-modeling and normalization to design viable data models for a given problem.

**CO2.** Formulate relational database schemas, apply suitable integrity constraints, for querying databases.

**CO3.** Use SQL to store, query, and manipulate data in relational databases.

**CO4.** Develop PL/SQL blocks to centralize database applications for maintainability and reusability.

**CO5.** Analyze transaction processing, concurrency control and storage methods for database management.

**CO-PO-PSO Mapping Table:**

| Learning Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO 2 | PO3 | PO 4 | PO5 | PO 6 | PO 7 | PO8 | PO 9 | PSO 1 | PSO 2 | PSO 3 |
| CO1 | 2 | 2 | 3 | - | - | - | - | 3 | - | - | - | 3 |
| CO2 | 1 | 2 | - | - | - | - | - | 3 | - | 2 | - | 3 |
| CO3 | 3 | 2 | - | - | - | - | - | 3 | - | 1 | - | 3 |
| CO4 | 1 | 2 | 3 | 2 | - | - | - | 3 | - | 3 | - | 2 |
| CO5 | 3 | 3 | - | - | - | - | - | 3 | - | 2 | | 3 |
| **Course Correlation Mapping** | **3** | **2** | **3** | **2** | **-** | **-** | **-** | **3** | - | **2** | - | **3** |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

**COURSE CONTENT**

**Module 1: INTRODUCTION TO DATABASE SYSTEMS AND DATABASE DESIGN** ***(08 Periods)***

**Introduction to Database Systems:** Database system applications, Purpose of database systems, View of data , Data abstraction, Instances and schemas, Data models; Database languages - Data Definition Language, Data Manipulation Language; Database architecture, Database users and administrators.
**Introduction to Database design:** Database design and ER diagrams, Entities, attributes and
entity sets, Relationships and relationship sets, Additional features of ER model, Conceptual Design with ER model.

**Module 2: RELATIONAL MODEL AND RELATIONAL ALGEBRA** ***(08 Periods)***

**Relational Model:** Creating and modifying relations, Integrity constraints over relations, Enforcing integrity constraints, Querying relational data, Logical database design, Introduction to views, Destroying/altering tables and views.
**Relational Algebra:** Preliminaries, Relational Algebra operators

**Module 3 SQL AND PL/SQL** ***(10 Periods)***

**SQL:** Form of basic SQL query, Nested queries, Aggregate operators, Null values, Complexintegrity constraints in SQL, Triggers and active databases.
**PL/SQL:** Generic PL/SQL block, PL/SQL data types, Control structure, Procedures and functions,Cursors, Database triggers.

**Module 4 SCHEMA REFINEMENT AND TRANSACTIONS** ***(10 Periods)***

**Schema Refinement:** Problems caused by redundancy, Decompositions, Problems related to decomposition, Functional dependencies, Reasoning about FDs, First normal form, Second normal form, Third normal form, Boyce-Codd normal form, Multivalued dependencies, Fourth normalform, Join dependencies, Fifth normal form.
**Transactions:** Transaction concept, Transaction atomicity and durability, Concurrent Executions ,
Serializability, Recoverability, Implementation of isolation, Testing for serializability.

**Module 5 CONCURRENCY CONTROL, STORAGE AND INDEXING** ***(09 Periods)***

**Concurrency Control:** Lock Based Protocols, Timestamp Based Protocols, Validation BasedProtocols, Multiple Granularity, Deadlock Handling.
**Storage and Indexing:** Data on external storage, File organizations and indexing, Clusteredindexes, Primary and secondary indexes; Index data structures , Hash based indexing, Tree based
indexing; Comparison of file organizations.

***Total Periods: 45***

**RESOURCES**

**TEXT BOOKS:**


1. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, McGraw Hill, 3rdEdition, 2014.

2. Abraham Silberschatz, Henry. F. Korth, S. Sudarshan, Database System Concepts, McGrawHill, 7th edition, 2019.

**REFERENCE BOOKS:**


1. Ivan Bayross, SQL, PL/SQL: The Programming Language of Oracle, BPB publications, 4 thEdition, 2017.
2. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, 7th Edition,Pearson, 2015.


**VIDEO LECTURES:**

1. https://swayam.gov.in/nd1_noc19_cs46/preview
2. https://www.classcentral.com/course/swayam-introduction-to-database-systems17660

**WEB RESOURCES:**

1. https://nptel.ac.in/courses/106105175
2. https://onlinecourses.nptel.ac.in/noc21_cs04/preview
3. https://www.coursera.org/learn/database-management

**LIST OF EXERCISES:**

**1.** Design and analyze an ER Model for the following use case. Roadway Travels‖ is in business since 1977 with several buses connecting different places in India. Its main office is located in Hyderabad. The company wants to computerize its operations inthe following areas:
- Reservations.
- Ticketing.
- Cancellatio

nsReservations:
Reservations are directly handled by booking office. Reservations can be made 60 days in advance in either cash or credit. In case the ticket is not available, await listed ticket is issued to the customer. This ticket is confirmed against the cancellation. Cancellation and Modification:
Cancellations are also directly handed at the booking office. Cancellation charges will be charged. Waitlisted tickets that do not get confirmed are fully refunded.

**2.** a). Implement Data Definition Language commands -Create, Alter, Drop, Truncate,and Rename.
b). Implement Data Manipulation Language commands - Insert, Select, Update, and Delete.
C). Implement Single Row functions - Character, Numeric and Date functions.

**3.** Implement various types of integrity constraints - NOT NULL constraint, DEFAULTconstraint, UNIQUE constraint, PRIMARY key, FOREIGN key, CHECK constraint.

**4.** a). Implement group functions with different operators such as aggregate operators,group by, having and order by.
b). Implement nested and correlated nested queries using set operators and setcomparison operators.

**5.** a). Creation of views, synonyms, sequence, indexes and save point.
b). Implement various types of joins - outer join and inner join.

**Basic SQL:**

**6.** Construct PL/SQL block for the following.
a). To determine whether a number is palindrome
b). To determine whether a number is an Armstrong numberc). To find greatest of three numbers
d). To display Fibonacci series

**Control Structures:**

**7.** a). Write a program in PL/SQL to update the salary of a specific employee by 8% if the salary exceeds the mid-range of the salary against this job and update up to mid- range if the salary is less than the mid-range of the salary, and display a suitable message.
b). Write a PL/SQL program to display the description against a student‟s grade using CASE statement.

**Exception Handling:**

**8.** a). Develop a PL/SQL program that displays the name and address of a student whose ID is given. If there is no student with the given student ID in the database, the program should raise a run-time exception NO_DATA_FOUND, which should be captured in the EXCEPTION block.
b). Construct the user-defined exceptions to get the salary of an employee and check it with the job‟s salary range. If the salary is below the range, raise an exception BELOW_SALARY_RANGE. If the salary is above the range, raise the exception
ABOVE_SALARY_RANGE.

**Functions:**

**9.** a). Write a function that accepts two numbers A and B and performs the followingoperations.
- Addition.
- Subtraction.
- Multiplication
- Division.

b). Write a PL/SQL block that updates salary of an employee in Employee table by using incr function which takes employee number as argument and calculates increment and returns increment based on the following criteria. If salary <= 3000,
increment = 30% of salary If salary > 3000 and <= 6000, increment = 20% of salaryelse increment = 10% of salary

**Procedures:**

**10.** a). Write a procedure that accepts two numbers and displays their sum.b). Write procedures to demonstrate IN, IN OUT and OUT parameters.

**Cursors:**

**11.** a). Write a block in PL/SQL to create a Cursor that displays the employee name and number of jobs he or she has done in the past.
b). Write a program in PL/SQL to create a cursor to display the name and salary of each employee in the EMPLOYEES table whose salary is less than that specified by a passed-in parameter value.

**Triggers:**

**12.** Develop a suitable student database application by considering appropriate attributes. Couple of attributes to be maintained is the attendance of a student in each subject for which he/she has enrolled and internal assessment Using TRIGGERS for the following
a). Whenever the attendance is updated, check if the attendance is less than 85%; if so, notify the concerned head of the department.
b). Whenever, the marks in an internal assessment test are entered, check if the marks are less than 40%; if so, notify the concerned head of the department.

# PROGRAM CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22MM101011 | SOFTWARE ENGINEERING | 3 | - | - | - | 3 |

**Pre-Requisite** **22MM102007-Database Management Systems**

**Anti-Requisite** XXXX-

**Co-Requisite** XXXX-

**COURSE DESCRIPTION:** Concepts of Software Engineering; Software Process Models; Conventional and Agile Process Models; Software Requirements Engineering Process; System Analysis; Architectural Design; User Interface Design and Re- engineering; Software Testing; Risk and Quality Management.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Demonstrate knowledge on Fundamental concepts of software engineering and analyze process models required to develop a software system.

**CO2.** Analyze software requirements and model requirements for the given scenario.

**CO3.** Apply design concepts and metrics for software development.

**CO4.** Apply testing strategies and techniques for quality software.

**CO5.** Analyze risks in software development life cycle and apply risk strategies to mitigate risks.

**CO-PO-PSO Mapping Table:**

| Learning Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PSO 1 | PSO 2 | PSO 3 |
| CO1 | 2 | 3 | 3 | - | - | - | - | - | - | - | - | 3 |
| CO2 | 2 | 3 | - | - | - | 3 | 3 | 2 | - | 2 | - | 3 |
| CO3 | 2 | 3 | 3 | 2 | - | 2 | 2 | - | - | 1 | - | 3 |
| CO4 | 2 | - | - | - | 2 | 3 | - | - | - | 3 | - | 2 |
| CO5 | 2 | - | - | - | 2 | 3 | - | - | - | 2 | | 3 |
| **Course Correlation Mapping** | **2** | **2** | **3** | **2** | **2** | **3** | **2** | **2** | - | **2** | - | **3** |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

**COURSE CONTENT**

**Module 1: SOFTWARE PROCESS AND AGILE DEVELOPMEN** ***(09 Periods)***

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models –Introduction to Agility,Agile process,Extreme programming-XP Process.

**Module 2: REQUIREMENTS ANALYSIS AND SPECIFICATION** ***(09 Periods)***

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document , Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management- Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary.

**Module 3 SOFTWARE DESIGN** ***(09 Periods)***

Design process , Design Concepts,Design Model, Design Heuristic, Architectural Design - Architectural styles, Architectural Design, Architectural Mapping using Data Flow, User Interface Design: Interface analysis, Interface Design ,Component level Design: Designing Class based components, traditional Components.

**Module 4 TESTING AND MAINTENANCE** ***(09 Periods)***

Software testing fundamentals,Internal and external views of Testing-white box testing - basis path testing,control structure testing,black box testing- Regression Testing , Unit Testing , Integration Testing , Validation Testing , System Testing And Debugging ,Software Implementation Techniques: Coding practices,Refactoring,Maintenance and Reengineering-BPR model-Reengineering process model,Reverse and Forward Engineering.

**Module 5 PROJECT MANAGEMENT** ***(09 Periods)***

Software Project Management: Estimation , LOC, FP Based Estimation, Make/Buy Decision COCOMO I & II Model , Project Scheduling , Scheduling, Earned Value Analysis Planning , Project Plan, Planning Process, RFP Risk Management – Identification, Projection , Risk Management-Risk Identification-RMMM Plan- CASE TOOLS

***Total Periods: 45***

**Experiential learning:**

1. Study and usage of software project management tools such cost estimates and scheduling.
2. Documentation generators –Study and practice of Documentation generators.
3. Data Modelling using automated tools
4. Structure charts, Data Flow Diagrams, Decision tables and ER diagrams for
    a. Banking System
    b. Railway Reservation System
    c. Hotel management system
    d. Inventory Control System
    e. Library management system

**RESOURCES**

**TEXT BOOKS:**

1. Roger S. Pressman, Software Engineering - A Practitioner's Approach, McGraw-Hill,Eight Edition, 2015.

2. Ian Sommerville, Software Engineering**,** Pearson Education, Ninth Edition, 2011.

**REFERENCE BOOKS:**

1. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers, Third Edition, 2007.
2. Shely Cashman Rosenblatt, Systems Analysis and Design, Thomson Publications, SixthEdition, 2006.

**VIDEO LECTURES:**

1. https://nptel.ac.in/courses/106105087/
2. https://nptel.ac.in/courses/106105182/

**WEB RESOURCES:**

1. https://www.coursera.org/courses?query=software%20engineering
2. https://www.javatpoint.com/software-engineering-tutorial
3. https://www.geeksforgeeks.org/software-engineering/

# PROGRAM CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22AI102001** | **OPERATING SYSTEMS** | 3 | - | 2 | - | 4 |

**Pre-Requisite**

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Operating Systems Operations; Process Scheduling; Process Synchronization, Deadlocks; Paging and Segmentation, Disk Scheduling; File Concepts, I/O Interface; Concepts of Protection and Security.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Analyze performance of CPU scheduling algorithms.

**CO2.** Design solutions for process synchronization problems by using semaphores and monitors.

**CO3.** Devise solutions for deadlocks using deadlock handling mechanisms.

**CO4.** Solve memory management problems using page replacement and disk scheduling algorithms.

**CO5.** Identify efficient file allocation methods for optimal disk utilization & analyse services of I/O subsystems and mechanisms of security & protection.

**CO6.** Work independently or in team to solve problems with effective communication

## CO-PO-PSO Mapping Table:

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | | | | PSO1 | PSO2 | PSO3 | |
| **CO1** | 2 | 3 | 2 | 2 | 2 | - | - | - | - | | | | 3 | - | - | |
| **CO2** | 2 | 2 | 3 | - | 2 | - | - | - | - | | | | 3 | - | - | |
| **CO3** | 2 | 2 | 3 | - | 2 | - | - | - | - | | | | 3 | - | - | |
| **CO4** | 2 | 2 | 3 | - | 2 | - | - | - | - | | | | - | - | 3 | |
| **CO5** | 3 | 3 | - | 3 | - | - | - | - | - | | | | 3 | - | - | |
| **CO6** | - | - | - | - | - | - | - | - | 3 | | | | - | - | - | |
| **Course Correlation Mapping** | **2** | **2** | **3** | **3** | **2** | **-** | **-** | **-** | **3** | | | | **3** | **-** | **3** | |

***Correlation Levels: 3: High; 2: Medium;1: Low***

## COURSE CONTENT

**Module 1 INTRODUCTION TO OPERATING SYSTEM AND PROCESS MANAGEMENT** ***(08 Periods)***

**Introduction:** Definition, Operating System Structure and Services, System Calls.
**Process Management**: Process Scheduling, Process Control Block, Inter Process Communication, Threads, Multithreading Models, CPU Scheduling Criteria, Scheduling Algorithms, Multiprocessor Scheduling.

**Module 2 PROCESS SYNCHRONIZATION AND DEADLOCKS** ***(10 Periods)***

**Process Synchronization:** Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Synchronization Problems, Monitors.
**Deadlocks:** System Model, Deadlock characterization, Methods for handling deadlocks, Prevention, Detection, Avoidance, Recovery from deadlock.

**Module 3 MEMORY MANAGEMENT AND SECONDARY STORAGE** ***(10 Periods)***

**Memory Management**: Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging.
**Virtual Memory**: Demand Paging, Page Replacement Algorithms, Copy-on-Write, Thrashing.
**Secondary Storage Structure**: Overview of Mass Storage Structure, Disk Structure, Disk Scheduling, Disk Management.

**Module 4 FILE AND I/O SYSTEMS** ***(08 Periods)***

**File System**: File concept, Access Methods, Directory Structure, File System Structure, i-node, File System Implementation, Directory Implementation, Allocation Methods.
**I/O System**: I/O Hardware, Application I/O Interface, Kernel I/O subsystem.

**Module 5 PROTECTION AND SECURITY** ***(09 Periods)***

**Protection:** Goals, Principles, Domain of Protection, Access Matrix, Implementation of Access Matrix, Access Control, Revocation of Access Rights.
**Security:** Security Problem, Program Threats, System and Network Threats, User Authentication, Implementing Security Defenses, Firewalling to Protect Systems and Networks, Computer-Security Classifications.

***Total Periods: 45***

## EXPERIENTIAL LEARNING

1. a) Write a program to implement Process System Calls.
   b) Write a program to implement I/O System Calls.
2. Write a program to implement named and unnamed pipes.
3. Demonstrate File Permissions.
4. Analyze the following CPU Scheduling Algorithms:
   a) FCFS b) SJF (Preemptive) c) Priority d) Round Robin
5. Design solutions for the following synchronization problems:
   a) Producer Consumer Problem b) Dining Philosophers Problem.
6. Design Banker's Algorithm for Deadlock Avoidance. Find the safe sequence. If Maximum request of any one process is changed, detect whether a deadlock has occurred or not. Consider the number of resources are three and Jobs are five.
7. Implement the following Algorithms:
   a) First Fit b) Best Fit c) Worst Fit

8. Implement the following Page Replacement Algorithms
   a) FIFO b) LFU c) LRU d) Optimal
9. Implement the following Disk Scheduling Algorithms
   a) FCFS b) SSTF c) SCAN d) CSCAN
10. Implement the following file allocation strategies:
    a) Contiguous Allocation b) Linked Allocation

## RESOURCES

**TEXT BOOKS:**

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, Wiley India Edition, 9th Edition, 2016.

**REFERENCE BOOKS:**

1. William Stallings, Operating Systems, Internals and Design Principles, Pearson Education, 7th Edition, 2013.
2. Andrew S. Tanenbaum, Modern Operating Systems, PHI, 3rd Edition, 2009.

**SOFTWARE/TOOLS:**

1. **Software: Windows, Linux OS, Fedora OS, Ubuntu OS**

**VIDEO LECTURES:**

1. https://onlinecourses.nptel.ac.in/noc21_cs72/preview
2. https://www.udemy.com/course/operating-systems-from-scratch-part1/

**WEB RESOURCES:**

1. operating-systems · GitHub Topics · GitHub
2. Operating System Introduction (w3schools.in)
3. What is Operating System (OS)? Defintion and Functions - javatpoint
4. Operating System Tutorial - GeeksforGeeks

## PROGRAM CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM102009** | **WEB TECHNOLOGIES** | 3 | - | 2 | - | 4 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Hyper Text Markup Language (HTML); Features of HTML5; Cascading Style Sheets (CSS); JavaScript; JQuery; Bootstrap; Hypertext Preprocessor (PHP); MySQL.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Demonstrate knowledge on web page design elements, dynamic content and database connection.

**CO2.** Analyze user requirements to develop web applications.

**CO3.** Design client-server applications using web technologies.

**CO4.** Demonstrate problem solving skills to develop enterprise web applications.

**CO5.** Apply HTML, CSS, JavaScript, JQuery, Bootstrap and PHP technologies for device independent web application development.

**CO-PO-PSO Mapping Table:**

| Course Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO 3 | PO 4 | PO 5 | PO6 | PO7 | PO 8 | PO 9 | PSO1 | PSO2 | PSO3 |
| **CO1** | 3 | 3 | - | 3 | - | - | - | 3 | - | - | - | 3 |
| **CO2** | 3 | 3 | - | 3 | - | - | - | - | - | - | - | 3 |
| **CO3** | 3 | 3 | - | - | - | - | - | - | - | - | - | 3 |
| **CO4** | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 |
| **CO5** | 3 | 3 | - | 3 | - | - | - | - | - | - | - | 3 |
| **Course Correlation Mapping** | **3** | **2** | **-** | **3** | **-** | **-** | **-** | **3** | - | **-** | - | **3** |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

**COURSE CONTENT**

**Module 1: HTML (09 periods)**

**Introduction:** Fundamentals of HTML, Working with Text, Organizing Text in HTML, Working with Links and URLs, Creating Tables, Working with Images, Canvas, Forms, Frames and Multimedia.

**Module 2: MORE ON HTML *(09 Periods)***

Introduction, HTML5 Document Structure, Creating Editable Content, Checking Spelling Mistakes, Exploring Custom Data Attributes, Client-Side Storage, Drag and Drop Feature, Offline Web Applications, Web Communications, Cross-Document Messaging and Desktop Notifications

**Module 3: CSS AND JAVASCRIPT *(10 Periods)***

**CSS:** Introduction, CSS Selectors, Inserting CSS in an HTML document, Backgrounds, Fonts, and Text Styles, Creating Boxes, Displaying, Positioning and Floating Elements, Features of CSS3, Media Queries.

**Java script:** Overview of JavaScript, JavaScript Functions, Events, Image Maps and Animations, JavaScript Objects, Working with Browser and Document Objects, JQuery **-** Introduction, JQuery Selectors, Events, Methods to access HTML elements and attributes, Introduction to AJAX.

**Module 4: INTRODUCTION TO PHP *(09 Periods)***

Introduction, Data Types, Variables, Constants, Expressions, String Interpolation, Control Structures, Functions, Arrays, Embedding PHP Code in Web Pages, Object Oriented PHP.

**Module 5: PHP WEB FORMS AND MYSQL *(08 Periods)***

**PHP Web forms:** PHP and Web Forms, Sending Form Data to a Server, Working with Cookies and Session Handlers

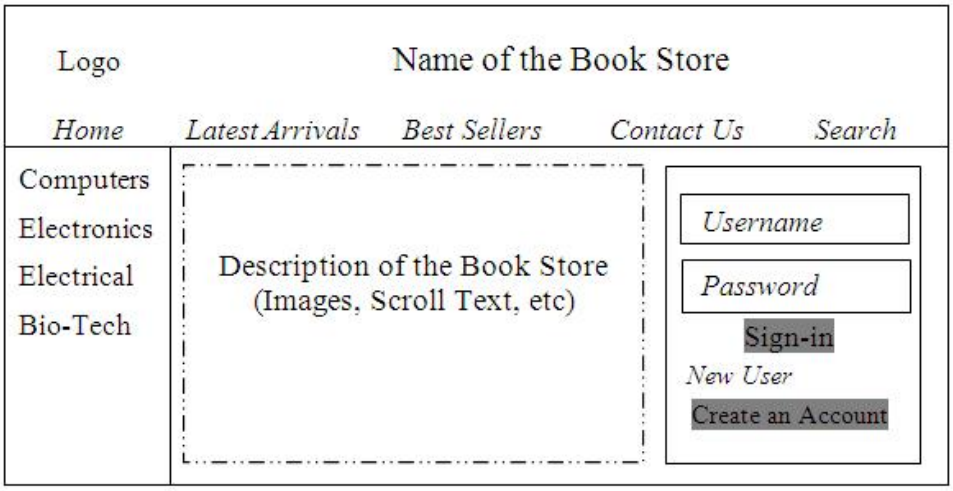
**PHP with MySQL:** Interacting with the Database, Prepared Statement, Database Transactions.

***Total Periods: 45***

**LIST OF EXPERIMENTS**

Design the following static web pages of an online book store web application.

1. **a. Home Page:**

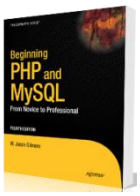



**b. Catalogue Page:**

The catalogue page should display the following details of available books.

i. Snap shot of cover page ii. Title of the text book iii. Author name

iv. Publisher v. Price vi. More details link.

| Logo | Name of the Book Store | | | |
|---|---|---|---|---|
| *Home* | *Latest Arrivals* | *Best Sellers* | *Contact Us* | *Search* |
| Computers<br>Electronics<br>Electrical<br>Bio-Tech |  | **HTML5 Black Book**<br>Kogent Learning Solutions<br>Dreamtech Press<br>Rs. 570/- | More Details | |
| |  | **Beginning PHP and MySQL**<br>4th Edition<br>W Jason Gilmore<br>Apress<br>Rs. 520/- | More Details | |

**c. Registration Page:**

Design the Registration page with the following fields and navigate it with create an

account link.

| | | |
|---|---|---|
| i. First Name | ii. Last Name | iii. Gender |
| iv. Date of Birth | v. Username | vi. Password |
| vii. Confirm Password | viii. Address | ix. Postal Code |
| x. Mobile No. | xi. Email-Id | |

2. a. Design a web page to store username and password information using the local storage concept.

   b. Design a web page to store employee information including Name, Emp. Id, Department, Salary and Address on a client's machine using a real SQL database.

3. Apply the following styles to all web pages of online book store web application.

   a. Fonts and Styles: font-family, font-style, font-weight and font-size

   b. Backgrounds and colors: color, background-color, background-image and background-repeat

   c. Text: text-decoration, text-transformation, text-align and text-indentation, text-align

   d. Borders: border, border-width, border-color and border-style

   e. Styles for links: A: link, A: visited, A:active, A:hover

   f. Selectors, Classes, Layers and Positioning elements.

4. Write a JavaScript/JQuery code to validate the following fields of the Registration web page.

   a. First Name/Last Name - should contain only alphabets and the length should not be less than 8 characters.

   b. Username - It should contain combination of alphabets, numbers and underscore. It should not allow spaces and special symbols.

   c. Password - It should not less than 8 characters in length and it contains one uppercase letter and one special symbol.

   d. Date of Birth - It should allow only valid date; otherwise display a message stating that entered date is invalid. Ex. 29 Feb. 2009 is an invalid date.

   e. Postal Code: It must allow only 6 digit valid number.

   f. Mobile No. - It should allow only numbers and total number of digits should be equal to 10.

   g. e-mail id - It should allow the mail

5. Design a web page with the following features using HTML5, JavaScript and JQuery

   a. Displaying of images with Custom animated effects

   b. Playing of selected video from the list of videos

   c. Showing the animated text in increasing and decreasing font size

   d. Changing the size of the area in a web page using DIV tag

e. Hiding and Showing elements in a web page.

6. Design a web page with the following features using Bootstrap and Media Query.
   a. Components
   b. Responsive tables
   c. Responsive images and videos
   d. Toolbars, Buttons and Lists

7. a. Deploy and navigate web pages of online book store using WAMP/XAMPP web server.

   b. Write a PHP program to read user name and favorite color from the HTML form. Display the name of the user in green color and sets user favorite color as a background for the web page.

8. Write a PHP code to read the username and password entered in the Login form of the online book store and authenticate with the values available in cookies. If user enters a valid username and password, welcome the user by username otherwise display a message stating that, entered details are invalid.

9. Write a PHP code to read user details entered through the registration web page and store the same into MySQL database.

10. Write a PHP code for storing books details like Name of the book, author, publisher, edition, price, etc into MySQL database. Embed a PHP code in catalogue page of the online book store to extract books details from the database

**RESOURCES**

**TEXTBOOKS:**


1. Kogent Learning Solutions Inc, *HTML 5 Black Book: Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP and JQuery*, Dreamtech Press, First Edition, 2011.

2. W. Jason Gilmore, *Beginning PHP and MySQL*, APress, Fourth Edition, 2011.


**REFERENCE BOOKS:**


1. Snig Bahumik, *Bootstrap Essentials*, PACKT Publishing, First Edition, 2015 (e-book).

2. Thomas A. Powell, *The Complete Reference: HTML and CSS,* Tata McGraw Hill, Fifth Edition, 2010.

3. Andrea Tarr, *PHP and MySQL*, Willy India, First Edition, 2012.

4. Kogent Learning Solutions Inc, HTML 5 Black Book: Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP and JQuery, Dreamtech Press, First Edition, 2011.

**VIDEO LECTURES:**

1. Introduction to Web Technologies - Part 1 | Web Technologies Tutorial - YouTube

**WEB RESOURCES:**

1. https://www.w3schools.com/php/DEFAULT.asp
2. https://www.w3schools.com/js/

## PROGRAM CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22CS101002** | **COMPUTER ORGANIZATION AND ARCHITECTURE** | 3 | - | - | - | 3 |

**Pre-Requisite** --

**Anti-Requisite** --

**Co- Requisite** --

**COURSE DESCRIPTION:** This course deals with basic function, structure and components of computer system, Central Processing Unit, Control Unit and I/O Unit. This course also imparts knowledge on different types of Memory Systems, Parallel Processing techniques and Multicore architectures with its issues.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1**. Demonstrate knowledge on computer organization, architecture and interconnection structures of a digital computer.

**CO2**. Analyze Arithmetic Operations, Addressing Modes, Instruction Formats, Processor and Register organization.

**CO3.** Design digital circuits for the given functional description of microoperations and memory elements.

**CO4**. Investigate the performance of Input /Output Systems, Memory systems, parallel processors, Multicore architectures to evaluate the cost-performance trade-offs.

### CO-PO-PSO Mapping Table:

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | | | | PSO 1 | PSO 2 | PSO 3 | PSO 4 |
| **CO1** | 3 | - | - | - | - | - | - | - | - | | | | 3 | - | - | - |
| **CO2** | 3 | 2 | | - | - | - | - | - | - | | | | 3 | - | - | - |
| **CO3** | 3 | 2 | 1 | - | - | - | - | - | - | | | | 3 | - | - | - |
| **CO4** | 3 | 2 | - | - | - | - | - | - | - | | | | 3 | - | - | - |
| **Course Correlation Mapping** | **3** | **2** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | | | | **3** | - | - | - |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

## COURSE CONTENT

**Module 1: INTRODUCTION TO COMPUTER SYSTEM (08 Periods)**

Organization and architecture, Structure and function, IAS computer structure, Computer function, Interconnection structures, Bus interconnection.

**Module 2: CENTRAL PROCESSING UNIT (09 Periods)**

Arithmetic logic unit, Integer multiplication- Booth's algorithm; Floating point representation principles, Machine instruction characteristics, Addressing modes, Instruction formats – Instruction length, Allocation of bits; Processor organization, Register organization – User visible registers, Control and status registers; Instruction cycle.

**Module 3: CONTROL UNIT AND INPUT/OUTPUT (10 Periods)**

**Control Unit:** Micro operations, Control of the processor – Functional requirements, Control signals, Internal processor organization; Hardwired implementation, Microinstructions, Micro programmed control unit, Micro instruction sequencing – Design considerations, sequencing techniques, Address generation; Micro instruction execution- A taxonomy of microinstructions, Microinstruction encoding.

**Input/Output:** External devices, I/O modules, Direct memory access function, I/O Channels and Processors, PCI Physical and Logical Architecture.

**Module 4: MEMORY SYSTEMS (09 Periods)**

**Semiconductor Memories:** Computer Memory System overview, Semiconductor Main Memory- Organization, DRAM and SRAM, Types of ROM, Chip logic, Chip packaging, Module organization, Interleaved memory; DDR DRAM, Flash Memory, Newer Nonvolatile Solid-State Memory Technologies.

**Cache Memory**: Cache Memory Principles, Elements of Cache Design- Cache Addresses, Mapping Functions.

**External Memory**: Solid State Drives.

**Module 5: PARALLEL ORGANIZATION (09 Periods)**

**Parallel Processing:** Multiple Processor Organizations, Instruction Pipelining, Symmetric Multiprocessors, Non uniform Memory Access, Multicore Organization.

**Multicore Computers:** Hardware performance issues, Software performance issues, Multicore organization, Intel Core i7-990X.

**Total Periods: 45**

## EXPERIENTIAL LEARNING

1. Write a report on Product Specifications such as CPU, Memory, Processor Graphics and advanced technologies of Intel Core i9-12900K -New performance hybrid architecture. The World's Best Gaming Processor: Available with up to 16 cores and 24 threads, the new 12th Gen Intel Core processor family includes the world's best gaming processor, the Core i9-12900K, unleashing gaming experiences across top titles. (https://ark.intel.com/content/www/us/en/ark/products/134599/intel-core-i912900k-processor-30m-cache-up-to-5-20-ghz.html)

2. Write a report on OpenCL(Open Computing Language) framework used for writing programs that execute across heterogeneous platforms consisting of central processing units, graphics processing units, digital signal processors, field-programmable gate arrays and other processors or hardware accelerators.(https://www.khronos.org/api/opencl)

## RESOURCES

### TEXT BOOKS:


1. William Stallings, Computer Organization and Architecture: Design for performance, Pearson, 11th Edition, 2020.


### REFERENCE BOOKS:


1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, 5th Edition, McGraw Hill Education, 2013.
2. David A. Patterson and John L. Hennessy, Computer Organization and Design - A Hardware software interface, 5th Edition, Morgan Kaufmann, 2014.


### VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc21_cs37/preview
2. https://onlinecourses.nptel.ac.in/noc20_cs64/preview
3. https://onlinecourses.nptel.ac.in/noc21_cs47/preview
4. https://freevideolectures.com/course/2277/computer-organization
5. https://www.youtube.com/watch?v=4TzMyXmzL8M

### WEB RESOURCES:

1. https://www.javatpoint.com/computer-organization-and-architecture-tutorial
2. https://www.geeksforgeeks.org/last-minute-notes-computer-organization/
3. https://gateoverflow.in/blog/9728/some-good-resources-for-computer-organisation-architecture
4. https://tutorialspoint.dev/computer-science/computer-organization-and-architecture/

# PROGRAM CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM101012** | **SOFTWARE QUALITY ASSURANCE/TESTING** | 3 | - | - | - | 3 |

**Pre-Requisite** **22MM101011-SOFTWARE ENGINEERING**

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Software Quality Assurance (SQA) is NOT the same as SoftwareTesting. True SQA deals with the processes producing software, whereas Testing and other forms of Software Quality Control (SQC) deal with the products of those processes. Both are important for reliably producing quality software.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Describe fundamental concepts of software quality assurance.

**CO2** Explore test planning and its management.

**CO3** Understand fundamental concepts of software automation.

**CO4** Apply Selenium automation tool for testing web based application.

**CO5** Demonstrate the quality management, assurance, and quality standard to software system.

## CO-PO-PSO Mapping Table:

| Course Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 |
| **CO1** | 3 | 3 | - | 3 | - | - | - | 3 | - | - | - | 3 |
| **CO2** | 3 | 3 | - | 3 | - | - | - | - | - | - | - | 3 |
| **CO3** | 3 | 3 | - | - | - | - | - | - | - | - | - | 3 |
| **CO4** | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 |
| **CO5** | 3 | 3 | - | 3 | - | - | - | - | - | - | - | 3 |
| **Course Correlation Mapping** | **3** | **2** | **-** | **3** | **-** | **-** | **-** | **3** | - | **-** | - | **3** |

*Correlation Levels: 3: High; 2: Medium; 1: Low*

## COURSE CONTENT

**Module 1: Product Quality & Process Quality:** ***(09 Periods)***

Introduction, software system evolution, product quality,models for software product quality, process quality

**Module 2: Functional Testing** ***(09 Periods)***

Boundary Value Testing: Analysis, robust testing, worst case testing, special & random testing, examples ; Equivalence Class Testing- equivalence classes, examples; Decision TableBased Testing: decision tables with examples

**Module 3: Structural-Testing** ***(09 Periods)***

Path testing: DD-Paths, Metrics, basic path testing; Data Flow Testing, DUtesting, slice based testing; Mutation testing

**Module 4: Integration & System Testing:** ***(09 Periods)***

levels of testing; integration testing: decomposition based, call graph based & path based integration; System testing: threads based structural & functional testing

**Module 5: Object Oriented Testing:** ***(09 Periods)***

Some issues in Object Oriented Testing, Units for object-oriented testing, implications of composition and encapsulation, implication of inheritance, implication of polymorphism, and levels of object-oriented testing

***Total Periods: 45***

## EXPERIENTIAL LEARNING

1. Write test cases for any know applications(e.g Banking application)
2. Create a Test plan Document for any know application(e.g library management system)
3. Study of any testing tool(e.g Win Runner)
4. Study of any web testing tool(e.g Selenium)
5. Study of any Bug tracking tool(e.g Bugzilla,bugbit)

## RESOURCES

**TEXTBOOKS:**

**1.** Sadalage, P. & Fowler, *NoSQL Distilled: A Brief Guide to the Emerging World ofPolyglot Persistence*, Wiley Publications,1st Edition ,2019.

**REFERENCE BOOKS:**

1. Software Testing and Analysis: Process, Principles and Techniques, by Mauro Pezze and Michal Young, John Wiley & Sons

2. The Art of Software Testing, Second Edition by Glenford J. Myers et. al. Digital copy available in DePaul library

3. Software Engineering: A Practitioner's Approach, Roger S Pressman, McGraw-Hill. Chapters 13 and 14

**VIDEO LECTURES:**

1. https://www.youtube.com/watch?v=XIcOWh_psSI
2. https://www.simplilearn.com/automation-testing-masters-program-certification-training-course
3. https://www.indeed.com/career-advice/career-development/software-quality-assurance-certification
4. https://www.skillsoft.com/course/software-quality-assurance-63cc19d0-f9e0-4809-b96a-ca14fab12298
5. https://www.conestogac.on.ca/fulltime/software-quality-assurance-and-test-engineering

**WEB RESOURCES:**

1. http://agilemodeling.com/essays/examiningBRUF.htm
2. https://www.pluralsight.com/courses/software-testing-quality-assurance-big-picture
3. https://www.udemy.com/course/qa-software-testing-training-course/
4. https://www.coursera.org/courses?query=quality%20assurance
5. https://www.conestogac.on.ca/fulltime/software-quality-assurance-and-test-engineering

## PROGRAM CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM102010** | **PYTHON PROGRAMMING** | 3 | - | 2 | - | 4 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** This course provides a detailed discussion and hands-on experience on Basics of Python programming, Control structures, Sequences, Sets, Dictionaries, Regular expressions, Functions, File handling, Object-oriented programming, Exception handling.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Demonstrate knowledge on Python constructs, sequences, sets and dictionaries to solve basic computational problems.

**CO2.** Apply the concepts of regular expressions for searching patterns in strings.

**CO3.** Develop and use Python modules to provide solutions to problems.

**CO4.** Apply the knowledge of file operations in Python for file processing.

**CO5.** Design applications using object-oriented programming features – encapsulation, inheritance, polymorphism and exception handling.

**CO6.** Work independently to solve problems with effective communication.

**CO-PO-PSO Mapping Table:**

| Learning Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | | | | PSO1 | PSO2 | PSO3 | PSO4 |
| **CO1** | 3 | 2 | - | - | 3 | - | - | - | - | | | | - | - | 3 | - |
| **CO2** | 3 | 2 | - | - | 3 | - | - | - | - | | | | - | - | 3 | - |
| **CO3** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | | | | - | - | 3 | - |
| **CO4** | 3 | 2 | 2 | 2 | 3 | - | - | - | - | | | | - | - | 3 | - |
| **CO5** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | | | | - | - | 3 | - |
| **CO6** | - | - | - | - | - | - | - | 3 | 3 | | | | - | - | - | - |
| **Course Correlation Mapping** | 3 | 3 | 3 | 3 | 3 | - | - | 3 | 3 | | | | - | - | 3 | **-** |

**Correlation Levels: 3: High; 2: Medium; 1: Low**

**COURSE CONTENT**

**Module 1: INTRODUCTION TO PYTHON PROGRAMMING** ***(07 Periods)***

Introduction to Python, Tokens, Variables, Literals, Identifiers, Keywords, Special symbols, Operators, Fundamental datatypes, Expressions, Type conversions, Handling Input and output in Python.

**Module 2: CONTROL STRUCTURES** ***(08 Periods)***

**Selection Statements:** if statement, if-else statement, if-elif-else statement, nested-if statement.

**Iterative Statements:** while loop, for loop, break statement, continue statement, pass and else statements used with loops.

**Module 3: SEQUENCES, SETS, DICTIONARIES AND REGULAR EXPRESSIONS** ***(11 Periods)***

**Sequences:** Lists and operations – Creating, Inserting elements, Updating elements, Deleting elements, Searching and sorting, List comprehensions, Nested lists; Tuples – Creating, Searching and sorting, Nested tuples; Strings – Initializing a string and string operations, String handling methods, String formatting.

**Sets**: Set creation, Set operations.

**Dictionaries:** Operations on dictionaries, Dictionary methods, Sorting elements using lambdas.

**Regular Expressions:** Regular expressions, Sequence characters in regular expressions, Quantifiers in regular expressions, Special characters in regular expressions.

**Module 4: FUNCTIONS AND FILE HANDLING** ***(09 Periods)***

**Functions:** Need for functions, Function definition, Function call, Variable scope and lifetime, Return statement, Positional arguments, Keyword arguments, Default arguments and variable length arguments, Recursive functions, Lambda functions, Generators.

**File Handling:** Types of files, Opening and closing files, Reading and writing data.

**Module 5: OBJECT ORIENTED PROGRAMMING AND EXCEPTION HANDLING** ***(10 Periods)***

**Object Oriented Programming:** Introduction to object-oriented programming, Classes and objects, Inheritance and polymorphism, Abstract Classes and interfaces.

**Exception Handling:** Errors in a python program, Exceptions, Exception handling, Types of exceptions, Except block, Assert statement, User defined exceptions.

***Total Periods: 45***

**LIST OF EXPERIMENTS:**

1) Design a python script to the perform the various computations for the amount payable by the customer for Challenger Computers Store. A customer buying two numbers of SSD device, one SSD device cost is Rs. 3575/-. The stores offer 15% of the total cost. The customer has to pay 9% CGST, and 9% SGST. Prepare the Net Amount to be payable by the customer.
2) Design a python script to compute and generate the electricity bill as per the following slab rates. Collect the meter reading inputs, such as current unit and previous unit.

| Consumption Units | Rate (in Rupees/Unit) |
|---|---|
| 0-200 | 3.0 |
| 201-250 | 4.5 |
| 251-300 | 5.2 |
| 301-400 | 6.5 |
| Above 400 | 7.0 |

3) Design a python script to display the sum of numbers divisible by 4. The code must allow the user to accept a number and add it to the sum if it is divisible by 4.

It should repeatedly accepting numbers as long as the user wants to provide an input using an appropriate iterative statement and should display the final sum.

4) Food Corner home delivers vegetarian and non-vegetarian combos to its customer based on order. A vegetarian combo costs Rs.120 per plate and a non-vegetarian combo costs Rs.150 per plate. Their non-veg combo is really famous that they get more orders for their non-vegetarian combo than the vegetarian combo.
Apart from the cost per plate of food, customers are also charged for home delivery based on the distance in kms from the restaurant to the delivery point. The delivery charges are as mentioned below:

| Distance in kms | Delivery charge in Rs per km |
|---|---|
| For first 3kms | 0 |
| For next 3kms | 3 |
| For the remaining | 6 |

Given the type of food, quantity (no. of plates) and the distance in kms from the restaurant to the delivery point, write a python program to calculate the final bill amount to be paid by a customer. The below information must be used to check the validity of the data provided by the customer.

- Type of food must be 'V' for vegetarian and 'N' for non-vegetarian.
- Distance in kms must be greater than 0.
- Quantity ordered should be minimum 1.
- If any of the input is invalid, bill amount should be considered as -1.

5) a) A list has the AP City Names [Tirupati, Kurnool, Kadapa]. Design a python script and perform the operations like, add 3 more AP City names Chittoor, Nellore, Guntur, insert Hyderabad in 3rd position, delete any two city names, update all city names as in Uppercase. Displays the list data, whenever an operation completes.

b) Design a python script for given an integer tuple, for each element in the tuple, check whether there exists a smaller element on the next immediate position of the tuple. If it exists print the smaller element. If there is no smaller element on the immediate next to the element then print -1.
Example: Input: 4 2 1 5 3 Output: 2 1 -1 3 -1

6) a) Sets n1 has the data {1, 3, 5, 7, 9}, n2 has the data {9, 5, 6, 8},
wd1=set(["Mon", "Tue", "Wed", "Thu", "Fri", "Sat", "Sun"]),
wd2=set(["Mon", "Tue", "Wed"]).
Design a python script to perform intersection, difference, and symmetric difference operations on the sets n1 and n2, and to perform superset, and subset operations on the sets wd1, and wd2.

b) The dictionary city_pin has the data {'Tirupati': 517101, 'Hyderabad': 500002, 'Chittoor': 517001,'Nellore': 524001}. Design a python script using lambda function to sort the dictionary on city name and produce the output and sort the dictionary on pincode and produce the output.

c) The string has the data, Wel_str = "Welcome to AI ML DS". Design a python script to search the pattern "AI" using regular expression search and display the three location numbers of the pattern. First shows the pattern starts location, second shows the pattern end location, and the last shows pattern span locations.

7) a) Design a python script for the mathematical puzzle, Towers of Hanoi. The puzzle has three rods and n disks. To move the entire stack to another rod, obeying the three rules (i) Only one disk can be moved at a time, (ii) Each move consists of taking the upper disk from one of the stacks and placing it on top of another stack i.e., a disk can only be moved if it is the uppermost disk on a stack, (iii) No disk may be placed on top of a smaller disk.

b) Design a python script to display the numbers that do not appear in the Fibonacci series of n numbers where n is given by the user. (If n is 8 then up

to 8 Fibonacci numbers has to be printed Ex: 1 1 2 3 5 8 13 21 and in this series missing numbers should be traced and printed, Ex: missing numbers are: 4 6 7 9 10 11 12 14 15 16 17 18 19.

8) a) Design a function Learner_Age_Days with two formal parameters name, age and it computes Learner's age in days, then displays learners name and age in days.
   (i) Design a driver code to call the function using positional arguments, keyword arguments
   (ii) Apply the necessary changes in Learner_Age_Days function, and design a driver code to call the function using default arguments.

   b) Design a python script using lambda and filter functions to construct an odd numbers list from numbers 1 to 10, and construct a negative numbers list from range of numbers -7 to 7 and to find the biggest number from a numbers list.

9) a) Design a python script to create a new file Collect_Literals_Phython.txt, collect the data from the keyboard about the contents of collection literals list, tuple, sets, dictionaries details, then write all the data into that file, and then close that file. Afterwards Open the Collect_Literals_Phython.txt file in read mode, read the entire contents of the file Collect_Literals_Phython.txt, then display all the contents of that file in monitor.
   b) The file feat_python1.txt has the contents of features of the Python programming language. Design a python script to open that file feat_python1.txt in read mode, open the new file in feat_python2.txt in write mode, then read entire contents of the file feat_python1.txt, then copy all the contents of that file into the new file feat_python2.txt

10) a) Construct a Python script to implement the below requirements. Create a base class Basic_Info with data members name, rollno, gender and two member functions getdata() and display(). Derive a class Physical_Fit from Basic_Info which has data members height and weight and member functions getdata() and display(). Display all the information using object of derived class.
   b) Design a Python script to implement the below specifications, compute, and produce required output. Define a class REPORT with the following specification

**Private members**

Admno : 4-digit admission number
Name : 20 characters
Marks : A list of 5 floating point values
Average : average marks obtained
GETAVG() a function to compute the average obtained in five subjects.

**Public members**

READINFO() function to accept values for Adno, Name, Marks. Invoke the function GETAVG ().
DISPLAYINFO() function to display all data members of report on the screen. You should give function definitions. Write driver code to demonstrate all the functions.

## RESOURCES

### TEXT BOOKS:


1. R. Nageswara Rao, *Core Python Programming*, 3rd Edition, Dreamtech Press, 2021.
2. Paul J. Deitel, Harvey Deitel, Python for Programmers with Big Data and Artificial Intelligence Case Studies, Pearson, 2019.


### REFERENCE BOOKS:

1. Charles Dierbach, *Introduction to Computer Science using Python: A Computational Problem Solving Focus*, Wiley India, 2016.
2. Christian Hil, Learning Scientific Programming with Python, 2nd Edition, Cambridge University Press, 2020.

**SOFTWARE/TOOLS:**

1. Python 3.10
2. Jupyter Notebook/JupyterLab/IDLE/Google CoLab

**VIDEO LECTURES:**

1. https://onlinecourses.nptel.ac.in/noc19_cs41/preview
2. https://www.coursera.org/specializations/python
3. https://www.coursera.org/learn/python-for-applied-data-science-ai
4. https://www.youtube.com/watch?v=WGJJIrtnfpk
5. https://www.youtube.com/watch?v=_uQrJ0TkZlc
6. https://www.udemy.com/topic/python/
7. https://freevideolectures.com/course/2512/python-programming

**WEB RESOURCES:**

1. https://www.w3schools.com/python/
2. https://www.programiz.com/python-programming
3. https://www.geeksforgeeks.org/python-programming-language/
4. https://www.javatpoint.com/python-lists
5. https://www.learnpython.org/

## PROGRAM CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM101009** | **ARTIFICIAL INTELLIGENCE** | 3 | - | - | - | 3 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Introduction to artificial intelligence, Designing intelligent agents, Solving general purpose problems, Search in complex environments, Probabilistic reasoning, Represent knowledge and reason under uncertainty, Robotics, Ethics and safety in AI.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Architect intelligent agents using artificial intelligence techniques and principles.

**CO2** Analyze and interpret the problem, identify suitable solutions using heuristic functions, optimization algorithms and search algorithms.

**CO3** Select and apply appropriate knowledge representation to build Bayesian network models to reason under uncertainty.

**CO4** Investigate robot hardware and frameworks for intelligent robotic perception.

**CO5** Demonstrate knowledge on ethical implications of intelligent machines for providing privacy, trust, security and safety.

**CO-PO-PSO Mapping Table:**

| Course Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PSO1** | **PSO2** | **PSO3** |
| **CO1** | 3 | 3 | - | 3 | - | - | - | 3 | - | - | - | 3 |
| **CO2** | 3 | 3 | - | 3 | - | - | - | - | - | - | - | 3 |
| **CO3** | 3 | 3 | - | - | - | - | - | - | - | - | - | 3 |
| **CO4** | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 |
| **CO5** | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 |
| **Course Correlation Mapping** | **3** | **2** | **-** | **3** | **-** | **-** | **-** | **3** | - | **-** | - | **3** |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

**COURSE CONTENT**

**Module 1:** **FOUNDATIONS OF ARTIFICIAL INTELLIGENCE** ***(09 Periods)***

Foundations of artificial intelligence, History of artificial intelligence, State of the art, Risks and benefits of AI, Intelligent agents – Agents and environments, The concept of rationality, Structure of agents.

**Module 2:** **PROBLEM SOLVING BY SEARCHING** ***(07 Periods)***

Problem solving agents, Search algorithms, Uninformed search strategies, Informed search strategies – Greedy best-first search, A* search; Heuristic functions.

**Module 3:** **SEARCH IN COMPLEX ENVIRONMENTS** ***(09 Periods)***

Local search algorithms and optimization problems – Hill-climbing search, Simulated annealing, Local beam search, Evolutionary algorithms; Optimal decisions in games – The minimax search algorithm, Optimal decisions in multiplayer games, Alpha-Beta pruning, Move ordering; Monte Carlo tree search.

**Module 4:** **ROBOTICS, ETHICS AND SAFETY IN AI** ***(10 Periods)***

**Robotics:** Robots, Robot hardware, Robotic perception, Alternative robotic frameworks, Application domains.

**Ethics and Safety in AI:** Limits of AI, Ethics of AI – Surveillance, security and privacy, Fairness and bias, Trust and transparency, AI safety.

**Module 5:** **ROBOTICS, ETHICS AND SAFETY IN AI** ***(10 Periods)***

**Robotics:** Robots, Robot hardware, Robotic perception, Alternative robotic frameworks, Application domains.

**Ethics and Safety in AI:** Limits of AI, Ethics of AI – Surveillance, security and privacy, Fairness and bias, Trust and transparency, AI safety.

***Total Periods: 45***

**LIST OF EXPERIMENTS**

1. Detect the language of the text using Language detection library (langdetect) ported from Google's language-detection.
2. Perform translation of given input text phrases or document using Google Translate API.
3. Detect multiple objects present in an image using Detectron-Facebook's free API.
4. Extract a 3D mesh model of a human body from 2D RGB images using Facebook's DensePose tool.
5. Real time Smile Detection in Human Face using OpenCV.
6. Face Recognition using Microsoft Face API.

7. Test and evaluate the performance of the Google Tesseract OCR tool in recognizing printed Text characters.
8. Build a Chatbot capable of communicating and interacting with the users based on the given text input.
9. Test and evaluate the videos using Google's tools

**RESOURCES**

**TEXTBOOKS:**

**1.** Stuart Russell, Peter Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, 4thEdition, 2020.

**REFERENCE BOOKS:**

1. Denis Rothman, Artificial Intelligence by Example, Packt Publishers, 2018.

2. Dr. Joshua Eckroth, Python Artificial Intelligence projects for Beginners, Packt Publishers, 2018.

**VIDEO LECTURES:**

**1.** Artificial Intelligence | Introduction | Lec-1| Bhanu Priya - YouTube

**2.** What Is Artificial Intelligence? | Artificial Intelligence (AI) In 10 Minutes | Edureka - YouTube

**WEB RESOURCES:**

1. https://searchenterpriseai.techtarget.com/definition/AI-Artificial-Intelligence
2. http://aima.cs.berkeley.edu/
3. https://ai.google/education/
4. https://www.coursera.org/courses?query=artificial%20intelligence
5. https://www.edureka.co/blog/artificial-intelligence-with-python/

# PROGRAM CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM101017** | **INTERNET OF THINGS** | 3 | - | | - | 3 |

**Pre-Requisite**

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Internet of Things Components; Domain Applications; Communication models; Sensors; Connectivity; Prototyping; Hardware; Design Methodology; Development platforms; Data Analytics for IoT; IoT Security..

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Understand IoT Architectures , communication technologies and various applications of IoT

**CO2** Learn IoT-related protocols and Smart Objects

**CO3** Understand hardware platforms and cloud services related to IoT

**CO4** Build IoT applications using Arduino and Raspberry Pi

**CO5** Understand data analytics concepts and security issues in the context of IoT

**CO-PO-PSO Mapping Table:**

| Learning Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | | | | PSO1 | PSO2 | PSO3 | |
| **CO1** | 3 | 2 | | | | | | | | | | | 3 | 2 | | |
| **CO2** | 3 | 2 | | | | | | | | | | | 3 | 2 | | |
| **CO3** | | 2 | 3 | | | | | | | | | | | 2 | 3 | |
| **CO4** | | | | 2 | 3 | | | | | | | | | | 2 | |
| **CO5** | | | 2 | 3 | | | | | | | | | | 2 | | |
| **Course Correlation Mapping** | **3** | **2** | **3** | **3** | **3** | | | | | | | | **2** | **2** | **2** | |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1: INTRODUCTION & DOMAIN APPLICATIONS** ***(09 Periods)***

**Introduction to Internet of Things:**

Definition, Conceptual Framework, Architectural View, Technology behind IoT, Communication Technologies, Data Enrichment, Data consolidation and Device management at Gateway.

**IoT and M2M:** M2M, Difference between IoT and M2M, SDN and NFV for IoT.

**Domain Specific IoTs:** Home automation, Cities, Environment, Health and Life Style.

**Module 2: SENSORS & CONNECTIVITY** ***(09 Periods)***

Sensor Technology, Actuators, RFID Technology, Internet Connectivity, Internet-Based Communications, IP Addressing in the IoT, Medium Access Control, Application Layer Protocols.

**Module 3: PROTOTYPING & HARDWARE** ***(8 Periods)***

Embedded Computing Basics, Embedded platforms for prototyping, Things always connected to the Internet/Cloud, Amazon Web Services for IoT.

**Module 4: DESIGN METHODOLOGY & CASE STUDIES** ***(10 Periods)***

**Design Methodology:** Purpose and Requirements specifications, Process Specifications, Domain Model Specification, Information Model Specification, Service Specification, IoT Level Specifications, Functional View Specification, Operational View Specification, Device and Component integration, Application development.

**Case Studies Illustrating IoT Design:** Home Automation, Cities.

**Module 5: DATA ANALYTICS FOR IOT& IoT Security** ***(9 Periods)***

**Data Analytics for IoT:**Apache Hadoop, Using HadoopMapReduce for Batch Data Analysis.

**IoT Security:** Vulnerabilities, Security Requirements and Threat analysis, Security Tomography and Layered Attacker Model, Identity Management and Establishment, Access Control and Secure Message Communication, Security Models, Profiles and Protocols for IoT

***Total Periods: 45***

**EXPERIENTIAL LEARNING**

1. (a) Design and Simulate LED 7-Segment Display interfacing with Arduino.
   (b) Design and Simulate Servo motor interfacing with Arduino.
2. (a) Design and Simulate ultrasonic sensor and LCD interfacing with Arduino.

(b) Design and Simulate Flame Sensor interfacing with Arduino.

3. Design and Implement to capture Gas Sensor and send sensor data to cloud from your

   NodeMCU device using Arduino IDE.

4. Design and Implementation of Humidity and Temperature Monitoring Using Arduino and

   upload data to cloud using MQTT.

5. Design and Implementation of an IoT ECG (Electrocardiogram) System to record hearts

   electrical activity.

**RESOURCES**

**TEXTBOOKS:**


1. ArshdeepBahga, Vijay Madisetti, Internet of Things – A hands-on approach, University Press, 2015.

2 Raj Kamal, Internet of Things- Architecture and Design Principles, McGraw Hill, 2017.


**REFERENCE BOOKS:**


1. Adrian McEwen and Hakim Cassimally, Designing the Internet of Things, Wiley Publishing, 2013.

2. CharlesBell, Beginning Sensor Networks with Arduino and Raspberry Pi, Apress, 2013.


**VIDEO LECTURES:**

1. https://www.digikey.com/en/maker/projects/how-to-interface-a-seven-segment-display-with-an-arduino/9c05f147618c4fe3b8bb79acce5c60e3

2. https://www.engineersgarage.com/interfacing-servo-motor-with-arduino-mega-2560/

**WEB RESOURCES:**

1. What Is the Internet of Things (IoT)? | Oracle India
2. Introduction to Cybersecurity | Codecademy
3. Iotellect - Home

## PROGRAM CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22MM101018 | INTRODUCTION TO INFORMATION RETRIEVAL SYSTEMS | 3 | - | - | - | 3 |

**Pre-Requisite**

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION**: Architecture of Information Retrieval Systems; Functional Capabilities; Data Structures; Mathematical Algorithms; Indexing; Similarity and Clustering; Human Perception and Presentation; Text Search Techniques and Evaluation Measures.

**COURSE OUTCOMES**: After successful completion of the course, students will be able to:

CO1 Analyze functionalities of information retrieval systems.

CO2 Apply data structures to manage data items and mathematical algorithms for information retrieval.

CO3 Create searchable index using item processing and automatic indexing techniques for information retrieval.

CO4 Apply similarity measures and clustering techniques to group similar items.

CO5 Demonstrate knowledge on information presentation.

**CO-PO-PSO Mapping Table:**

| Course Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 3 | - | 3 | - | - | - | 3 | - | - | - | 3 |
| CO2 | 3 | 3 | - | 3 | - | - | - | - | - | - | - | 3 |
| CO3 | 3 | 3 | - | - | - | - | - | - | - | - | - | 3 |
| CO4 | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 |
| CO5 | 3 | 3 | - | 3 | - | - | - | - | - | - | - | 3 |
| Course Correlation Mapping | 3 | 2 | - | 3 | - | - | - | 3 | - | - | - | 3 |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

**COURSE CONTENT**

**Module 1: INTRODUCTION** *(09 Periods)*

Primary information retrieval problems, Objectives of information retrieval system, Functional overview, Understanding the search functions, Relationship to DBMS, Digital libraries and data warehouses, Data structures and mathematical algorithms

**Module 2: INGEST AND INDEXING** *(07 Periods)*

Ingest: Introduction, Item receipt, Duplicate detection, Item normalization, Zoning and creation of processing tokens, Stemming, Entity processing, Categorization, Citational metadata. Indexing: Manual indexing process, Automatic indexing of text and multimedia

**Module 3: SEARCH AND CLUSTERING** *(09 Periods)*

Search: Similarity measures and ranking, Hidden-markov models, Ranking algorithms, Relevance feedback, Selective dissemination of information search, Weighted searches for boolean systems, Multimedia searching. Clustering: Introduction to clustering, Thesaurus generation, Item clustering, Hierarchy of clusters

**Module 4: INFORMATION PRESENTATION** *(10 Periods)*

Introduction, Presentation of the hits, Display of the item, Collaborative filtering, Multimedia presentation, Human perception and presentation

**Module 5: SEARCH ARCHITECTURE AND EVALUATION** *(10 Periods)*

Search Architecture: Index search optimization, Text search o ptimization, GOOGLE Scalable multiprocessor architecture. Evaluation: Information system evaluation, Measures used in system evaluation

*Total Periods: 45*

**EXPERIENTIAL LEARNING**

1. Presentation on image query processing i.e. about QBIC.
2. Presentation on one of the case studies of Information Retrieval System
3. Demonstrate the Collaborative filtering.
4. Explain GOOGLE Scalable multiprocessor architecture
5. Write about Information system evaluation in detail.

**RESOURCES**

**TEXTBOOKS:**

1. Gerald Kowalski, *Information Retrieval Architecture and Algorithms*, Springer Pvt. Ltd, 2013.

**REFERENCE BOOKS:**

1. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, *An Introduction to Information Retrieval*, Cambridge University Press, 2012.

2. Ricardo Baeza-Yates and Berthier Ribiero-Neto, *Modern Information Retrieval the Concepts and Technology behind Search*, Addison Wesley, 2nd Edition, 2010

**VIDEO LECTURES:**

1. Introduction to Information Retrieval Systems || || Information Retrieval Systems || IRS - YouTube
2. Basic Concepts of IRS System 1-6 - YouTube
3. Introduction to Information retrieval - YouTube

**WEB RESOURCES:**

1. 7 x 11.5 long title.p65 (cambridge.org)
2. Best Information Retrieval Courses & Certifications [2023] | Coursera

## PROGRAM CORE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM101014** | **INTRODUCTION TO CYBER SECURITY** | 3 | - | | - | 3 |

**Pre-Requisite**

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Cybercrime, Cyberoffenses, Phishing, Identity theft, Cybercrime in mobile and wireless devices, Organizational measures for handling mobile devices, Security implications on using mobile devices, Tools and methods used in cybercrime, Forensics of computer and handheld devices, Real-life examples of cybercrime

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Analyze methods of cybercrime, cyber offenses to maintain cyber security.

**CO2** Investigate tools used for cybercrime to protect computational assets.

**CO3** Apply appropriate authentication mechanisms to reduce attacks on mobile and wireless devices.

**CO4** Use appropriate cyber forensics tools and techniques to maintain cyber security.

**CO5** Recognize the need for cybersecurity and practice ethics to protect privacy, property rights in cyberspace.

### CO-PO-PSO Mapping Table:

| Course Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 |
| **CO1** | 3 | 3 | - | 3 | - | - | - | 3 | - | - | - | 3 |
| **CO2** | 3 | 3 | - | 3 | - | - | - | - | - | - | - | 3 |
| **CO3** | 3 | 3 | - | - | - | - | - | - | - | - | - | 3 |
| **CO4** | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 |
| **CO5** | 3 | 3 | - | 3 | - | - | - | - | - | - | - | 3 |
| **Course Correlation Mapping** | **3** | **2** | **-** | **3** | **-** | **-** | **-** | **3** | - | **-** | - | **3** |

*Correlation Levels: 3: High; 2: Medium; 1: Low*

## COURSE CONTENT

**Module 1:** **CYBERCRIME** ***(09 Periods)***

Cybercrime and information security, Cybercriminals, Classifications of cybercrimes, Need for Cyberlaws in Indian context, Legal perspectives of cybercrime, Indian perspective of cybercrimes, Cybercrime and the Indian ITA 2000, Positive aspects and weak areas of ITA 2000, Amendments made in Indian ITA 2000 for admissibility of e-records, Amendments to the Indian IT Act, Global perspective on cybercrimes, Intellectual property in cyberspace, Ethical dimension of cybercrimes

**Module 2:** **CYBEROFFENSES** ***(07 Periods)***

Categories of cybercrime, How criminals plan the attacks, Social engineering, Cyber stalking, Cybercafe and cybercrimes, Botnets, Attack vector, Cloud computing, Phishing – Methods, Techniques, Spear phishing, Phishing scams, Phishing toolkits, Spy phishing, Countermeasures; Identity Theft – Personally identifiable information, Types, Techniques, Countermeasures, Effacing online identity

**Module 3:** **CYBERCRIME IN MOBILE AND WIRELESS DEVICES** ***(09 Periods)***

Proliferation of mobile and wireless devices, Trends in mobility, Credit card frauds in mobile and wireless computing era, Security challenges posed by mobile devices, Registry settings for mobile devices, Authentication service security, Attacks on mobile/cell phones, Security implications of mobile devices for organizations, Organizational measures for handling mobile devices related security issues

**Module 4:** **TOOLS AND METHODS USED IN CYBERCRIME** ***(10 Periods)***

Proxy servers and anonymizers, Password cracking, Keyloggers and spywares, Virus and worms, Trojan horses and backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow, Attacks on wireless networks.

**Module 5:** **CYBERFORENSICS, CYBERCRIME IN REAL-WORLD** ***(10 Periods)***

**Forensics of Computer and Handheld Devices:** Cyberforensics, Cyberforensics and digital evidence, Forensics analysis of e-mail, Forensics and social networking sites, Forensics of handheld devices – Smartphone forensics, EnCase, Device Seizure, MOBILedit.

**Cybercrime examples, mini-cases, online scams:** Real-life examples - Official website of Maharashtra Government hacked, Indian banks lose millions of rupees, Game source code stolen; Mini-cases - Indian Case of online gambling, Indian case of intellectual property crime; Online scams - Cheque cashing scam, Charity scams.

***Total Periods: 45***

**EXPERIENTIAL LEARNING**

1. What are Cyber Attack and Cyber Threats?
2. Explain in detail about CIA Triad with neat diagram.
3. Discuss in detail about the Cyber Criminals.
4. What is attack? Explain Cyber Warfare.

**RESOURCES**

**TEXTBOOKS:**

1. Nina Godbole, SunitBelapure, *Cyber Security*: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley, 2013.

**REFERENCE BOOKS:**

1. Nilakshi Jain, Ramesh Menon, *Cyber Security and Cyber Laws*, Wiley, 2020.
2. Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short, *Cybersecurity Essentials*, 1st Edition, Sybex, 2018.
3. ErdalOzkaya, *Cybersecurity: The Beginner's Guide*, 1st Edition, Packt Publishing, 2019.

**VIDEO LECTURES:**

1. Cyber War Explained In 6 Minutes | What Is Cyber War? | Cyber Security For Beginners | Simplilearn - YouTube
2. Cyber Security Full Course 2023 | Cyber Security Course Training For Beginners 2023 | Simplilearn - YouTube

**WEB RESOURCES:**

1. Yuri Diogenes, ErdalOzkaya, *Cybersecurity: Attack and Defense Strategies*, 2nd Edition, Packt Publishing, 2019.
2. http://www.ignou.ac.in/upload/Announcement/programmedetails.pdf
3. Alessandro Parisi, *Hands-On Artificial Intelligence for Cybersecurity*, Packt Publishing, 2019.

# PROGRAM ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM101003** | **DATA COMMUNICATION AND NETWORKING** | 3 | - | - | - | 3 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** This course provides a detailed discussion Data Communications and networking. It familiarizes the students with the basics of data communications, OSI model and techniques, applications and control of modern data communications networks. Topics included are network models, digital and analog transmission, multiplexing, circuit and packet switching. This course will mainly focus to develop engineering skills in troubleshooting and designing data networks

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Understand the basics of data communication, networking, internet and their importance.

**CO2.** Understanding of the basic concepts of data communications and networking. The purpose of network layered models, the Open System Interconnect (OSI) and the Internet Model using TCP/IP protocols.

**CO3.** Analyze the services and features of various protocol layers in data networks.

**CO4.** Identify the basic security threats of a network and recognize the different internet devices and their functions..

## CO-PO-PSO Mapping Table:

| Course Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 |
| **CO1** | 3 | 2 | - | - | - | - | - | - | - | 3 | 3 | - |
| **CO2** | 3 | 2 | - | - | - | - | - | - | - | 3 | 3 | - |
| **CO3** | 3 | 3 | 3 | - | - | - | - | - | - | 3 | 3 | - |
| **CO4** | 3 | 3 | 3 | 2 | - | - | - | - | - | 3 | 3 | - |
| **Course Correlation Mapping** | **3** | **3** | **3** | **2** | **-** | **-** | **-** | **-** | - | **3** | **3** | **3** |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT:

**Module 1: Basics of Computer Network** ***(08 Periods)***

Computer Network: Definition, Goals, Structure; Broadcast and Point-ToPoint Networks; Network Topology and their various Types; Types of Network: LAN, MAN, WAN; Server Based LANs & Peer-to-Peer LANs; Communications Types: Synchronous, Asynchronous; Modes of Communication: Simplex, Half Duplex, Full Duplex; Protocols and Standards.

**Module 2: Network Models** ***(09 Periods)***

Network hardware - Network software – Network Architecture - Physical layer - Guided transmission media - Cable television.
Network Models Design Issues of the Layer, Protocol Hierarchy, ISO-OSI Reference Model : Functions of each Layer, Various Terminology used in Computer Network, Connection-Oriented & Connectionless Services, Internet (TCP/IP) Reference Model, Comparison of ISO-OSI and TCP/IP Model

**Module 3: Transmission Media** ***(10 Periods)***

Transmission Media Transmission Media, Guided Media (Wired) : Coaxial Cable: Physical Structure, Standards, BNC Connector, Applications, Twisted Pair : Physical Structure, UTP vs STP, Connectors, Applications, Fiber Optics Cable: Physical Structure, Propagation Modes (Single Mode & Multimode), Fiber Sizes, Connectors , Applications , Advantages & Disadvantages; Unguided Media(Wireless): Electromagnetic Spectrum for Wireless Communication, Propagation Methods, (Ground, Sky, Line-of-Sight); Wireless Transmission: Radio Waves, Infrared, Micro-wave; Wireless LANs (IEEE 802.11), Architecture, MAC Sub Layer, Frame Format, Frame Types; Bluetooth, Architecture ( Piconet, Scatternet, Bluetooth, Layers), Applications

**Module 4: Network Connectivity Devices** ***(08 Periods)***

Categories of Connectivity Devices, Passive and Active Hubs, Repeaters, Bridges, Switches (2-Layer Switch, 3-Layer, Switch(Router), Gateways, Network Security Devices (Firewalls, Proxy Servers)

**Module 5: Components of LAN and Internet** ***(10 Periods)***

Components of LAN Network Interface Card (NIC), Network Adapters, Components of NIC, Functions of NIC, Types of NIC; Ethernet : Basic Features, Types of Ethernet, Different Framer Format: IEEE 802.3, IEEE 802.4, IEEE 802.5

Internet Basics Internet: Growth, Architecture, Accessing, Internet Service Providers(ISP), Internet Addressing System:IP Address, DNS, URL; World Wide Web( WWW): Web Servers,Web Browsers, Search Engine; Concept of Intranet & Extranet.

***Total Periods: 45***

## Experiential Learning

1. What is meant by Data Communication and explain its characteristics?
2. What are the components of Data communication?
3. Explain different Data flow directions.
4. What is Network and explain characteristics of Networks?

## RESOURCES

**TEXT BOOKS:**

1. W. Stallings, "Data and Computer Communication", Pearson Education, 5th Edition,

2001

2. Behrouz A. Forouzan, "Data Communications and Networking", 4th Edition, McGraw Hill Education, 2007.

**REFERENCE BOOKS:**

1. William Stallings, "Local and Metropolitan Area Networks", 6th Edition, Pearson Education India, 2008.
2. Tannenbaum, A.S., "Computer Networks", 4th Edition, Prentice Hall, 2003.
3. Jim Kurose; Keith Ross, "Computer Networking: A Top-Down Approach", 6th Edition, Pearson Education, Inc, 2003.

**VIDEO LECTURES:**

1. https://www.youtube.com/watch?v=QY6K1G_UypM
2. https://www.youtube.com/watch?v=sG6WGvzmVaw

**Web Resources:**

1. https://in.coursera.org/learn/fundamentals-network-communications
2. https://in.coursera.org/browse/information-technology/networking
3. h https://www.classcentral.com/course/data-communication-network-services-9160

# PROGRAM ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22MM101004 | DESIGN AND ANALYSIS OF ALGORITHMS | 3 | - | - | - | 3 |

**Pre-Requisite** XXXX-

**Anti-Requisite** XXXX-

**Co-Requisite** XXXX-

**COURSE DESCRIPTION:** Algorithms and asymptotic notations; Algorithm performance analysis; Amortized analysis; Recurrences; Disjoint sets; Divide and Conquer; Dynamic programming; Greedy algorithms; Back tracking; Branch and bound; NP-hard and NPcomplete problems.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Analyze the complexity of algorithms by applying the knowledge of asymptotic notations and recurrence methods.

**CO2.** Analyze the given problem and identify appropriate algorithm design technique for problem solving.

**CO3.** Perceive and apply different algorithm design paradigms to find solutions for computing problems.

**CO4.** Apply the knowledge of NP-hard and NP-Complete complexity classes to classify decision problems.

**CO-PO-PSO Mapping Table:**

| Learning Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 2 | - | - | - | - | - | - | - | 3 | 3 | - |
| CO2 | 3 | 3 | - | - | - | - | - | - | - | 3 | 2 | - |
| CO3 | 2 | 3 | 3 | - | - | - | - | - | - | 3 | 3 | - |
| CO4 | 3 | 3 | - | - | - | - | - | - | - | 3 | 2 | - |
| **Course Correlation Mapping** | **3** | **2** | **3** | **-** | **-** | **-** | **-** | **-** | - | **3** | **2** | **-** |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

## COURSE CONTENT

**Module 1: INTRODUCTION TO ALGORITHMS** ***(10 Periods)***

Algorithm, Algorithm pseudocode conventions, Performance analysis - Space complexity, Timecomplexity, Asymptotic notations; Amortized analysis , Aggregate analysis, Accounting method,Potential method; Recurrences - Substitution method, Recursiontree method, Master method.

**Module 2: DISJOINT SETS, DIVIDE AND CONQUER** ***(08 Periods)***

**Disjoint Sets:** Operations, Union and Find algorithms.
**Divide and Conquer:** General method, Defective chess board, Binary search, Finding maximumand minimum, Merge sort, Strassen's matrix multiplication.

**Module 3 DYNAMIC PROGRAMMING** ***(09 Periods)***

General method, Matrix-chain multiplication, All pairs shortest path, Optimal binary search trees,0/1 Knapsack problem, Traveling salesperson problem, Flow shop scheduling.

**Module 4 GREEDY METHOD, BACKTRACKING** ***(10 Periods)***

**Greedy Method:** General method, Knapsack problem, Job sequencing with deadlines, Huffmancodes, Single source shortest paths, Optimal merge patterns.
**Backtracking:** General method, 8–Queens problem, Sum of subsets, Graph coloring, Hamiltonian
cycles.

**Module 5 BRANCH AND BOUND, NP-HARD AND NP-COMPLETE PROBLEMS** ***(08 Periods)***

**Branch and Bound:** LC search, LC branch and bound, FIFO branch and bound, 0/1 knapsackproblem, Traveling salesperson problem.
**NP Hard and NP-Complete Problems:** Nondeterministic algorithms, NP-hard and NPcompleteclasses, Cook's theorem, NP-hard scheduling problems – Scheduling identical processors.

***Total Periods: 45***

## EXPERIENTIAL LEARNING:

1. Design and develop shortest paths algorithm.
2. Demonstrate Warshall'salgorithm.
3. Implement 0/1 Knapsack problem using Dynamic Programming.
4. Find Minimum Cost Spanning Tree for a given undirected graph using Kruskal's algorithm.
5. Demonstrate Tree Traversal and Graph Traversal .

## RESOURCES

**TEXT BOOKS:**


1. Ellis Horowitz, Sartaj Sahni, and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, 2 nd Edition, Universities Press, 2008.

2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms,3rd Edition, MIT Press, 2009.


**REFERENCE BOOKS:**

1. Michael T. Goodrich and Roberto Tamassia, Algorithm Design and Applications, Wiley, 2014.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, The Design and Analysis of Computer Algorithms, Pearson, 2006.

**VIDEO LECTURES:**

1. https://nptel.ac.in/courses/106/106/106106131/
2. https://archive.nptel.ac.in/courses/106/101/106101060/
3. https://onlinecourses.nptel.ac.in/noc19_cs47/preview

**Web Resources:**

1. https://www.coursera.org/lecture/analysis-of-algorithms/resources-jMWPy
2. https://www.udemy.com/course/design-and-analysis-of-algorithms/
3. https://courses.cs.duke.edu/fall08/cps230/Book.pdf

# PROGRAM ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM101013** | **COMPUTER GRAPHICS** | 3 | - | - | - | 3 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Computer Graphics are created using 2D, 3D designs and Animation designs. In Computer Graphics course, students are usually taught subjects like 2D design, 3D design, web design, animation design, image processing etc. The concept of Physics, Optics, and Geometry are largely used in Computer Graphics

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO6.** Design and implement algorithms for 2D graphics primitives and attributes.

**CO7.** Illustrate Geometric transformations on both 2D and 3D objects.

**CO8.** Apply concepts of clipping and visible surface detection in 2D and 3D viewing, and Illumination Models.

**CO9.** Decide suitable hardware and software for developing graphics packages using OpenGL.

**CO10.** Explore projections and visible surface detection techniques for display of 3D scene on 2D screen

## CO-PO-PSO Mapping Table:

| Course Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 |
| **CO1** | 3 | 3 | - | 3 | - | - | - | 3 | - | - | - | 3 |
| **CO2** | 3 | 3 | - | 3 | - | - | - | - | - | - | - | 3 |
| **CO3** | 3 | 3 | - | - | - | - | - | - | - | - | - | 3 |
| **CO4** | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 |
| **CO5** | 3 | 3 | - | 3 | - | - | - | - | - | - | - | 3 |
| **Course Correlation Mapping** | **3** | **2** | **-** | **3** | **-** | **-** | **-** | **3** | - | **-** | - | **3** |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1: Overview** ***(09 Periods)***

Computer Graphics and OpenGL: Computer Graphics: Basics of computer graphics, Application of Computer Graphics, Video Display Devices: Random Scan and Raster Scan displays, graphics software. OpenGL: Introduction to OpenGL ,coordinate reference frames, specifying two-dimensional world coordinate reference frames in OpenGL, OpenGL point functions, OpenGL line functions, point attributes, line attributes, curve attributes, OpenGL point attribute functions, OpenGL line attribute functions, Line drawing algorithms(DDA, Bresenham"s), circle generation algorithms (Bresenham"s).

**Module 2: Fill area Primitives, 2D Geometric Transformations and 2D viewing** ***(09 Periods)***

Fill area Primitives: Polygon fill-areas, OpenGL polygon fill area functions, fill area attributes, general scan line polygon fill algorithm, OpenGL fill-area attribute functions. 2DGeometric Transformations: Basic 2D Geometric Transformations, matrix representations and homogeneous coordinates. Inverse transformations, 2DComposite transformations, other 2D transformations, raster methods for geometric transformations, OpenGL raster transformations, OpenGL geometric transformations function, 2D viewing: 2D viewing pipeline, OpenGL 2D viewing functions

**Module 3: Clipping, 3D Geometric Transformations, Color and Illumination Models** ***(09 Periods)***

Clipping: clipping window, normalization and viewport transformations, clipping algorithms,2D point clipping, 2D line clipping algorithms: cohen-sutherland line clipping only -polygon fill area clipping: Sutherland-Hodgeman polygon clipping algorithm only.3DGeometric Transformations: 3D translation, rotation, scaling, composite 3D transformations, other 3D transformations, affine transformations, OpenGL geometric transformations functions. Color Models: Properties of light, color models, RGB and CMY color models. Illumination Models: Light sources, basic illumination models-Ambient light, diffuse reflection, specular and phong model, Corresponding openGL functions.

**Module 4: 3D Viewing and Visible Surface Detection** ***(09 Periods)***

3DViewing:3D viewing concepts, 3D viewing pipeline, 3D viewing coordinate parameters , Transformation from world to viewing coordinates, Projection transformation, orthogonal projections, perspective projections, The viewport transformation and 3D screen coordinates. OpenGL 3D viewing functions. Visible Surface Detection Methods: Classification of visible surface Detection algorithms, depth buffer method only and OpenGL visibility detection functions.

**Module 5: Input & interaction, Curves and Computer Animation** ***(09 Periods)***

Input and Interaction: Input devices, clients and servers, Display Lists, Display Lists and Modeling, Programming Event Driven Input, Menus Picking, Building Interactive Models, Animating Interactive programs, Design of Interactive programs, Logic operations .Curved surfaces, quadric surfaces, OpenGL Quadric-Surface and Cubic-Surface Functions, Bezier Spline Curves, Bezier surfaces, OpenGL curve functions. Corresponding openGL functions.

***Total Periods: 45***

**EXPERIENTIAL LEARNING**

1. Describe how a color CRT works.
2. Describe the tristimulus theory of color perception and its relevance to computer displays.
3. What is the CIE Chromaticity diagram?

**TEXTBOOKS:**


1. Donald Hearn & Pauline Baker: Computer Graphics with OpenGL Version,3rd / 4th Edition, Pearson Education,2011
2 Edward Angel: Interactive Computer Graphics- A Top Down approach with OpenGL, 5th edition. Pearson Education, 2008


**REFERENCE BOOKS:**


1. James D Foley, Andries Van Dam, Steven K Feiner, John F Huges Computer graphics with OpenGL: pearson education

2. Kelvin Sung, Peter Shirley, steven Baer : Interactive Computer Graphics, concepts and applications, Cengage Learning

3 Xiang, Plastock : Computer Graphics , sham"s outline series, 2nd edition, TMG.


**VIDEO LECTURES:**

1. https://www.youtube.com/watch?v=qFwOg9M9s2U
2. https://www.youtube.com/watch?v=zi57OkPwzbk
3. https://www.youtube.com/watch?v=2tiLGgoAMcU
4. https://www.geeksforgeeks.org/videos/painters-algorithm-in-computer-graphics/
5. https://www.youtube.com/watch?v=U9NrXOBXA1I

**WEB RESOURCES:**

1. https://www.edx.org/learn/computer-graphics/
2. https://www.coursera.org/courses?query=computer%20graphics
3. https://onlinecourses.nptel.ac.in/noc20_cs90/preview

# PROGRAM ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM102011** | **Object Oriented System Design** | 3 | - | 2 | - | 4 |

**Pre-Requisite** **22MM101011-Software Engineering**

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Object-oriented analysis and design (OOAD) is a technical approach for analyzing and designing an application, system, or business by applying object-oriented programming, as well as using visual modeling throughout the software development process to guide stakeholder communication and product quality

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Select the basic elements of modeling such as Things, Relationships and Diagrams depending on the views of UML Architecture and SDLC.

**CO2** Apply basic and Advanced Structural Modeling Concepts for designing real time applications.

**CO3** Design Class and Object Diagrams that represent Static Aspects of a Software System.

**CO4** Analyze Dynamic Aspects of a Software System using Use Case, Interaction and Activity Diagrams.

**CO5** Apply techniques of State Chart Diagrams and Implementation Diagrams to model behavioral aspects and Runtime environment of Software Systems.

**CO-PO-PSO Mapping Table:**

| Course Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 |
| **CO1** | 3 | 3 | - | 3 | - | - | - | 3 | - | - | - | 3 |
| **CO2** | 3 | 3 | - | 3 | - | - | - | - | - | - | - | 3 |
| **CO3** | 3 | 3 | - | - | - | - | - | - | - | - | - | 3 |
| **CO4** | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 |
| **CO5** | 3 | 3 | - | 3 | - | - | - | - | - | - | - | 3 |
| **Course Correlation Mapping** | **3** | **2** | **-** | **3** | **-** | **-** | **-** | **3** | - | **-** | - | **3** |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1: Review of Object Oriented Systems** ***(09 Periods)***

Design Objects, Class hierarchy, inheritance, polymorphism, object relationships and associations, aggregations and object containment, object persistence, meta-classes, Object-oriented systems development life cycle, Software development process Object Oriented systems development: a use-case driven approach.

**Module 2: Methodology for Object Oriented Design** ***(09 Periods)***

Object modeling technique as software engineering methodology, Rumbaugh methodology, Jacobson Methodology, Booch Methodology, Patterns, Frameworks, the unified approach, unified modeling language (UML).

**Module 3: Unified Modeling language** ***(09 Periods)***

Introduction, UML diagrams, UML class diagrams, Use Case diagrams, UML dynamic modeling, Packages and model organization, UML extensibility, UML meta model.

**Module 4: Object Oriented Analysis** ***(09 Periods)***

Analysis Process, Use-Case Driven Object Oriented Analysis, Use-Case Model, Object Classification, Theory, Different Approaches for identifying classes, Classes, Responsibilities and Collaborators, Identifying Object Relationships, Attributes and Methods, Super-sub Class Relationships

**Module 5: Object Oriented Design** ***(09 Periods)***

Object oriented design process, corollaries, design axioms, design patterns, object oriented design philosophy, UML Object Constraint Language, Designing Classes: The Process, Class Visibility, Refining Attributes, Designing Methods and Protocols, Packages and Managing classes, Designing Interface Objects, View layer interface design, Macro and Micro level interface design process.

***Total Periods: 45***

## EXPERIENTIAL LEARNING

**List of Exercises**

1. E- R Diagram
2. Study of Class Diagram
3. Study of Use Case Diagram
4. Study of Sequence Diagram
5. Study of Activity Diagram
6. Study of package diagram
7. Study of State chart Diagram
8. Study of Collaboration Diagram

9. Study of Component Diagram
10. Study of Deployment Diagram

## RESOURCES

### TEXTBOOKS:

1. Ali Bahrami, Object Oriented Systems Development, McGraw Hill, 1999.

### REFERENCE BOOKS:

1. MichaelBlaha and James Rambaugh, Oriented Modeling and Design wih UML , PHI Learning pvt Ltd, second edition, 2008.

2. Grady Booch, Object-Oriented Analysis and Design with Applications, Addison-Wesley Professional, Second Edition , 1983.

### VIDEO LECTURES:

1. https://www.youtube.com/watch?v=fJW65Wo7IHI
2. https://www.youtube.com/watch?v=Oj0tVfwKmbA&list=PL0jWhwlG_ZXkWESywBdkFOxpwYI5fG6b6
3. https://www.youtube.com/watch?v=TGN48yc9aPU&list=PLhsqmA1RE0NEC15NCay3ObqcGaeHB_ebm

### WEB RESOURCES:

1. https://www.coursera.org/learn/object-oriented-design
2. https://www.udemy.com/topic/object-oriented-design/
3. https://onlinecourses.nptel.ac.in/noc22_cs99/preview

## PROGRAM ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM101015** | **DATA WAREHOUSING AND DATA MINING** | 3 | - | - | - | 3 |

**Pre-Requisite** **22MM102007-Database Management Systems**

**Anti-Requisite** XXXX-

**Co-Requisite** XXXX-

**COURSE DESCRIPTION:** Data Warehouse Components and Architecture; Data mining Functionalities; Data Preprocessing; Association Rule Mining; Classification and Clustering; Multimedia, Text, Web Data Mining and Applications.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Demonstrate knowledge on: Schemas of Data warehouse, Data preprocessing methods, Classification and Clustering techniques.

**CO2.** Analyze frequent item sets using Apriori and FP growth algorithms.

**CO3.** Design and develop solutions for different classification and prediction models.

**CO4.** Solve complex problems by adapting appropriate analysis and interpretation of different types of text, multimedia and web data.

**CO5.** Use WEKA tool for creation of weather, hospital, banking dataset and perform preprocessing on these datasets.

**CO-PO-PSO Mapping Table:**

| Learning Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 |
| **CO1** | 1 | 3 | 2 | 3 | 3 | - | - | - | - | - | 3 | - |
| **CO2** | 2 | 3 | 3 | 2 | 2 | - | - | - | - | - | 3 | - |
| **CO3** | 2 | 2 | 3 | 2 | 3 | - | - | - | - | - | 3 | - |
| **CO4** | 2 | 3 | 3 | 2 | - | - | - | - | - | - | | - |
| **CO5** | 2 | 2 | 3 | 2 | - | - | - | - | - | - | | - |
| **Course Correlation Mapping** | **2** | **3** | **3** | **2** | **3** | **-** | **-** | **-** | - | **-** | **2** | **-** |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

## COURSE CONTENT

**Module 1: INTRODUCTION AND DATA WAREHOUSE COMPONENTS** ***(08 Periods)***

**Introduction:** The need for Data Warehousing, Paradigm Shift, Business Problem Definition, operational and informational Data Stores, Data Warehouse Definition and Characteristics, Data Warehouse Architecture.
**Data Warehouse Components:** Overall Architecture, Data Warehouse Database, Sourcing, Acquisition , Cleanup and Transformation tools, meta data, data marts, Data Warehouse Administration and Management .

**Module 2: BUILDING A DATA WAREHOUSE AND INTRODUCTION TO DATAMINING** ***(10 Periods)***

**Building A Data Warehouse:** Business Consideration, Design considerations, Technical considerations, Implementation considerations, integrated solutions, Benefits of Data Warehousing, Multidimensional Data Model-From tables and spread sheets to Data Cubes and Star, Snowflake and fact constellation Schemas.
**Introduction to Data Mining:** Motivated Data Mining, Definition of Data Mining, Kinds of Data, Data mining Functionalities, classification of Data mining systems, Data mining primitives, Integration of Data mining Systems with a Database or Data Warehouse System, Major issues in Data Mining.

**Module 3 DATA PREPROCESSING AND ASSOCIATION RULE MINING** ***(08 Periods)***

**Data Preprocessing:** Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.
**Association Rule Mining:** Basic Concepts, The Apriori algorithm for finding frequent itemsets using candidate generation, Generating association rules from frequent itemsets, Mining frequent itemsets without candidate generation.

**Module 4 CLASSIFICATION AND CLUSTERING** ***(10 Periods)***

**Classification:** Definition of classification, Definition of prediction, issues in classification and prediction, Classification by Decision Tree Induction, Bayesian Classification, Accuracy and Error measures, evaluating the accuracy of a classifier or predictor, bagging.
**Clustering:** Introduction to cluster Analysis, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning methods - k-means and k-mediods methods, CLARANS, Hierarchical Methods-Agglomerative and divisive hierarchical clustering.

**Module 5 MULTIMEDIA, TEXT AND WEB DATA MINING APPLICATION** ***(09 Periods)***

**Mining different types of data:** Multimedia Data Mining, Text Mining - Text data analysis and informational retrieval, text mining approaches, Mining the World Wide Web- Mining web page layout structure, Mining web's link structures, Web usage mining.
**Data Mining Applications:** Financial data Analysis, Retail Industry, Telecommunication Industry.

***Total Periods: 45***

**LIST OF PROGRAMS:**

| | |
|---|---|
| 1 | Construct data acquisition process to extract, transform and load data from different databases. |
| 2 | Design and implement data acquisition process to perform<br>a) Expression Transformation<br>b) Joiner Transformation |
| 3 | Design and implement data acquisition process to perform<br>a) Aggregator Transformation<br>b) Source Qualifier Transformation |
| 4 | Design and implement data acquisition process to perform<br>a) Filter Transformation<br>b) Router Transformation |
| 5 | Design and implement data acquisition process to perform<br>a) Ranker Transformation<br>b) Sorter Transformation |

**Working with Data Mining - WEKA tool.**

| | |
|---|---|
| 6 | Creation on weather nominal and student results data sets in .arff and .csv formats |
| 7 | Perform data preprocessing steps on weather nominal and student information data setsas follows:<br>a) Handling of missing values for categorical and nominal values.<br>b) Selection of relevant attributes.<br>c) Applying normalization techniques |
| 8 | Perform Association rule mining algorithm on preprocessed data set. |
| 9 | Use Experimenter WEKA component to evaluate the accuracy and error measures of a classifier or predictor |
| 10 | Verify ID3 classifier performance using Gain ration and Ranker method using a Knowledgeflow WEKA component. |

## RESOURCES

**TEXT BOOKS:**


1. Jiawei Han and Micheline Kamber, "Data Mining–Concepts and Techniques," MorganKaufmann Publishers, 2nd Edition, 2006
2. Berson Alex and Stephen J Smith, "Data Warehousing, Data Mining and OLAP," TataMcGraw-Hill, 2004.


**REFERENCE BOOKS:**


1. Ralph Kimball, Margy Ross, Warren Thornthwaite and Joy Mundy, Bob Becker, "The DataWarehouse Life cycle Tool kit," John Wiley & Sons Inc, 2nd Edition, 2007.
2. William H Inmon, "Building the Data Warehouse," John Wiley & Sons Inc, 4th Edition, 2005.
3. Arun K Pujari, "Data Mining Techniques," Universities Press (India) Pvt. Ltd, 2nd Edition,2001.


**VIDEO LECTURES:**

1. https://nptel.ac.in/courses/106/105/106105174/

2. https://www.youtube.com/watch?v=vuc93jbO2Dw.
3. Tutorial on Data Mining Algorithms by Ian.

**WEB RESOURCES:**

1. Data Mining - Concepts and Techniques (3rd edition) by Jiawei Han, Micheline Kamber andJian Pei.
2. Mining of Massive Datasets by Anand Rajaraman and Jeff Ullman.
3. Open source tools for data mining: http://eprints.fri.uni-lj.si/893/1/2008-OpenSourceDataMining.pdf

## PROGRAM ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM102012** | **BIG DATA TECHNOLOGIES USING R** | 3 | - | 2 | - | 4 |

**Pre-Requisite** **22MM102007- Database Management Systems**

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** This course provides a detailed discussion on Introduction to Big Data, Data analysis using big data tools, data frames and charts and graphs.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Understand data and classification of digital data.

**CO2** Understand Big Data Analytics.

**CO3** Load data in to R.

**CO4** Organize data in the form of R objects and manipulate them as needed.

**CO5** Perform analytics using R programming.

**CO-PO-PSO Mapping Table:**

| Course Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 |
| **CO1** | 3 | 3 | - | 3 | - | - | - | 3 | - | - | - | 3 |
| **CO2** | 3 | 3 | - | 3 | - | - | - | - | - | - | - | 3 |
| **CO3** | 3 | 3 | - | - | - | - | - | - | - | - | - | 3 |
| **CO4** | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 |
| **CO5** | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 |
| **Course Correlation Mapping** | **3** | **2** | **-** | **3** | **-** | **-** | **-** | **3** | - | **-** | - | **3** |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

**COURSE CONTENT**

**Module 1: Introduction to Big data** ***(09 Periods)***

Data, classification Of Digital Data--structured, unstructured, semi-structured data, characteristics of data, evaluation of big data, definition and challenges of big data, what is big data and why to use big data ?, business intelligence Vs big data.

**Module 2: Big data Analytics** ***(08 Periods)***

What is and isn't big data analytics? Why hype around big data analytics? Classification of analytics, top challenges facing big data, importance of big data analytics, technologies needed to meet challenges of big data.

**Module 3: Introduction to R and getting started with R** ***(09 Periods)***

What is R? Why R? , advantages of R over other programming languages, Data types inR-logical, numeric, integer, character, double, complex, raw, ls() command, expressions, variables and functions, control structures, Array, Matrix, Vectors.

**Module 4: Exploring data in R** ***(09 Periods)***

Data frames-data frame access, ordering data frames, R functions for data frames dim(), nrow(), ncol(), str(), summary(), names(), head(), tail(), edit() .Load data frames—readingfrom .CSV files, reading from tab separated value files, reading from tables.

**Module 5: Data Visualization using R** ***(10 Periods)***

Reading and getting data into R (External Data): XML files, Web Data, JSON files, Databases, Excel files.

Working with R Charts and Graphs: Histograms, Bar Charts, Line Graphs, Scatter plots, Pie Charts.

***Total Periods: 45***

**LIST OF EXPERIMENTS**

**List of Exercises**

1. Create a vector in R and perform operations on it.
2. Create integer, complex, logical, character data type objects in R and print their valuesand their class using print and class functions.
3. Write code in R to demonstrate sum(), min(), max() and seq() functions.

4. Write code in R to manipulate text in R using grep(), toupper(), tolower() and substr()functions.
5. Create data frame in R and perform operations on it.
6. Import data into R from text and excel files using read.table () and read.csv () functions.
7. Write code in R to find out whether number is prime or not.
8. Print numbers from 1 to 100 using while loop and for loop in R.
9. Write a program to import data from csv file and print the data on the console.
10. Write a program to demonstrate histogram in R.

**RESOURCES**

**TEXTBOOKS:**


1. Seema Acharya , Subhashini Chellappan, Big Data And Analytics, Wiley, second edition, 2019.
2. Seema Acharya, Data Analytics using R, McGraw Hill education (India) Private Limited, First edition, 2018.


**REFERENCE BOOKS:**


1. W. N. Venables, D.M. Smith, An Introduction to R, Network theory Limited, second edition, 2009.


**VIDEO LECTURES:**

1. Data Analytics Using R | Introduction To Data Analytics | Data Analytics For Beginners | Simplilearn - YouTube
2. Data Analytics Using R | Introduction To Data Analytics | Data Analytics For Beginners | Simplilearn - YouTube

**WEB RESOURCES:**

1. columbia.edu/~sjm2186/EPIC_R/EPIC_R_BigData.pdf
2. Big Data Analytics - Introduction to R (tutorialspoint.com)

# PROGRAM ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM102013** | **Advance Java Script** | 3 | - | 2 | - | 4 |

**Pre-Requisite** **22MM102009-Web Technologies**

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** To impart knowledge in designing a webpage in a structured way by using advanced java script ie., using different scripting languages.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Implement web based applications using features of HTML and XML

**CO2** Develop reusable component for Graphical User Interface applications

**CO3** Apply the concepts of server side technologies for dynamic web applications

**CO4** Implement the web based applications using effective data base access with rich client interaction

**CO5** Summarize flow control. Demonstrate objects and arrays usage.

## CO-PO-PSO Mapping Table:

| Course Outcomes | Program Outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** |
| **CO1** | 3 | - | - | - | - | - | - | 2 | 2 |
| **CO2** | 3 | 2 | - | - | - | - | - | 2 | 2 |
| **CO3** | 2 | 3 | - | - | - | - | - | 2 | 2 |
| **CO4** | 2 | 3 | - | 2 | - | - | - | 2 | 2 |
| **CO5** | 2 | 2 | - | 3 | - | - | - | 2 | 2 |
| **Course Correlation Mapping** | **2** | **3** | **-** | **3** | **-** | **-** | **-** | **2** | **2** |

*Correlation Levels: 3: High; 2: Medium; 1: Low*

## COURSE CONTENT

**Module 1: QueryBasics** ***(09 Periods)***

String, Numbers, Boolean, Objects, Arrays, Functions, Arguments, Scope, Built-in Functions. jQuery – Selectors: CSS Element Selector, CSS Element ID Selector, CSS Element Class Selector, CSS Universal Selector, Multiple Elements E, F, G Selector, Callback Functions. jQuery – DOM Attributes: Get Attribute Value, Set Attribute Value. jQuery – DOM Traversing : Find Elements by index, Filtering out Elements, Locating Descendent Elements, JQuery DOM

Traversing Methods.

**Module 2: jQuery – CSS Methods** ***(09 Periods)***

Apply CSS Properties, Apply Multiple CSS Properties, Setting Element Width & Height, JQuery CSS Methods. jQuery – DOM Manipulation Methods: Content Manipulation, DOM Element Replacement, Removing DOM Elements, Inserting DOM elements, DOM Manipulation Methods. jQuery – Events Handling: Binding event handlers, Removing event handlers, Event Types, The Event Object, The Event Attributes. jQuery – Effects: JQuery Effect Methods, jQuery Hide and Show, jQuery Toggle, jQuery Slide – slideDown, slideUp, slideToggle, jQuery Fade – fadeIn, fadeOut, fadeTo, jQuery Custom Animations

**Module 3: Intro to jQuery UI** ***(09 Periods)***

Need of jQuery UI in real web sites, Downloading jQuery UI, Importing jQuery UI, Draggable, Droppable, Resizable, Selectable, Sortable, Accordion, Auto Complete, Button Set , Date Picker, Dialog, Menu, Progress Bar, Slider, Spinner, Tabs, Tooltip, Color Animation, Easing Effects, addClass, removeClass, Effects, jQuery UI themes, Customizing jQuery UI widgets / plug-ins, jQuery UI with CDN, Consuming jQuery Plug-ins from 3rd party web sites jQuery Validations, Intro to jQuery validation plug-in, Using jQuery validation plug-in, Regular expressions.

**Module 4: Intro to AJAX** ***(09 Periods)***

Need of AJAX in real web sites, Getting database data using jQuery- AJAX, Inserting, Updating, Deleting database data using jQuery-AJAX Grid Development using jQuery-AJAX Intro to **JSON** JSON syntax, Need of JSON in real web sites, JSON object, JSON array, Complex JSON objects, Reading JSON objects using jQuery.

**Module 5: Intro to AngularJS** ***(09 Periods)***

Need of AngularJS in real web sites, Downloading AngularJS, AngularJS first example, AngularJS built-in directives, AngularJS expressions, AngularJS modules, AngularJS controllers, AngularJS scope AngularJS dependency injection AngularJS, bootstrapping AngularJS data bindings, AngularJS $watch, AngularJS filters, AngularJS events, AngularJS AJAX, Ng-repeat, AngularJS with json arrays, AngularJS registration form and login form, AngularJS CRUD operations, AngularJS Animations, AngularJS validations AngularJS $q, AngularJS custom values, AngularJS custom factories, AngularJS custom services, AngularJS custom directives, AngularJS custom providers, AngularJS Routing, AngularUI Routing.

***Total Periods: 45***

**EXPERIENTIAL LEARNING**

**List of Exercises**

1. Creation of website for a small scale company Creation of website for a student database
2. Using jQuery find all textareas, and makes a border. Then adds all paragraphs tothe jQuery object to set their borders red.
3. Using jQuery add a new class to an element that already has a class.
4. Using jQuery insert a DOM element after all paragraphs.
5. Initialize the button and specify the disable option.
6. Initialize the button and specify an icon on the button.
7. Create a simple jQuery UI Datepicker. Now pick a date and store it in a textbox.
8. Initialize the datepicker and specify a text to display for the week of the yearcolumn heading.
9. Convert three headers and content panels into an accordion. Initialize theaccordion and specify the animate option
10. Convert three headers and content panels into an accordion. Initialize theaccordion and specify the height.

**RESOURCES**

**TEXTBOOKS:**

1. Dan Wellman, jQuery UI 1.8, Packt Pub Ltd, First edition, 2011.

**REFERENCE BOOKS:**

1. Rebecca Murphey, jQuery Fundamentals, Packt Pub Ltd, 2009.

**VIDEO LECTURES:**

1. https://www.youtube.com/watch?v=IljVmcDDrOg
2. https://www.youtube.com/watch?v=R9I85RhI7Cg
3. https://www.youtube.com/watch?v=l5IgdXi2UvY

**WEB RESOURCES:**

1. https://www.udemy.com/course/advanced-javascript-concepts/
2. https://practice.geeksforgeeks.org/courses/advanced-javascript-self-paced
3. https://www.coursera.org/courses?query=javascript

## PROGRAM ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM101005** | **COMPUTER NETWORKS** | 3 | - | - | - | 3 |

**Pre-Requisite** **22MM101003-Data Communication and Networking**

**Anti-Requisite** XXXX-

**Co-Requisite** XXXX-

**COURSE DESCRIPTION:** The course introduces an overview of the concepts and fundamentals of computer networks, data communication concepts and techniques in a layered network architecture and their protocols, switching and routing, types of communication, varioustypes of networks (LAN, MAN, WAN and Wireless networks); bridges, routers and gateways; ,network congestion, network topologies, network configuration and management, network model components, error detection and recovery; and local and remote procedures.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Analyze the types of network topologies, layers and protocols.

**CO2.** Evaluate sub netting and routing algorithms for finding optimal paths in networks.

**CO3.** Solve problems related to flow control, error control and congestion control in data transmission.

**CO4.** Assess the impact of wired and wireless networks in the context of network protocols Like DNS, SMTP, HTTP, and FTP.

**CO5.** Apply ethical principles and standards for developing network-based solutions.

**CO-PO-PSO Mapping Table:**

| Learning Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PSO 1 | PSO 2 | PSO 3 |
| **CO1** | 3 | 3 | 2 | - | - | - | - | - | - | | - | 3 |
| **CO2** | 3 | 2 | - | 3 | - | - | - | - | - | | - | 3 |
| **CO3** | 3 | 2 | - | 2 | - | - | - | - | - | | - | 3 |
| **CO4** | - | - | - | - | - | 2 | - | - | - | - | - | - |
| **CO5** | - | - | - | - | - | - | - | - | - | - | - | - |
| **Course Correlation Mapping** | **3** | **2** | **2** | **3** | **-** | **2** | **-** | **-** | - | | - | **3** |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

**COURSE CONTENT**

**Module 1: INTRODUCTION TO NETWORKS AND MODELS** ***(08 Periods)***

Introduction, Network models – Internet model, OSI model Physical Layer: Signals – Analog, Digital, Digital Transmission – Coding, Sampling, Analog Transmission – Modulation of digital and analog signal, Multiplexing – FDM, WDM, TDM, Transmission Media – cable, wireless, Circuit switching and Telephone network, DSL Technology, Cable modern, SONET

**Module 2: DATA LINK Layer** ***(10 Periods)***

Data Link Layer: Error detection and correction, Data link control and Protocols – Stop and wait, Go-back-n, Selective repeat, HDLC, point to point access, Channelization, LANS – Traditional Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LAN"s – IEEE 802.11, Blue tooth, Connecting LANs – Connecting devices, Backbone networks, Virtual LANS, Cellular telephony, Satellite networks, Virtual circuit switching, Frame relay, ATM.

**Module 3 NETWORK LAYER** ***(07 Periods)***

Network Layer:Inter-networks, Addressing, Routing, Network layer Protocols – ARP,IP, JCMP. IPV6, Routing – Introduction, Unicast routing, Protocols – RIP, OSPF, BGP, Multicast Routing, Protocols – DVMRP, MOSPF, CBT, PIM.

**Module 4 TRANSPORT LAYER** ***(10 Periods)***

Transport Layer: Process-to-Process Delivery, UDP, TCP, Data traffic, Congestion and Control, Quality of service (QOS) and techniques to improve QOS, Integrated services, QOS in Switched networks. Security: Introduction. Symmetric-key cryptography, public key cryptography, Message security, Digital signature, User authentication, Key management, Kerberos. Communication Security, Authentications Protocols, E-mail Security, Web security, Social Issues.

**Module 5 APPLICATION LAYER** ***(10 Periods)***

Application Layer: Design issues, file transfer, access and management. Client-Server model, Socket interface Introduction to DNS, Distribution of name space, DNS in the Internet. Electronic mail, SMTP, File Transfer, FTP, HTTP, World Wide web.

***Total Periods: 45***

**EXPERIENTIAL LEARNING:**

1. Linux Installation
2. Study of LAN environment
3. Networking commands in Linux

**RESOURCES**

**TEXT BOOKS:**


1. Forouzan B A, Data Communications and Networking, 4th edition, Tata McGraw
2. Tanenbaum A S, Computer Networks, 4th edition, Pearson Education, 2003.
3. Andrew S. Tanenbaum and David J. Wetherall, Computer Networks, Pearson, 5th Edition, 2015

**REFERENCE BOOKS:**


1. Stallings W, Data and Computer Communications, 7th edition, Pearson Education, 2004
2. Gallo M A, and Hancock W M, Computer Communications and Networking Technologies, Thomson Brooks/Cole, 2002.
3. Comer D E, Computer Networks – and Internets with Internet Applications, 4th edition, Pearson Education, 2004.
4. Kutose J F, and Ross K W, Computer Networking – A Top-down Approach Fealuring the Internet, Pearson Education, 2001.
5. Tomasi W, Introduction to Data Communications and Networking, Pearson Education, 2004.
6. Behrouz A. Forouzan, Data Communications and Networking, McGraw Hill, 5th Edition, 2013.
7. James F. Kurose and Keith W. Ross, Computer Networking: A Top-Down Approach, Pearson, 7th Edition, 2017.


**VIDEO LECTURES:**

1. https://nptel.ac.in/courses/106106091
2. https://www.digimat.in/nptel/courses/video/106105183/L01.html
3. https://www.youtube.com/watch?v=6_PINy02_g0
4. http://ns2simulator.com/ns2-tcp-congestion-control/

**WEB RESOURCES:**

1. https://www.cisco.com/c/en/us/solutions/smallbusiness/resourcecenter/networking/networking-basics.html
2. https://memberfiles.freewebs.com/00/88/103568800/documents/Data.And.Computer.Communications.8e.WilliamStallings.pdf
3. http://www.ns2blogger.in
4. https://memberfiles.freewebs.com/00/88/103568800/documents/Data.And.Computer.Communications.8e.WilliamStallings.pdf
5. https://www01.ibm.com/servers/resourcelink/svc0302a.nsf/pages/zVMV7R1sc246333/$file/kijl0_v7r1.pdf

# PROGRAM ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22MM101016 | SOFTWARE PROJECT MANAGEMENT | 3 | - | - | - | 3 |

**Pre-Requisite** 22MM101011-Software Engineering

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Software project management and its importance, Plans, methods and methodologies, Software processes and process models, Stepwise project planning, Software effort estimation, Cost estimation, Activity planning, Plan models, Critical path and critical activities, Risk management, Resource allocation, Monitoring andcontrol, Managing people, Software quality.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Apply knowledge of software project management, project plans, process modelsfor efficient implementation and completion of projects.

**CO2.** Estimate effort for the project to assign and schedule available resources in themost effective and economical way possible.

**CO3.** Develop network models for sequences of activities in a project for effective projectmanagement.

**CO4.** Identify the risk factors, monitor the progress and quality of projects to takemitigating actions.

**CO5.** Recognize the need for organizational behavior, teamwork and communication toimprove the performance on projects.

## CO-PO-PSO Mapping Table:

| Course Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 3 | - | 3 | - | - | - | 3 | - | - | - | 3 |
| CO2 | 3 | 3 | - | 3 | - | - | - | - | - | - | - | 3 |
| CO3 | 3 | 3 | - | - | - | - | - | - | - | - | - | 3 |
| CO4 | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 |
| CO5 | 3 | 3 | - | 3 | - | - | - | - | - | - | - | 3 |
| **Course Correlation Mapping** | **3** | **2** | **-** | **3** | **-** | **-** | **-** | **3** | - | **-** | - | **3** |

*Correlation Levels: 3: High; 2: Medium; 1: Low*

**COURSE CONTENT**

**Module 1: Introduction to Software Project Management:** ***(09 Periods)***

Importance of software project management, Defining project, Software projects versus other types of project, Contract management and technical project management, Activities covered by software project management, Plans, methods and methodologies, Categorizing software projects, Project charter, Stakeholders, Setting objectives, The business case, Project success and failure,Management and management control, Project management life cycle, Traditional versusmodern project management practices.

**Module 2: PROJECT APPROACH AND EFFORT ESTIMATION** ***(09 Periods)***

**Selection of Project Approach**: Build or buy, Choosing methodologies and technologies, Software processes and process models, Choice of process models, Spiral model, Software prototyping, Incremental delivery, Agile methods.

**Software Effort Estimation:** Effort estimation, Problems with over and under estimates, Basis for software estimating, Software effort estimation techniques, Bottom-up estimating, The top-down approach and parametric models, Albrecht function point analysis, COCOMO II.

**Module 3: ACTIVITY PLANNING AND RISK MANAGEMENT** ***(09 Periods)***

**Activity Planning:** Objectives of activity planning, Projects and activities, Sequencing and scheduling activities, Network planning models, Formulating a network model, Adding the time dimension, The forward pass, The backward pass, Identifying the critical path and critical activities, Activity float.

**Risk Management:** Risk, Categories of risk, Risk management approaches, A framework for dealing with risk, Risk identification, Risk assessment, Risk planning, Risk management, PERT technique, Monte Carlo simulation.

**Module 4: RESOURCE ALLOCATION, MONITORING AND CONTROL** ***(09 Periods)***

**Resource Allocation:** Nature of resources, Identifying resource requirements, Scheduling resources, Creating critical paths, Publishing resource schedule, Cost schedules, Scheduling sequence.

**Monitoring and Control:** Creating framework, Review, Visualizing progress, Cost monitoring, Earned value analysis, Prioritizing monitoring, Getting the project back to target, Change control, Software configuration management.

**Module 5: MANAGING PEOPLE, QUALITY IN SOFTWARE ENVIRONMENT** ***(09 Periods)***

**Managing People:** Organizational behavior, Oldham-Hackman job characteristics model, Ethical and professional concerns, Working in teams – Decision making, Organization and

team structures, Dispersed and virtual teams, Communication genres and plans, Leadership.

**Software Quality:** The place of software quality in project planning, Importance of software quality, Defining software quality, Software quality models, ISO 9126, Process capability models, Quality plans.

***Total Periods: 45***

**EXPERIENTIAL LEARNING**

| | |
|---|---|
| 1. | Requirement Management Plan |
| 2. | Use Case Diagram. |
| 3. | Sequence Diagram |
| 4. | Collaboration Diagram |
| 5. | Activity Diagram |

| **TEXTBOOKS:** | |
|---|---|
| **1.** | Bob Hughes, Mike Cotterell, Rajib Mall, *Software Project Management*, 6th Edition,McGraw Hill, 2018. |
| **REFERENCE BOOKS:** | |
| 1. | Michele Sliger and Stacia Broderick, *The Software Project Manager's Bridge to Agility*,Addison-Wesley, 2008. |
| 2. | Pankaj Jalote, *Software Project Management in Practice*, Pearson, 2002. |
| **VIDEO LECTURES:** | |
| 1. | https://onlinecourses.nptel.ac.in/noc19_cs70/preview |
| 2. | https://www.youtube.com/watch?v=ZRaZVLRXctU |
| 3. | https://www.youtube.com/watch?v=vi1NFF1OTPc |
| **WEB RESOURCES:** | |
| 1. | https://www.udemy.com/course/software-project-management-the-complete-course/. |
| 2. | https://www.coursera.org/courses?query=software%20project%20management. |
| 3. | https://onlinecourses.nptel.ac.in/noc19_cs70/preview |

# PROGRAM ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM101019** | **BLOCK CHAIN TECHNOLOGIES** | 3 | - | - | - | 3 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Introduction to Blockchain Technologies and its decentralization concepts, Digital Currencies, Smart Contracts, Ethereum, Hyperledger, Alternative Blockchains, Current Challenges and Scope of Research.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Analyze the concepts of distributed systems, decentralization and blockchains in the Blockchain ecosystem.

**CO2.** Devise suitable Blockchain platforms for scalable applications.

**CO3.** Assess the challenges, trending technologies for understanding the research scope in Blockchain technologies.

**CO4.** Pertain to ethical and legal usage of Blockchain applications.

**CO5.** Formulate secured and sustainable Blockchains for healthy and safe society.

**CO-PO-PSO Mapping Table:**

| Course Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 |
| **CO1** | 3 | 3 | - | 3 | - | - | - | 3 | - | - | - | 3 |
| **CO2** | 3 | 3 | - | 3 | - | - | - | - | - | - | - | 3 |
| **CO3** | 3 | 3 | - | - | - | - | - | - | - | - | - | 3 |
| **CO4** | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 |
| **CO5** | 3 | 2 | - | 3 | - | - | - | - | - | - | - | 3 |
| **Course Correlation Mapping** | **3** | **2** | **-** | **3** | **-** | **-** | **-** | **3** | - | **-** | - | **3** |

*Correlation Levels: 3: High; 2: Medium; 1: Low*

**COURSE CONTENT:**

**Module 1: Overview of Block Chain** ***(09 Periods)***

The Internet of Information, In Search of the Trust Protocol, What is Block chain?, Practitioner Perspective: Andreas Wallendahl, Head of Strategic Initiatives at ConsenSys, Practitioner Perspective: Rob Carter, Executive VP and CIO, FedEx40s,Achieving Trust in the Digital Age, How Blockchain Works, The Internet of Information, In Search of the Trust Protocol / What is Blockchain,

Achieving Trust in the Digital Age, How Blockchain Works, The Second Era of the Internet, Steps of a Blockchain Transaction

**Module 2: Blockchain Design Principles** ***(07 Periods)***

Intro to Blockchain Design Principles, Principle 1: Networked Integrity, Principle 2: Distributed Power, Practitioner Perspective: Rob Carter, Executive VP and CIO, FedEx1m, Principle 3: Value as Incentive, Principle 4: Security. Principle 5: Privacy, Principle 6: Rights Preserved, Principle 7: Inclusion, Practitioner Perspective: Julie Maupin, Director of Social Impact & Regulatory Affairs at IOTA Foundation, Privacy Rights and Inclusion, Blockchain Design Principles

**Module 3: Public and Private Ledgers** ***(09 Periods)***

The Benefits of Shared Knowledge, How Much is Too Much Transparency, Centralized vs. Distributed Ledgers ,Public vs Private Ledgers, Practitioner Perspective: Rolf Hoefer, Keyless Technologies.

Practitioner Perspective: Andreas Wallendahl, Head of Strategic Initiatives at ConsenSys, Transparency as a Strategic Risk, Transparency as a Strategic Asset , Usage of Multiple IDs, Zero Knowledge Proofs, Implementation in Public vs. Private Block chains.

**Module 4: The Blockchain Ecosystem** ***(10 Periods)***

Intro to the Blockchain Ecosystem ,Blockchain Stakeholders Part, Practitioner Perspective: Rob Carter, Executive VP and CIO, FedEx, Blockchain Stakeholders Part ,Blockchain Stakeholders Part ,Practitioner Perspective: Oleg Fomenko, Co-founder of Sweatcoin, Stewarding the Blockchain Revolution

**Module 5: Blockchain Implementation Challenges** ***(10 Periods)***

Overcoming Showstoppers, Challenge 1: The Technology is Not Ready for Prime Time, Challenge 2: The Energy Consumed is Unsustainable, Challenge 3: Governments Will Stifle or Twist It, Practitioner Perspective: Oleg Fomenko, Co-Founder at Sweatcoin, Practitioner Perspective: Will Harborne, Director of Operations at Ethfinex, Challenge 4: Powerful Incumbents of the Old Paradigm Will Usurp It, Challenge 5: The Incentives are Inadequate. Challenge 6: Blockchain is a Job Killer, Challenge 7: Governing the Protocols, Practitioner Perspective: Rob Carter, Executive VP and CIO, FedEx, Challenge 8: Distributed Autonomous Agents, Challenge 9: Privacy, Challenge 10: Criminals Will Use It, Reasons Blockchain Will Fail or Implementation Challenges? Course Wrap-up

**TOTAL HOURS:45**

**EXPERIENTIAL LEARNING:**

**Part 1** Understanding Block using (https://tools.superdatascience.com/Blockchain/block)

1.1 Understanding Block chain using (https://tools.superdatascience.com/Blockchain/Blockchain)

1.2 Understanding Distributed Blockchain using https://tools.superdatascience.com/Blockchain/distributed

1.3 Understanding Tokens using https://tools.superdatascience.com/Blockchain/tokens

1.4 Understanding coin based transaction using (https://tools.superdatascience.com/Blockchain/tokens)

**Part 2** Using JavaScript Perform following (Source: YouTube Channel: Simply Explain Savjee)

2.1 Creating a Blockchain

2.2 Implementing Proof-of-Work

2.3 Miner rewards & transactions

2.4 Signing transactions

2.5 Angular frontend

**Part 3** Introduction to Geth:

3.1 Introduction to geth

3.2 Creation of private Blockchain

3.2 Creation of Account

3.4 Mining using geth

**Part 4** Introduction to Remix Ethereum:

4.1 Introduction to Metamask

4.2 Creation of account using Metamask

4.3 Introduction to Remix Ethereum

4.4 Introduction to solidity program structure, compilation and deployment environment.

4.5 Write a smart contract in solidity to store and get "Hello World".

4.6 Write a smart contract in solidity to create a function setter and getter to set and get a value.

4.7 Write a smart contract in solidity to print the array of integers and its length.

4.8 Write a solidity code to print array elements and its position.

**Part 5** Introduction to Ethereum-Ganache:

5.1 Creation of account using Ganache.

5.2 Introduction to solidity smart contract compilation and deployment environment.

5.3 Write a smart contract in solidity to store and get "Hello World".

## RESOURCES:

### TEXT BOOKS:


1. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Second Edition, Packt Publishing, 2018


### REFERENCE BOOKS:


1. Arshdeep Bahga, Vijay Madisetti, "Blockchain Applications: A Hands On Approach", VPT, 2017.
2. Roger Wattenhofer, "The Science of the Blockchain" CreateSpace Independent Publishing, 2016.
3. A. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press, 2016.


### VIDEO LECTURES:

1. https://in.coursera.org/learn/introduction-blockchain-technologies

### WEB RESOURCES:

1. https://www.udemy.com/topic/blockchain/
2. https://in.coursera.org/courses?query=blockchain
3. https://www.simplilearn.com/blockchain-certification-training-course

# PROGRAM ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22MM101020 | CYBER SECURITY ESSENTIALS | 3 | - | - | - | 3 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION**: The Cyberecurity Essentials course develops foundational understanding of cybersecurity and how it relates to information and network security. The 30-hour course introduces students to characteristics of cyber crime, security principles, technologies, and procedures to defend networks. Through interactive, multimedia content, lab activities, and multi-industry case studies, students build technical and professional skills to pursue careers in cybersecurity.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Analyze and evaluate the cyber security needs of an organization.

**CO2.** Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation.

**CO3.** The students can use basic security tools to enhance system security and can develop basic security enhancements in stand-alone applications.

**CO4.** Demonstrate knowledge on network and Internet security techniques for addressing the security threats.

**CO-PO-PSO Mapping Table**:

| Course Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 3 | - | 3 | - | - | - | 3 | - | - | - | 3 |
| CO2 | 3 | 3 | - | 3 | - | - | - | - | - | - | - | 3 |
| CO3 | 3 | 3 | - | - | - | - | - | - | - | - | - | 3 |
| CO4 | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 |
| **Course Correlation Mapping** | **3** | **2** | **-** | **3** | **-** | **-** | **-** | **3** | - | **-** | - | **3** |

*Correlation Levels: 3: High; 2: Medium; 1: Low*

## COURSE CONTENT

**Module 1: NETWORK & SECURITY CONCEPTS** ***(09 Periods)***

Introduction - - Cyber Security Goals - - Security Attacks - - Passive Attacks – Release of Message Contents – Traffic Analysis - - Active Attacks – Masquerade – Replay – Modification of Messages – Denial of Service - - Examples

**Module 2: ATTACKER TECHNIQUES** ***(07 Periods)***

Introduction - - Antiforensics – Using Proxies – Using Tunneling – Using Botnets – Using Fast Flux - - Fraud Techniques – Phishing – Rogue Antivirus – Click Fraud - - Cyber Security Statistics

**Module 3: EXPLOITATION** ***(09 Periods)***

Introduction - - Malware - - Types of Malware – VIRUS – Computer Worm – Trojan Horse – Ransomware - - Cyber Attacks - - Denial of Service Attacks - - Man-in-the-Middle Attacks - - SQL Injection Attacks

**Module 4: MUTUAL TRUST** ***(10 Periods)***

**Key Management and Distribution:** Symmetric key distribution using symmetric and asymmetric encryption, Distribution of public keys, X.509 certificates, Public key infrastructure.

**User Authentication:** Remote user authentication principles, Kerberos, Personal identity verification.

**Module 5: DEFENSE & ANALYSIS TECHNIQUES** ***(10 Periods)***

**Introduction:** The Power of Active Defense, Cyber Security Defenses, Firewall, Antivirus Software, Cyber Security Tools, Basic Tools, Monitoring Tools, Expert Tools, Android Security Apps, Tips for Securing Your System

***Total Periods: 45***

**EXPERIENTIAL LEARNING:**

1. Study of Firewalls.
2. Study of IAM.
3. Study of patch management.
4. Study of insider threat Detection.

## RESOURCES

**TEXT BOOKS:**


1. Charles J Brooks, Christopher Grow, Philip A. Craig, Donald Short, "Cybersecurity Essentials", Sybex Publishers, First edition, 2018.
2. Wade Trappe, Lawrence C Washington, " Introduction to Cryptography with coding theory", Pearson Education, Second edition, 2011.


**REFERENCE BOOKS:**


1. William Stallings, Network Security Essentials: Applications and Standards, 6th Edition, Pearson, 2018.

2. Douglas R. Stinson, Maura B. Paterson, Cryptography: Theory and Practice, 4th Edition, CRC Press, 2018.
3. Atul Kahate, Cryptography and Network Security, 3rd Edition, McGraw Hill, 2017.

**VIDEO LECTURES:**

1. http://nptel.ac.in/courses/106105031/lecture by Dr. Debdeep MukhopadhyayIIT Kharagpur

**WEB RESOURCES:**

1. https://www.udemy.com/introduction-to-cryptography-online-course-rahsoft-cryptocertificate/
2. https://www.coursera.org/learn/asymmetric-cryptography
3. https://www.khanacademy.org/computing/computer-science/cryptography

# PROGRAM ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM101001** | **FUNDAMENTALS OF DIGITAL ELECTRONICS AND LOGIC DESIGN** | 3 | - | - | - | 3 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** This course provides a detailed discussion on Foundations in design and analysis of the operation of digital gates, Concepts of Boolean algebra, Minimization of logic circuits, Design and implementation of combinational and sequential logic circuits, Analysis and design of flip-flops, registers, and counters and comparison of their behavior and characteristics, Design digital systems using Programmable Logic.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Apply knowledge of binary systems, logic gates and Boolean functions to represent a given problem using Boolean logic.

**CO2.** Minimize and implement Boolean functions to build combinational logic circuits.

**CO3.** Design combinational and sequential logic circuits for digital systems.

**CO4.** Design digital systems using programmable logic to solve engineering problems.

## CO-PO-PSO Mapping Table:

| Course Outcomes | Program Outcomes | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 |
| **CO1** | 3 | 2 | - | - | - | - | - | - | - | 3 | 3 | - |
| **CO2** | 3 | 2 | - | - | - | - | - | - | - | 3 | 3 | - |
| **CO3** | 3 | 3 | 3 | - | - | - | - | - | - | 3 | 3 | - |
| **CO4** | 3 | 3 | 3 | 2 | - | - | - | - | - | 3 | 3 | - |
| **Course Correlation Mapping** | **3** | **3** | **3** | **2** | **-** | **-** | **-** | **-** | - | **3** | **3** | **3** |

*Correlation Levels: 3: High; 2: Medium;1: Low*

## COURSE CONTENT:

**Module 1: BINARY SYSTEMS AND BOOLEAN ALGEBRA** ***(10 Periods)***

Introduction, Binary Numbers, Number Base Conversions, Complements of Numbers, Binary Codes, Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Digital Logic Gates.

**Module 2: GATE LEVEL MINIMIZATION** ***(09 Periods)***

K-Map, Four Variable K-Map, Product-of-Sums and Sum-of-Products Simplification, Don't Care Conditions, NAND and NOR Implementations, Other Two Level Implementations, Exclusive–OR function.

**Module 3: COMBINATIONAL LOGIC** ***(09 Periods)***

Combinational Circuits, Analysis of Combinational Circuits, Design Procedure, Binary Adder-Subtractor, Magnitude Comparator, Decoders, Encoders, Multiplexers, De-Multiplexers.

**Module 4: SEQUENTIAL LOGIC** ***(10 Periods)***

Latches, Flip-Flops, Design of Synchronous Sequential Circuits, Registers, Shift Registers, Ripple Counters, Ring Counter.

**Module 5: PROGRAMMABLE LOGIC** ***(07 Periods)***

RAM, ROM, Programmable Logic Array, Programmable Array Logic, Sequential Programmable Devices.

***Total Periods: 45***

## EXPERIENTIAL LEARNING:

Design a digital circuit system of the vehicle with two photocell sensors, which work as inputs with the following conditions.

1. a. A BCD code is being transmitted to a remote receiver. The bits are A3, A2, A1, and A0, with A3 as the MSB. The receiver circuitry includes a BCD error detector circuit that examines the received code to see if it is a legal BCD code (i.e., ≤1001). Design this circuit to produce a HIGH for any error condition and also design a two bit BCD adder circuit.
   b. A photo detector circuit is being used to generate a pulse each time a customer walks into a certain establishment. The pulses are fed to an eight-bit counter. The counter is used to count these pulses as a means for determining how many customers have entered the store. After closing the store, the proprietor checks the counter. Design a counter for this application.
2. Consider a digital thermostat in which the measured room temperature is converted to a digital number and applied to the A inputs of a comparator. The desired room temperature, entered from a keypad, is stored in a register that is connected to the B inputs. If the furnace should be activated to heat the room. The furnace should continue to heat while and shut off when. As the room cools off, the furnace should stay off while and turn on again when. What digital circuit can be used to interfacea magnitude comparator to a furnace to perform the thermostat control application described above?

3. Four large tanks at a chemical plant contain different liquids being heated. Liquid-level sensors are being used to detect whenever the level in tank A or tank B rises above a predetermined level. Temperature sensors in tanks C and D detect when the temperature in either of these tanks drops below a prescribed temperature limit. Assume that the liquid-level sensor outputs A and B are LOW when the level is

satisfactory and HIGH when the level is too high. Also, the temperature-sensor outputs C and D are LOW when the temperature is satisfactory and HIGH when the temperature is too low. Design a logic circuit that will detect whenever the level in tank A or tank B is too high at the same time that the temperature in either tank C or tank D is too low.

4. A manufacturing plant needs to have a horn sound to signal quitting time. The horn should be activated when either of the following conditions is met:

   i. It's after 5 o'clock and all machines are shut down.
   ii. It's Friday, the production run for the day is complete, and all machines are shut down.
   Design a logic circuit that will control the horn. (Hint: Use four logic input variables to represent the various conditions; for example, input A will be HIGH only when the time of day is 5 o'clock or later)

## RESOURCES

### TEXT BOOKS:


1. M. Morris Mano, Michael D. Ciletti, Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog, 6th edition, Pearson, 2018.
2. A. Anand Kumar, Switching Theory and Logic Design, 3rd edition, PHI Learning Private Limited, India, 2016.


### REFERENCE BOOKS:


1. Charles H. Roth, Jr. and Larry L. Kinney, Fundamentals of Logic Design, 7th edition, Cengage Learning, 2015.
2. Alan B. Marcovitz, Introduction to Logic Design, 3rd edition, McGraw Hill, 2010


### VIDEO LECTURES:

1. https://nptel.ac.in/courses/106/108/106108099/
2. https://nptel.ac.in/courses/106105185

### WEB RESOURCES:

1. https://www.rapidtables.com/convert/number/base-converter.html
2. https://learnabout-electronics.org/Digital/dig10.php
3. https://coderstoolbox.net/number/

# PROGRAM ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22CA101015** | **CLOUD COMPUTING** | **3** | **-** | **-** | **-** | **3** |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Virtualization, Cloud Computing Fundamentals, Deployment Models; Cloud Computing Architecture; Cloud Computing Mechanisms; Cloud Security; Working with Clouds; and Case Studies.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Understand the importance of virtualization and how this has enabled the development of Cloud Computing.

**CO2.** Analyze the cloud computing models, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.

**CO3.** Implement different types of Virtualization technologies and Service Oriented Architecture systems

**CO4.** Apply modern technologies & tools of Cloud Computing in solving resource sharing problems in industry.

**CO5.** Identify security and privacy issues in cloud computing.

**CO-PO-PSO Mapping Table:**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | | | | **PSO1** | **PSO2** | **PSO3** |
| **CO1** | 3 | - | - | - | - | - | - | - | - | | | | 3 | - | 3 |
| **CO2** | 1 | 3 | 2 | - | 2 | - | 2 | - | - | | | | 3 | - | 3 |
| **CO3** | - | 2 | 3 | 2 | 1 | - | - | - | - | | | | 3 | - | 2 |
| **CO4** | 1 | 2 | 3 | 2 | - | - | - | 2 | - | | | | 3 | 2 | - |
| **CO5** | - | - | - | - | - | 2 | 2 | - | - | | | | - | - | 3 |
| **Course Correlation Mapping** | **2** | **2** | **3** | **2** | **2** | **2** | **2** | **2** | **-** | | | | **3** | **2** | **3** |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

## COURSE CONTENT

**Module 1: INTRODUCTION TO VIRTUALIZATION (07 Periods)**

Virtualization: Introduction to Virtualization, objectives of virtualization, benefits of virtualized technology, Adding guest Operating system. Virtualization Technologies: Ubuntu, VMware, Microsoft Hyper-V.

**Module 2: DEFINING CLOUD COMPUTING (10 Periods)**

Defining Cloud Computing: Defining Cloud Computing, Cloud Types - The NIST model, The Cloud Cube Model, Deployment models, Service models, Benefits of cloud computing, Disadvantages of cloud computing, Assessing the Role of Open Standards. Understanding Cloud Architecture: Exploring the Cloud Computing Stack, Compos ability, Infrastructure, Platforms, Connecting to the Cloud.

**Module 3 UNDERSTANDING SERVICES AND APPLICATIONS (10 Periods)**

Understanding Services and Applications by Type: Defining Infrastructure as a Service (IaaS), IaaS workloads, Pods, aggregation, and silos, Defining Platform as a Service (PaaS), Defining Software as a Service (SaaS), SaaS characteristics.

Understanding Abstraction and Virtualization: Using Virtualization Technologies, Load Balancing and Virtualization, Understanding Hypervisors, Virtual machine types, VMware vSphere,

**Module 4 EXPLORING PLATFORM AS A SERVICE (10 Periods)**

**Using Amazon Web Services:** Understanding Amazon Web Services, Amazon Web Service Components and Services, Working with the Elastic Compute Cloud (EC2), Amazon Machine Images, Pricing models, System images and software, Creating an account and instance on EC2.

**Managing the Cloud:** Administrating the Clouds, Management responsibilities, Lifecycle management, Emerging Cloud Management Standards, DMTF cloud management standards, Cloud Commons and SMI.

**Module 5 UNDERSTANDING CLOUD SECURITY (08 Periods)**

**Understanding Cloud Security:** Securing the Cloud, The security boundary, Security service boundary, Security mapping, Securing Data, Brokered cloud storage access, Storage location and tenancy, Encryption, Auditing and compliance, Establishing Identity and Presence, Identity protocol standards, Windows Azure identity standards, Presence.

**Total Periods: 45**

## EXPERIENTIAL LEARNING

1. Compare Cloud Delivery Models.
2. Compare Cloud Deployment Models
3. Impact of cloud computing on real world environment.

## RESOURCES

**TEXT BOOKS:**

1. Barrie Sosinsky, *"Cloud Computing Bible,"* Wiley India Pvt Ltd, 1st Edition, 2011.
2. Ivanka Menken Ivanka Menken, *"Cloud Computing Virtualization Specialist Complete Certification Kit - Study Guide Book",* Emereo Publishing, 2nd Edition, 2012.

**REFERENCE BOOKS:**

1. Anthony T. Velte, Toby J. Velte Robert Elsenpeter, *"Cloud Computing: A practical Approach"*, Tata Mc Graw Hill, ISBN: 9780071626941, 1st Edition, 2010.
2. John W. Rittinghouse, James F. Ransome, *"Cloud Computing implementation, Management and Security"*, CRC Press, ISBN: 9788120341609, Taylor & Francis group, 1st Edition 2010.
3. George Reese, *"Cloud Application Architectures",* Oreilly publishers, 1st Edition, 2010.
4. David S. Linthicum, *"Cloud Computing and SOA Convergence in your Enterprise",* Addison-Wesley, 1st Edition, 2010.

**VIDEO RESOURCES:**

1. https://onlinecourses.nptel.ac.in/noc21_cs14/preview
2. https://digimat.in/nptel/courses/video/106105167/L01.html
3. https://freevideolectures.com/course/4639/nptel-cloud-computing

**WEB RESOURCES:**

1. htpps:// trailhead.salesforce.com/en/home
2. https://mkyong.com/tutorials/google-App- engine-tutorial/
3. https://www.awsacademy.com

## EXPERIENTIAL LEARNING

1. Compare Cloud Delivery Models.
2. Compare Cloud Deployment Models
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2. Ivanka Menken Ivanka Menken, *"Cloud Computing Virtualization Specialist Complete Certification Kit - Study Guide Book",* Emereo Publishing, 2nd Edition, 2012.

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1. Anthony T. Velte, Toby J. Velte Robert Elsenpeter, *"Cloud Computing: A practical Approach"*, Tata Mc Graw Hill, ISBN: 9780071626941, 1st Edition, 2010.
2. John W. Rittinghouse, James F. Ransome, *"Cloud Computing implementation, Management and Security"*, CRC Press, ISBN: 9788120341609, Taylor & Francis group, 1st Edition 2010.
3. George Reese, *"Cloud Application Architectures",* Oreilly publishers, 1st Edition, 2010.
4. David S. Linthicum, *"Cloud Computing and SOA Convergence in your Enterprise",* Addison-Wesley, 1st Edition, 2010.

**VIDEO RESOURCES:**

1. https://onlinecourses.nptel.ac.in/noc21_cs14/preview

2. https://digimat.in/nptel/courses/video/106105167/L01.html
3. https://freevideolectures.com/course/4639/nptel-cloud-computing

**WEB RESOURCES:**

1. htpps:// trailhead.salesforce.com/en/home
2. https://mkyong.com/tutorials/google-App- engine-tutorial/
3. https://www.awsacademy.com

# PROGRAM ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22AI101015** | **AI FOR ROBOTICS** | 3 | - | - | - | 3 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** This course provides a detailed Introduction to AI and Intelligent Robot; Intelligent Robots; Advanced robotics and AI; Object recognition using AI; Image Recognition process; Perception and behaviour; Deliberation; Navigation; Localization; Mapping and Exploration.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Demonstrate the usage of Intelligent Robots and the role of Artificial Intelligence in robotic control.

**CO2** Conduct behavioural analysis and Objects recognition using AI based techniques

**CO3** Design the Robot deliberation, navigation and exploration methods using AI techniques

**CO4** Apply Machine Learning approaches and train Robot Arms for interactive functionality in socio-interactive applications

**CO-PO-PSO Mapping Table:**

| Learning Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | | | | PSO1 | PSO2 | PSO3 | |
| **CO1** | 3 | 1 | - | - | - | - | - | - | - | | | | - | 3 | - | |
| **CO2** | 3 | 2 | - | - | - | - | - | - | - | | | | - | 3 | - | |
| **CO3** | 3 | 2 | 2 | - | - | - | - | - | - | | | | - | 3 | - | |
| **CO4** | 3 | 2 | 2 | - | `1 | 1 | - | - | - | | | | - | 3 | - | |
| **Course Correlation Mapping** | 3 | 2 | 2 | - | 1 | 1 | - | - | - | | | | - | 3 | - | |

Correlation Levels: 3: High; 2: Medium; 1: Low

## COURSE CONTENT

**Module 1 INTRODUCTION TO AI AND INTELLIGENT ROBOTS** ***(09 Periods)***

**Intelligent Robots:** Definition, Components of a Robot, Three Modalities: Kinds of Robots, Seven Areas of AI: Intelligence.

**Foundation of Advanced Robotics and AI:** The basic principle of robotics and AI, Artificial intelligence and advanced robotics techniques, Introducing the robot and the

development environment, Software components (ROS, Python, and Linux), Robot control systems and a decision-making framework, Soft real-time control, Control loops, The robot control system - a control loop with soft real-time control, Reading serial ports in a real-time manner.

**Module 2 BAYESIAN CONCEPT LEARNING** ***(07 Periods)***

Introduction, Importance, Bayes' theorem, Bayes optimal classifier, Naïve Bayes classifier, Applications of Bayes classifier.

**Module 3 SUPERVISED LEARNING** ***(10 Periods)***

**Classification:** Classification model, Classification learning steps, K-Nearest Neighbor, Decision Tree, Support vector machines.

**Regression**: Introduction, Simple linear regression, Improving accuracy of the linear regression model, Multiple linear regression, Assumptions and problems in regression analysis.

**Module 4 UNSUPERVISED LEARNING** ***(09 Periods)***

Introduction, Unsupervised vs supervised learning, Applications of unsupervised learning, Clustering as a machine learning task, Types of clustering techniques, Partitioning methods, K-Medoids, Hierarchical clustering, DBSCAN.

**Module 5 ARTIFICIAL NEURAL NETWORKS** ***(09 Periods)***

Artificial neuron, Types of activation functions, Early implementations of ANN, Architectures of neural network, Learning process in ANN, Backpropagation.

***Total Periods: 45***

**EXPERIENTIAL LEARNING**

1. Use Naïve Bayes classifier to solve the credit card fraud detection problem.
2. Build a neural network that will read the image of a digit and correctly identify the number.

*(It's an indicative one. The Course Instructor may change the activities and the same shall be reflected in Course Handout)*

## RESOURCES

**TEXT BOOKS:**


1. Francis XGovers, "Artificial Intelligence for Robotics: Build Intelligent Robots that perform Human tasks using AI Techniques", Packt Publishing Ltd, 2018.
2. Robin R. Murphy, "Introduction to AI Robotics", 2nd Edition, The MIT Press, 2019.


**REFERENCE BOOKS:**


1. Stuart Russell, Peter Norvig, *Artificial Intelligence: A Modern Approach*, Prentice Hall, 4th Edition, 2020.
2. Rabindra Nath Shaw, Ankush Ghosh, Valentina E. Balas, Monica Bianchini, Artificial Intelligence for Future Generation Robotics,2021.

**VIDEO LECTURES:**

1. https://www.youtube.com/watch?v=3O2vX2cBZDs
2. https://www.udacity.com/course/artificial-intelligence-for-robotics--cs373

**WEB RESOURCES:**

1. https://medium.com/vsinghbisen/ai-in-robotics-use-of-artificial-intelligence-in-robotics-726a4e9ade18
2. https://towardsdatascience.com/how-does-ai-detect-objects-technical-d8d63fc12881
3. https://robotics.mit.edu/object-recognition-robots

# PROGRAM ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22AI102007** | **SOFT COMPUTING** | 3 | - | 2 | - | 4 |

**Pre-Requisite** **22MM102010-** Python Programming

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION: :** This course provides a detailed discussion on Soft computing techniques concepts, Supervised learning networks, Genetic algorithms, Fuzzy logic, Hybrid soft computing techniques and applications.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Investigate soft computing techniques for solving computational problems.

**CO2.** Design efficient neural architectures to model patterns for a given learning problem.

**CO3.** Investigate and solve optimization problems using genetic algorithms.

**CO4.** Apply fuzzy logic and reasoning to handle uncertainty in engineering problems.

**CO5.** Develop intelligent solutions using hybrid soft computing techniques to solve problems of multidisciplinary domains.

**CO-PO-PSO Mapping Table:**

| Learning Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | | | | PSO1 | PSO2 | PSO3 | |
| CO1 | 3 | - | - | - | - | - | - | - | - | | | | - | 3 | - | |
| CO2 | 3 | 3 | 3 | 1 | - | - | - | - | - | | | | - | 3 | - | |
| CO3 | 3 | 2 | - | - | - | - | - | - | - | | | | - | 3 | - | |
| CO4 | 3 | 2 | - | - | - | - | - | - | - | | | | - | 3 | - | |
| CO5 | 3 | 3 | 3 | - | - | 2 | - | - | - | | | | - | 3 | - | |
| Course Correlation Mapping | 3 | 3 | 3 | 1 | - | 2 | - | - | - | | | | - | 3 | - | |

Correlation Level: 3-High; 2-Medium; 1-Low

## COURSE CONTENT

**Module 1 INTRODUCTION TO SOFT COMPUTING AND SUPERVISED LEARNING NETWORKS** ***(10 Periods)***

**Introduction to Soft Computing:** Neural networks, Application scope of neural networks, Fuzzy logic, Genetic algorithm, Hybrid systems, Soft computing.
**Artificial Neural Networks:** Fundamentals, Basic Models, Terminologies, Linear Separability, Hebb network.

**Supervised Learning Networks:** Perceptron Networks- Theory, Perceptron learning rule, Architecture, Flowchart for training process, Perceptron training algorithm for single and multiple output classes, Perceptron network testing algorithm; Back-Propagation Network - Theory, Architecture, Flow chart for training process, Training algorithm, Learning factors of back-propagation network, Testing algorithm for back-propagation network.

**Module 2 UNSUPERVISED LEARNING NETWORKS** ***(08 Periods)***

Fixed weight competitive nets – Maxnet, Mexican Hat Net, Hamming network; Kohonen self-organizing feature maps – Theory, Architecture, Flowchart, Training algorithm; Learning vector quantization – Theory, Architecture, Flowchart, Training algorithm, Variants; Counter propagation networks – Theory, Full counter propagation Net, Forward-only counter propagation Net; Adaptive resonance theory network – Fundamental architecture, Fundamental operating principle, Fundamental algorithm.

**Module 3 GENETIC ALGORITHMS** ***(09 Periods)***

Genetic algorithms - Biological background, Traditional optimization and search techniques, Genetic algorithm and search space, Genetic algorithms vs. traditional algorithms, Basic terminologies in genetic algorithm, Simple GA, General genetic algorithm, Operators in genetic algorithm, Stopping condition for genetic algorithm flow, Constraints in genetic algorithm, Problem solving using genetic algorithm, Adaptive genetic algorithms, Hybrid genetic algorithms, Advantages and limitations of genetic algorithm, Applications of genetic algorithm.

**Module 4 FUZZY LOGIC** ***(11 Periods)***

Introduction to fuzzy logic, Classical sets, Fuzzy sets, Membership function – Features, Fuzzification, Methods of membership value assignments; Fuzzy arithmetic and measures – Fuzzy arithmetic, Extension principle, Fuzzy measures, Measures of fuzziness, Fuzzy integrals; Fuzzy rule base and approximation reasoning - Truth values and tables in fuzzy logic, Fuzzy propositions, Formation of rules, Compound rules, Aggregation of fuzzy rules, Fuzzy reasoning, Fuzzy inference systems, Overview of fuzzy expert system; Fuzzy decision making, Fuzzy logic control systems.

**Module 5 HYBRID SOFT COMPUTING TECHNIQUES AND APPLICATIONS** ***(07 Periods)***

Hybrid Soft Computing Techniques: Genetic neuro hybrid systems, Genetic fuzzy hybrid and fuzzy genetic hybrid systems.
Applications of Soft Computing: Optimization of traveling salesman problem using genetic algorithm approach, Genetic algorithm-based internet search technique, Soft computing-based hybrid fuzzy controllers, Soft computing-based rocket engine control.

***Total Periods: 45***

## EXPERIENTIAL LEARNING

1. Write a program to implement Activation Functions.
2. Write a program to Generate ANDNOT, XOR function using McCulloch-Pitts neural net.
3. Write a program to implement Hebb network.

4. Write a program to implement Linear separability.
5. Write a program of Perceptron Training Algorithm.
6. Write a program to implement Back Propagation Algorithm.
7. Write a program to implement Union, Intersection, Complement and Difference operations on fuzzy sets. Also create fuzzy relation by Cartesian product of any two fuzzy sets and perform max-min composition on any two fuzzy relations.
8. Write a program to implement Union, Intersection, Complement and Difference operations on crisp sets. Also create crisp relation by Cartesian product of any two crisp sets and perform max-min composition on any two crisp relations.
9. Write a program to implement Fuzzy Interface System.
10. Implement Travelling sales person using genetic Algorithm.

## RESOURCES

### TEXT BOOKS:

3. S.N.Sivanandam and S.N.Deepa, "*Principles of soft computing*", 3rd edition, Wiley India,2019

### REFERENCE BOOKS:

10 S. Rajasekaran and G. A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic
Algorithms: Synthesis and Applications, PHI Learning Private Ltd, 2011.

11 Udit Chakraborty, Samir Roy, Soft Computing: Neuro-Fuzzy and Genetic Algorithms,
Pearson, 2013.

12 Saroj Kaushik, Sunita Tewari, *Soft Computing: Fundamentals, Techniques and Applications*, McGraw Hill, 2018.

### VIDEO LECTURES:

3. https://nptel.ac.in/courses/106105173/

# INTERDISCIPLINARY MINOR

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM101002** | **SINGLE VARIABLE CALCULUS** | 3 | - | - | - | 3 |

**Pre-Requisite:** -

**Anti-Requisite:** -

**Co-Requisite:** -

**COURSE DESCRIPTION:** This course provides fundamental knowledge of calculus. Further, this course focuses on differentiability, Sequences and Series of functions, Tests for convergence and Divergence, Definite and Indefinite Integrals.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Evaluate the Sequences and Series of numbers, and Identify tests for convergence and divergence.

**CO2.** Demonstrate knowledge on the concepts of limits, continuity, differentiability and their applications.

**CO3.** Apply knowledge in single variable calculus for evaluating the consequences of Rolle's and intermediate value theorems for continuous functions.

**CO4.** Apply the techniques in calculus for evaluating Definite and Indefinite Integrals.

### CO-PO-PSO Mapping Table:

| Course Outcomes | Program Outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** |
| **CO1** | 3 | 3 | 3 | 2 | 1 | - | - | - | - |
| **CO2** | 3 | 3 | 3 | 3 | 2 | - | - | - | - |
| **CO3** | 3 | 3 | 3 | 3 | 2 | - | - | - | - |
| **CO4** | 3 | 3 | 3 | 3 | 2 | - | - | - | - |
| **Course Correlation Mapping** | **3** | **3** | **3** | **3** | **2** | **-** | **-** | **-** | - |

Correlation Levels: 3: High; 2: Medium; 1: Low

## COURSE CONTENT

**Module 1 SEQUENCES: CONVERGENCE AND DIVERGENCE** ***(09 Periods)***

Limits of sequences of real numbers, operations on convergent sequences, The Squeeze or Sandwich Rule, Subsequences, Bounded Monotone Sequences, Bounded Monotone convergence theorem, The Bolzano-Weierstrass Theorem, Cauchy Sequences.

**Module 2 TEST FOR CONVERGENCE AND DIVERGENCE SERIES** ***(09 Periods)***

Basic Divergence tests, Direct Comparison test, Limit Comparison Test, Cauchy's Condensation test, Alternating series test, Dirichlet's test.

**Module 3 LIMITS AND CONTINUITY** ***(09 Periods)***

Limit of a function, Limit point of a set, properties of Limits of functions, Infinite limits, Limits at Infinity, Basic Properties of continuous functions, Uniform Continuity, Piece wise continuous functions.

**Module 4 DIFFERENTIABILITY AND THEIR APPLICATIONS** ***(09Periods)***

Basic Properties of differentiable functions, Local Extreme theorem, Rolle's theorem and the Mean value theorems, L- Hospital's Rule: Another form, Second -Derivative test and concavity.

**Module 5 DEFINITE AND INDEFINITE INTEGRALS** ***(09 Periods)***

Definition and Basic Properties of Riemann Integrals, Darboux Integral, Basic Properties of Definite Integrals, The Fundamental theorems of Calculus, The mean value theorem for Integrals, Average Value of a function, The Logarithmic and Exponential functions.

***Total Periods: 45***

## EXPERIENTIAL LEARNING

1. You want to sell a certain number n of items in order to maximize your profit. Market research tells you that if you set the price at \$1.50, you will be able to sell 5000 items, and for every 10 cents you lower the price below \$1.50 you will be able to sell another 1000 items. Suppose that your fixed costs ("start-up costs") total \$2000, and the per item cost of production ("marginal cost") is \$0.50. Find the price to set per item and the number of items sold in order to maximize profit, and also determine the maximum profit you can get.
2. Describe all functions that have derivative $5x - 3$.
3. An object moves so that its velocity at time t is $v(t) = -9.8t + 20$ m/s. Describe the motion of the object between $t = 0$ and $t = 5$, find the total distance traveled by the object during that time, and find the net distance traveled.

## RESOURCES

**TEXT BOOKS:**


1. S. Ponnusamy, Foundations of Mathematical Analysis, Birkhauser Boston Inc, Twelve edition, 2010
2. M. Thamban Nair, Calculus of One Variable, Springer, Second Edition 2021.


**REFERENCE BOOKS:**


1. Shanti Narayan and P.K. Mittal, Differential Calculus, S. Chand & Company, Revised Edition, 2018.
2. Shanti Narayan and P.K. Mittal, Integral Calculus,S. Chand &Company,Revised Edition, 2014.

3. George, B., Thomas, Jr., Ross L. Finney, Late Jan. D. Weir Giordano, Thomas Calculus, Pearson, 10th Edition, 2005.
4. Frank Ayres and Elliott Mendelson, Calculus,McGraw-Hill, 6th Edition, 2013.
5. Robert T Smith and Roland Minton, Calculus: Early Transcendental Functions, 4th Edition, 2012.

**VIDEO LECTURES:**

1. https://nptel.ac.in/courses/101/104/109104124/
2. https://ocw.mit.edu/courses/18-01-single-variable-calculus-fall-2006/video_galleries/video-lectures

**Web Resources:**

1. https://www.khanacademy.org/math/differential-calculus
2. http://tutorial.math.lamar.edu/Classes/CalcI/CalcI.aspx
3. http://www.calculus-help.com/tutorials

## INTERDISCIPLINARY MINOR

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM101006** | **ORDINARY DIFFERENTIAL EQUATIONS** | 3 | - | - | - | 3 |

**Pre-Requisite** **SINGLE VARIABLE CALCULUS**

**Anti-Requisite** ----

**Co-Requisite** ----

**COURSE DESCRIPTION:** This course provides fundamental knowledge of differential equations. Further, this course focuses on Linear Differential Equations, Differential Equations of first order and Higher order linear differential equations

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO14** Solve linear differential equations and convert non-exact homogeneous equations to exact differential equations by using integrating factors.

**CO15** Demonstrate the knowledge on methods of finding solutions of differential equations of the first order but not of the first degree

**CO16** Solve higher-order linear differential equations, both homogeneous and non homogeneous, with constant coefficients.

**CO17** Understand the concept and apply appropriate methods for solving differential equations.

### CO-PO-PSO Mapping Table:

| Learning Outcomes | Program Outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 |
| CO1 | 3 | 3 | -- | 3 | 1 | -- | -- | -- | -- |
| CO2 | 3 | 3 | -- | 3 | 1 | -- | -- | -- | -- |
| CO3 | 3 | 2 | - | 3 | 1 | | -- | -- | -- |
| CO4 | 3 | 2 | - | 3 | 1 | | -- | | -- |
| Course Correlation Mapping | 3 | 3 | - | 3 | 1 | | -- | | -- |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

## COURSE CONTENT

**Module 1** **Differential Equations of first order and first degree** ***(09 Periods)***

Formation of Differential equations, Exact differential equations, Integrating factors, Linear Differential Equations; Bernouillis equation, Orthogonal Trajectories.

**Module 2** **Differential Equations of first order but not of the first degree** ***(09 Periods)***

Equations solvable for *p*; Equations solvable for *y*; Equations solvable for *x*; Clairaut's Equation.

**Module 3** **Higher order linear differential equations-I** ***(09 Periods)***

Solution of homogeneous linear differential equations of order n with constant coefficients; Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators. General Solution of f(D)y=0. P.I. of f(D)y = Q when Q= $e^{ax}$, sinbx or cos bx.

**Module 4** **Higher order linear differential equations-II** ***(09Periods)***

Solution of the non-homogeneous linear differential equations with constant coefficients. P.I. of f(D)y = Q when Q= $x^k$, $e^{ax}$ V**,** where V is a function of x. P.I. of f(D)y = Q when Q= XV **,** where V is a function of x.

**Module 5** **Higher order linear differential equations-III** ***(09 Periods)***

Method of variation of parameters; Linear differential Equations with non-constant coefficients; The Cauchy-Euler Equation, Legendre's linear equations

***Total Periods: 45***

## EXPERIENTIAL LEARNING

1. An electric circuit consists of inductance 0.25 *henries*, a resistance of 250 *ohms* and a condenser of capacitance $2\times10^{-4}$ *farads*. Estimate the charge $q$ and the current $i$ at time $t$, given the initial conditions $q=0.002$ *coulombs*, $i=0$ when $t=0$.
2. A simple pendulum of length $l$ is oscillating through a small angle $\theta$ in a medium in which the resistance is proportional to the velocity. Establish the differential equation of its motion. Discuss the motion and find the period of oscillation.
3. Find how many seconds a clock would loss per day if the length of its pendulum were increased in the ratio 900:90.

## RESOURCES

### TEXT BOOKS:


1. Zafar Ahsan , Differential Equations and Their Applications, Prentice-Hall of India Pvt. Ltd, New Delhi-Second edition, 2004.
2. M.D, Raisinghania, Ordinary and Partial Differential Equations, S. Chand & Company, New Delhi, 20th Edition, 2020.


### REFERENCE BOOKS:


1. S Narayanan and T K Manicavachogam Pillay, Differential Equations: S V Publishers Private Ltd., 1981.
2. G F Simmons, Differential equation with Applications and historical notes, 2nd ed.: McGraw-Hill Publishing Company, Oct 1991.


### VIDEO LECTURES:

1. https://www.youtube.com/watch?v=NBcGLLU90fM&list=PLbMVogVj5nJSGlf9sluucwobyr_zz6glD
2. https://www.youtube.com/watch?v=stxyteSFH08&list=PLR3C3NSCyhZQ7ZjFjTnrFNXOFPv2_622x

### WEB RESOURCES

1. http://www.sosmath.com/diffeq/diffeq.html
2. http://www.analyzemath.com/calculus/Differential_Equations/applicatios.html

## INTERDISCIPLINARY MINOR

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22MM101007 | MULTIVARIABLE CALCULUS | 3 | - | - | - | 3 |

**Pre-Requisite** 22MM101002-SINGLE VARIABLE CALCULUS

**Anti-Requisite** Nil

**Co-Requisite** Nil

**COURSE DESCRIPTION:** This course covers a range of subjects pertaining to multivariable calculus. Specifically, this encompasses subjects such as the differentiation and integration of multivariable functions, along with their practical uses. The course encompasses the study of vector functions in calculus, along with their applications.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO18** Determine the maximum and minimum of functions of two or three variables.

**CO19** Evaluate multiple integrals in Cartesian, Polar and Spherical coordinates.

**CO20** Demonstrate gradient, directional derivative, divergence, curl of a vector field.

**CO21** Evaluate the line, surface and volume integrals and understand the relation between line, surface and volume integrals using Green's, Gauss, Stoke's theorems.

### CO-PO Mapping Table:

| Learning Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | | | |
| CO1 | 2 | 3 | - | 2 | 1 | - | - | - | - | | | |
| CO2 | 2 | 3 | - | 3 | 1 | - | - | - | - | | | |
| CO3 | 3 | 2 | - | 3 | 1 | - | - | - | - | | | |
| CO4 | 3 | 2 | - | 3 | 1 | - | - | - | - | | | |
| Course Correlation Mapping | 3 | 3 | - | 3 | 1 | - | - | - | - | | | |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1: Multivariable Calculus (Differentiation)** ***(11 Periods)***

Introduction to function of several variables, Jacobian and its properties, Functional dependence, Maxima and minima of functions of two variables, Lagrange's multiplier method.

**Module 2: Multivariable Calculus (Integration-1)** ***(9 Periods)***

Evaluation of Double integrals (Cartesian and Polar coordinates), Change of order of integration (Cartesian form only), Change of variables: Double integration from Cartesian to Polar coordinates.

**Module 3 Multivariable Calculus (Integration-2)** ***(07 Periods)***

Evaluation of triple integrals, Triple integration from Cartesian to Spherical polar coordinates, cylindrical coordinates.

**Module 4 Vector Calculus (Vector Differentiation)** ***07 Periods)***

Scalar and Vector fields: Gradient of a scalar field, Directional derivative, Divergence of a vector field, Solenoidal vector, Curl of a vector field, Irrotational vector, Laplacian operator.

**Module 5 Vector Calculus (Vector Integration)** ***(11 Periods)***

Line Integral, Surface Integral and Volume integrals, Green's, Stoke's and Gauss divergence theorems, Verification and evaluation of vector integrals using them.

***Total Periods: 45***

**EXPERIENTAL LEARNING**

1. American Airlines requires that the total outside dimensions (length + width + height) of a checked bag not exceed 62 inches. Suppose you want to check a bag whose height is equal to its width. What is the largest volume bag of this shape that you can check on an American Airlines flight?

2. An insulated rod of length $l$ has its ends *A* and *B* maintained at $0^0C$ and $100^0C$ respectively until steady state conditions prevail. If *B* is suddenly reduced to $0^0C$ and maintained at $0^0C$, establish an equation to find the temperature at a distance $x$ from *A* at time $t$ under the above conditions.

3. Apply the Gamma function; obtain the mass of an octant of the ellipsoid $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$ with the density at any point being $\rho = k\,x\,y\,z$.

4. A person weighs 150lb walking exactly one revolution up a circular, spiral staircase of radius x ft. if the person rises 10ft then find the work done by the person. Consider different radii and find the work done by the person in each case.

## RESOURCES

**TEXT BOOKS:**


1. B. S. Grewal, *Higher Engineering Mathematics*, Khanna publishers, 44th edition, 2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th edition, 2011.
4. R. Gupta, Vector Calculus, Laxmi Publications, New edition, 2016.


**REFERENCE BOOKS:**


1. Dennis G. Zill and Warren S. Wright, *Advanced Engineering Mathematics*, Jones and Bartlett, 6th edition, 2011.
2. N.P. Bali and Manish Goyal, "A Text Book of Engineering Mathematics", Laxmi Publications, Reprint, 2008.


**VIDEO LECTURES:**

1. https://nptel.ac.in/courses/111107108 (MVC)

**Web Resources:**

1. http://www.efunda.com/math/math_home/math.cfm
2. http://www.sosmath.com/
3. http://www.mathworld.wolfram.com/

# INTERDISCIPLINARY MINOR

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM101008** | **Integral Transforms** | 3 | - | - | - | 3 |

**Pre-Requisite** -

**Anti-Requisite**

**Co-Requisite** -

**COURSE DESCRIPTION:** This course focus on basic areas of theory and more advanced Mathematics topics which provide students with the relevant mathematical tools required for solving differential equation in Engineering and higher-level research problem. This course includes Fourier series, Fourier Transforms, Laplace transforms, Inverse Laplace transform.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Have understanding regarding different kind of integral transforms

**CO2** Demonstrate Fourier series to study the behavior of periodic functions and their applications and Fourier transform to connect the frequency and time domain systems and will be able to solve the problem based on it.

**CO3** Have deep understanding of Laplace Transformation and its real life application.

**CO4** Solve initial value problem and boundary value problem using Laplace Transform.

**CO-PO Mapping Table:**

| Learning Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | | | |
| **CO1** | 3 | 3 | | 2 | 2 | - | - | - | - | | | |
| **CO2** | 3 | 3 | | 3 | 2 | - | - | - | - | | | |
| **CO3** | 3 | 3 | | 3 | 2 | - | - | - | - | | | |
| **CO4** | 3 | 3 | | 2 | 2 | - | - | - | - | | | |
| **Course Correlation Mapping** | **3** | **3** | | **3** | **2** | **-** | **-** | **-** | - | | | |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

## COURSE CONTENT

**Module 1: Fourier Series:** ***(09 Periods)***

Periodic function, Fourier series formula for periodic functions, Fourier series for Odd and Even functions, Fourier series for Discontinuous function, Half range Fourier series, Half range Cosine series, Half range Sine series.

**Module 2: Fourier Integral:** ***(09 Periods)***

Fourier Integral of a function formula and examples, Fourier Cosine integral, Fourier Sine integral, Complex Fourier integral, Evaluation of integration using Fourier integral.

**Module 3 FOURIER TRANSFORMS** ***(09 Periods)***

Fourier transform, sine and cosine transform, properties, convolution theorem, Application of Fourier sine and cosine transform on differential equation.

**Module 4 LAPLACE TRANSFORMS** ***(09 Periods)***

Definition of Laplace transforms, Existence conditions, Laplace transforms of standard functions, Properties of Laplace transforms, Laplace transforms of derivatives, Laplace transforms of integrals, Multiplication by $t^n$, Division by $t$, Laplace transforms of periodic functions, Laplace transforms of unit step function and unit impulse function.

**Module 5 INVERSE LAPLACE TRANSFORMS** ***(09 Periods)***

Inverse Laplace transforms by different methods, Convolution theorem, Inverse Laplace transforms by convolution theorem, Applications of Laplace transforms to ordinary differential equations of first and second order with constant coefficients

***Total Periods: 45***

## EXPERIENTAL LEARNING

1. A 100-gm mass is suspended from a spring with constant 50 N/m. It is set into motion by raising it 10 cm above its equilibrium position and giving it a velocity of 1 m/s downward. During the subsequent motion a damping force acts on the mass and the magnitude of this force is twice the velocity of the mass. If an impulse force of magnitude 2 N is applied vertically upward to the mass at t = 3 s, find the position of the mass for all time**.**

2. Develop a differential equation from an LRC circuit connected in series using Kirchoff Voltage law and then solve using Laplace transform. Analyze the result by using any technology**.**

## RESOURCES

### TEXT BOOKS:


1. B. S. Grewal, *Higher Engineering Mathematics*, Khanna publishers, 44th edition, 2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th edition, 2011.


### REFERENCE BOOKS:


1. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9/e, Wiley India, 2009.
2. Dr.T.K.V Iyengar, B.Krishna Gandhi, S. Ranganatham and M.V.S.S.N Prasad, Mathematics – II, S.Chand publications.


### VIDEO LECTURES:

1. https://nptel.ac.in/courses/111106111
2. https://www.youtube.com/watch?v=n9XP6pljtw8&list=PLbRMhDVUMngfsMNuiGSQQuNwPevZukOY_

Web Resources:

1. https://www-users.cse.umn.edu/~mille003/fouriertransform.pdf
2. https://nitkkr.ac.in/docs/12-%20Laplace%20Transforms%20and%20their%20Applications.pdf

## INTERDISCIPLINARY MINOR

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM101022** | **NUMBER THEORY AND ALGEBRA** | 3 | - | - | - | 3 |
| **Pre-Requisite** | ---- | | | | | |
| **Anti-Requisite** | ---- | | | | | |
| **Co-Requisite** | ---- | | | | | |

**COURSE DESCRIPTION:** The course contains various topics related to Number theory and its applications, Rings, ideals, polynomial rings and finite fields. In particular this contains the topics related to arithmetic functions and congruences which are helpful to the students in cryptography and Network security related topics in computer sciences.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Demonstrate the knowledge on the concepts of Basic number theory and their applications in computer sciences.

**CO2** Apply knowledge congruences in the computer programming involved in network security issues

**CO3** Evaluating and analyze the results and concepts in cryptography through the knowledge of Arithmetic functions and their properties.

**CO4** Apply the techniques of abstract algebra in evaluation of the problems in network security.

**CO-PO-PSO Mapping Table:**

| Learning Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | | | |
| **CO1** | 3 | 3 | - | 2 | 1 | - | - | - | - | | | |
| **CO2** | 3 | 3 | - | 2 | 2 | - | - | - | - | | | |
| **CO3** | 3 | 3 | - | 2 | 1 | - | - | - | - | | | |
| **CO4** | 3 | 3 | - | 2 | 1 | - | - | - | - | | | |
| **Course Correlation Mapping** | **3** | **3** | **-** | **2** | **2** | **-** | **-** | **-** | - | | | |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

**COURSE CONTENT**

**Module 1 BASIC NUMBER THEORY** ***(09 Periods)***

Divisibility of integers, GCD and LCM and their properties, Prime numbers and their properties, Euclidean algorithm.

**Module 2 CONGRUENCES** ***(09 Periods)***

Congruences and their elementary properties, Complete and reduced residue systems, Linear congruences, Chinese Remainder theorem, Fermat's theorem, Wilson's theorem, Applications.

**Module 3 ARITHMETIC FUNCTIONS** ***(09 Periods)***

Arithmetic functions, multiplicative and totally multiplicative functions, Euler's totient function, Divisor function, Sum of divisors (The function $\sigma$ ), Mobius function ( $\mu(n)$ ), Elementary properties of arithmetic functions.

**Module 4 Rings and Ideals** ***(09 Periods)***

Rings, examples of Rings. Basic properties, Integral domain, Field and Ideals, Ring homomorphism and isomorphism.

**Module 5 Polynomial Rings and Finite fields** ***(09Periods)***

Polynomial ring in one variable, Irreducible polynomials over finite fields, Factorization polynomial over finite fields, properties of finite fields, Primitive roots.

***Total Periods: 45***

**EXPERIENTIAL LEARNING**

1. Exhibit the complete residue system modulo 17 composed entirely of multiples of 3.
2. Analyse the numbers and prove every square number is of the form 5k-1, 5k, 5k+1, where n is some positive integer.

**RESOURCES**

**TEXT BOOKS:**


1. Nadiya Gubareni, Introduction to Modern Algebra and its applications, CRC Press, 2019.
2. K.C. Chowdhury, A first course in Number Theory, Asian Books, First edition, 2004.
2. Hiram Paley, Paul M. Weichsel, First course in Abstract Algebra, Holt, Rinehart and Winston, First Edition, 1966.
3. Joseph Silverman, A Friendly introduction to Number Theory, Pearson Publishers, 5th Edition, 2019.
4. Edwin Weiss, First course in Algebra and Number Theory, Academic Press, 1971.

**REFERENCE BOOKS:**


1. Papantonopoulou, Algebra, Pure and Applied Mathematics, Prentice Hall, 2002.
2. Arkadii slinko, Algebra fir applications, Springer Publications, 2015.
3. Abhijit Das, Computational Number Theory, CRC Press, 2013.


**VIDEO LECTURES:**

1. https://www.youtube.com/watch?v=yHwneN6zJmU
2. https://www.youtube.com/watch?v=6DfXcNv6as4
4. https://www.youtube.com/watch?v=MNj_e-t9tIs&list=PLLtQL9wSL16htZdyMm99giCaam049Od4x
5. https://www.youtube.com/playlist?list=PLU6SqdYcYsfLyL330UDwLrRvNvWbto7DR

**Web Resources:**

1. https://math.libretexts.org/Courses/Mount_Royal_University/MATH_2150%3A_Higher_Arithmetic/4%3A_Greatest_Common_Divisor_least_common_multiple_and_Euclidean_Algorithm
2. https://ocw.mit.edu/courses/18-781-theory-of-numbers-spring-2012/de23a8d881a615303f6d4fa665669dc9_MIT18_781S12_lec4.pdf
3. https://crypto.stanford.edu/pbc/notes/numbertheory/mult.html
4. https://sites.math.washington.edu/~bviray/teaching/RingHomomorphismsAndIsomorphisms.pdf
5. https://www.birs.ca/workshops/2006/06w5021/report06w5021.pdf

## INTERDISCIPLINARY MINOR

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM101026** | **Numerical analysis** | 3 | - | - | - | 3 |

**Pre-Requisite** ----

**Anti-Requisite** ----

**Co-Requisite** ----

**COURSE DESCRIPTION:** This course provides fundamental knowledge of errors in numerical computation, numerical solutions of equations, interpolation; numerical differentiation and integration, curve fitting, numerical solutions of ordinary differential equations.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Acquire knowledge on the concepts of errors and their approximations, errors in a series approximation.

**CO2** Develop skills in analyzing and solving algebraic and transcendental equations by various numerical methods.

**CO3** Use relevant numerical techniques for Interpolation of data and fitting interpolation polynomials.

**CO4** Develop numerical skills for finding the values of derivatives and integrals through various numerical methods and fitting of various types of curves to the experimental data.

**CO5** Apply the Numerical techniques for solving differential equations numerically when analytical methods fail to hold.

### CO-PO-PSO Mapping Table:

| Learning Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | | | |
| **CO1** | 3 | 3 | 3 | - | - | - | - | - | - | | | |
| **CO2** | 3 | 3 | 3 | - | - | - | - | - | - | | | |
| **CO3** | 3 | 3 | 2 | - | - | - | - | - | - | | | |
| **CO4** | 3 | 3 | 2 | - | - | - | - | - | - | | | |
| **CO5** | 3 | 3 | 2 | - | - | - | - | - | - | | | |
| **Course Correlation Mapping** | **3** | **3** | **3** | **-** | **-** | **-** | **-** | **-** | - | | | |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1 ERRORS IN NUMERICAL COMPUTATIONS** ***(09 Periods)***

Errors and their Accuracy, Errors and their Analysis, Absolute, Relative and Percentage Errors, A general error formula, Error in a series approximation.

**Module 2 SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS**: ***(09 Periods)***

The bisection method, The iteration method, The method of false position, Newton Raphson method, Generalized Newton Raphson method..

**Module 3 INTERPOLATION** ***(09 Periods)***

Errors in polynomial interpolation, Finite Differences, Forward differences, Backward differences, Central Differences, Symbolic relations, Newton's forward and backward difference formulae, Lagrange's interpolation formula. Partial fractions using Lagrange's interpolation formula.

**Module 4 NUMERICAL DIFFERENTIATION , INTEGRATION AND CURVE FITTING.** ***(09 Periods)***

Numerical differentiation using Newton's forward and backward formulae. Numerical integration using Trapezoidal rule, Simpsons 1/3$^{rd}$ rule and 3/8$^{th}$ rule, Curve fitting by the principle of least squares, fitting of a straight line, parabola and exponential curves.

**Module 5 NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS** ***(09 Periods)***

Numerical solutions of first order Initial value problems using Taylor series method, Euler's method , modified Euler's method, Runge – Kutta method (4 $^{th}$order only) and Milne's predictor – corrector method.

***Total Periods: 45***

## EXPERIENTIAL LEARNING

1. Write a Python program to solve algebraic equation by bisection method.
2. Write a Pseudo code on numerical integration using Simpson1/3 method.

## RESOURCES

**TEXT BOOKS:**


1. Numerical Analysis by S.S.Sastry, published by Prentice Hall of India Pvt. Ltd., New Delhi. (Latest Edition) .
2. B.S. Grewal, Higher engineering mathematics, Khanna Publishers, 42$^{th}$ Edition.2012

**REFERENCE BOOKS:**


1. Finite Differences and Numerical Analysis by H.C Saxena published by S. Chand and Company, Pvt. Ltd., New Delhi.
2. Numerical methods for scientific and engineering computation by M.K.Jain, S.R.K.Iyengar, R.K. Jain.
3. Numerical Analysis by G. Sankar Rao published by New Age International Publishers, New – Hyderabad.


**VIDEO LECTURES:**

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://www.youtube.com/watch?v=88ys5ZIolSg&list=PL6E313980EF23CA6E

**Web Resources:**

1. https://www.numerical-methods.com/
2. https://blasingame.engr.tamu.edu/z_zCourse_Archive/P620_14C/P620_14C_zReference/PDF_Txt_Hnbk_Num_Meth.pdf

## INTERDISCIPLINARY MINOR

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22MM101023 | GROUP THEORY | 3 | - | - | - | 3 |

**Pre-Requisite** --

**Anti-Requisite** --

**Co-Requisite** --

**COURSE DESCRIPTION**: This course provides a discussion on the structures and characteristics of groups, subgroups, normal subgroups and cyclic groups.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Demonstrate when a binary algebraic structure forms a group or not.

**CO2** Determine subgroups and determine whether given subsets of a group are subgroups.

**CO3** Identify the criteria for normal subgroups of a group.

**CO4** Identify the applications of fundamental theorem on homomorphism.

**CO5** Determine whether a given group is cyclic, and given a finite cyclic group, find a generator for a subgroup of a given order.

**CO-PO Mapping Table:**

| Learning Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | | | |
| CO1 | 3 | 3 | | 3 | 2 | - | - | - | - | | | |
| CO2 | 2 | 3 | | 2 | 2 | - | - | - | - | | | |
| CO3 | 3 | 3 | - | 2 | 1 | - | - | - | - | | | |
| CO4 | 2 | 3 | | 3 | 2 | - | - | - | - | | | |
| CO5 | | | | | | | | | | | | |
| Course Correlation Mapping | **3** | **3** | - | **3** | **2** | **-** | **-** | **-** | - | | | |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

## COURSE CONTENT

**Module 1: GROUPS** ***(8 Periods)***

Binary Operation – Algebraic structure – semi group-monoid – Group definition and elementary properties Finite and Infinite groups – examples – order of a group. Composition tables with examples.

**Module 2: SUBGROUPS** ***(10 Periods)***

Complex Definition – Multiplication of two complexes Inverse of a complex-Subgroup definition – examples-criterion for a complex to be a subgroups. Criterion for the product of two subgroups to be a subgroup-union and Intersection of subgroups.

**Co-sets and Lagrange's Theorem :-**

Cosets Definition – properties of Cosets–Index of a subgroups of a finite groups–Lagrange's Theorem

**Module 3 NORMAL SUBGROUPS** ***(10 Periods)***

Definition of normal subgroup – proper and improper normal subgroup–Hamilton group – criterion for a subgroup to be a normal subgroup – intersection of two normal subgroups – Sub group of index 2 is a normal sub group – simple group – quotient group – criteria for the existence of a quotient group.

**Module 4 HOMOMORPHISM** ***(08 Periods)***

Definition of homomorphism – Image of homomorphism elementary properties of homomorphism – Isomorphism – automorphism definitions and elementary properties–kernel of a homomorphism – fundamental theorem on Homomorphism and applications.

**Module 5 PERMUTATIONS AND CYCLIC GROUPS** ***(9 Periods)***

Definition of permutation – permutation multiplication – Inverse of a permutation – cyclic permutations – transposition – even and odd permutations – Cayley's theorem.

**Cyclic Groups :** Definition of cyclic group – elementary properties – classification of cyclic groups.

***Total Periods: 45***

**EXPERIENTIAL LEARNING**

1. If There are 28 Elements of Order 5, Identify the Subgroups of Order 5.

2. Let G be a group of order 5757. Assume that G is not a cyclic group.Then determine the number of elements in G of order 33.

3. Determine the Number of Elements of Order 3 in a Non-Cyclic Group of Order 57

## RESOURCES

### TEXT BOOKS:


1. V.Venkateswara Rao, N. Krishnamurthy, B.V.S.S. Sarma, S. Anjaneya Sastry, A text book of Mathematics , S.Chand & Company, New Delhi, First Edition, 2014.
2. Seth Warner, Modern Algebra, Dover publications, First Edition, 2003.


### REFERENCE BOOKS:


1. M. Artin, Abstract Algebra, 2nd Ed., Pearson, 2011
2. Joseph A. Gallian, Contemporary Abstract Algebra, 4th Ed., Narosa Publishing House, New Delhi, 1999.
3. Joseph J. Rotman, An Introduction to the Theory of Groups, 4th Ed., Springer Verlag, 1995.


### VIDEO LECTURES:

1. https://nptel.ac.in/courses/111105112
2. 6. https://onlinecourses.nptel.ac.in/noc21_ma42/preview

## INTERDISCIPLINARY MINOR

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM101024** | **RINGS AND FIELDS** | 3 | - | - | - | 3 |

**Pre-Requisite** ----

**Anti-Requisite** ----

**Co-Requisite** ----

**COURSE DESCRIPTION:** Introduction to ring and field theory, including: polynomial rings, matrix rings, ideals and homomorphisms, quotient rings, Chinese remainder theorem, Euclidean domains, principal ideal domains, unique factorization domains, introduction to module theory, basic theory of field extensions, splitting fields and algebraic closures, finite fields, introduction to Galois theory.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Know the fundamental concepts in ring theory,analyze Integral domain, and evaluate the field of fractions of an integral domain.

**CO2** Use Isomorphism theorems of rings and to calculate Prime and Maximal ideals

**CO3** Construct Principal ideal domain (PID), Unique factorization domain (UFD), Euclidean domain (ED)

**CO4** Develop and reconstruct Rings of polynomials and factorization of polynomials over a field.

**CO5** The students study the notion of finite fields which has a useful application in coding theory.

### CO-PO-PSO Mapping Table:

| Learning Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | | | |
| **CO1** | 3 | 2 | 3 | - | - | - | - | - | - | | | |
| **CO2** | 3 | 3 | 3 | - | - | - | - | - | - | | | |
| **CO3** | 3 | 2 | 2 | - | - | - | - | - | - | | | |
| **CO4** | 3 | 2 | 3 | - | - | - | - | - | - | | | |
| **CO5** | 3 | 3 | 3 | | | | | | | | | |
| **Course Correlation Mapping** | **3** | **2** | **3** | **-** | **-** | **-** | **-** | **-** | - | | | |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1 BASICS OF RING THEORY** ***(09 Periods)***

Definition of Ring and basic properties, Boolean Rings, divisors of zero and cancellation laws, Integral Domains, Division Ring and Fields, The characteristic of a ring and its properties.

**Module 2 SUBRINGS & IDEALS** ***(10 Periods)***

Subrings and its properties, Ideals, Ideal generated by a subset of a ring, Operations on ideals, quotient ring, Ring Homomorphisms, Properties of ring homomorphisms, Prime and maximal ideals.

**Module 3 DOMAINS OF RING THEORY** ***(09 Periods)***

Principal ideal domain (PID), Unique factorization domain (UFD), Euclidean domain (ED) and its properties.

**Module 4 POLYNOMIAL RINGS** ***(09Periods)***

Polynomial rings in one variables and its properties, factorization of polynomials, irreducible polynomials, quotient rings of polynomials.

**Module 5 FIELD THEORY** ***(08 Periods)***

Basic properties of fields, Field extensions, Finite and simple extensions of fields. Algebraic closure of a field. Splitting fields. Finite fields.

***Total Periods: 45***

**EXPERIENTIAL LEARNING**

1. Check whether the set S = {0, 1, 2, 3, 4} is a ring or not with respect to operation addition modulo 5 & multiplication modulo 5.
2. Explain the difference between the rings, fields and group.

## RESOURCES

**TEXT BOOKS:**

1. I. N. Herstein, Abstract Algebra, John Wiley and Sons, 3rd Edition, 1996.

2. John B. Fraleigh, A First Course in Abstract Algebra, Pearson publications, 7th edition , 2002.

**REFERENCE BOOKS:**

1. Hungerford, Algebra, Springer; 8 edition, 2003) .
2. John R. Durbin, Modern Algebra: An Introduction, Wiley, 6 edition , 2008.

**VIDEO LECTURES:**

1. https://archive.nptel.ac.in/courses/111/106/111106131
2. https://archive.nptel.ac.in/noc/courses/noc21/SEM1/noc21-ma06
3. https://onlinecourses.nptel.ac.in/noc22_ma76/preview
4. https://onlinecourses.nptel.ac.in/noc20_ma09/preview

**Web Resources:**

1. http://www.math.niu.edu/~beachy/abstract_algebr 8 a/study_guide/contents.html
2. https://en.wikipedia.org/wiki/Ring_theory
3. https://en.wikipedia.org/wiki/Algebraic_structure
4. https://mathworld.wolfram.com/search/?q=Ring+Theory

## INTERDISCIPLINARY MINOR

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22MM101021** | **PARTIAL DIFFERENTIAL EQUATIONS** | 3 | - | - | - | 3 |

**Pre-Requisite** **22MM101007- MULTIVARIABLE CALCULUS**

**Anti-Requisite** ----

**Co-Requisite** ----

**COURSE DESCRIPTION:** This course provides fundamental knowledge of Partial differential equations. Further, this course focuses on finding the solution for linear and nonlinear partial differential equations by using various methods.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Classify Partial differential equations, formulation of partial differential equations.

**CO2** Solve Cauchy's problems for first order equations and Lagrange's equations by various methods.

**CO3** Solve Lagrange's equations by various methods.

**CO4** Finding solutions of nonlinear partial differential equations of order on f(x,y,z,p,q)=0.

**CO5** Finding solutions of nonlinear partial differential equations of order one by charpit's equations.

### CO-PO-PSO Mapping Table:

| Learning Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | | | |
| **CO1** | 2 | 3 | - | 1 | 1 | - | - | - | - | | | |
| **CO2** | 2 | 3 | - | 1 | 1 | - | - | - | - | | | |
| **CO3** | 3 | 2 | - | 2 | 1 | - | - | - | - | | | |
| **CO4** | 3 | 3 | - | 2 | 1 | - | - | - | - | | | |
| **CO5** | 3 | 3 | - | 2 | 1 | | | | | | | |
| **Course Correlation Mapping** | **3** | **3** | **-** | **2** | **1** | **-** | **-** | **-** | - | | | |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

### COURSE CONTENT

| **Module 1** | **Introduction of Partial Differential Equations** | ***(07 Periods)*** |
|---|---|---|
| Definition of PDE, Classification of First Order Partial Differential Equation, Formation of PDE's by elimination of arbitrary constants, functions. | | |
| | | |

| | | |
|---|---|---|
| **Module 2** | **Linear Partial Differential Equations of first order** | ***(10 Periods)*** |
| Cauchy's first order equations, Lagrange's Equations, Method of grouping,Lagrange's method of solving partial differential equations | | |
| | | |
| **Module 3** | **Linear Partial Differential Equations of second order** | ***(08 Periods)*** |
| Lagrange's method of solving partial differential equations of second order, Solution to homogeneous and non-homogeneous linear partial differential equations of second and higher order by complimentary function and particular integral method, Method of separation of variables. | | |
| | | |
| **Module 4** | **Non linear partial differential equations** | ***(10 Periods)*** |
| Non linear partial differential equations, Charpit's method. | | |
| | | |
| **Module 5** | **Applications of Partial differential equation** | ***(10 Periods)*** |
| One dimensional wave equation, heat equation, Laplace equation | | |
| | | ***Total Periods: 45*** |

## EXPERIENTIAL LEARNING

1. A simple pendulum of length $l$ is oscillating through a small angle $\theta$ in a medium in which the resistance is proportional to the velocity. Establish the differential equation of its motion. Discuss the motion and find the period of oscillation.

2. Design an equation for the momentum of inertia of a hollow sphere about a diameter and find the momentum of inertia when its external and internal radii being 5 meters and 4 meters.

## RESOURCES

**TEXT BOOKS:**


1. B. S. Grewal, Higher Engineering Mathematics, Khanna publishers, 44th edition, 2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th edition, 2011.
3. M.D, Raisinghania, Ordinary and Partial Differential Equations, S. Chand & Company, New Delhi, 20th Edition, 2020.


**REFERENCE BOOKS:**


1. S Narayanan and T K Manicavachogam Pillay, Differential Equations: S V Publishers Private Ltd., 1981.
2. G F Simmons, Differential equation with Applications and historical notes, 2nd ed.: McGraw-Hill Publishing Company, Oct 1991.
3. N. P. Bali and Manish Goyal, *A text book of Engineering Mathematics*, Laxmi

Publications, Reprint, 2010.

**VIDEO LECTURES:**

1. https://nptel.ac.in/courses/111103021
2. https://nptel.ac.in/courses/111107108

**Web Resources:**

1. http://www.efunda.com/math/math_home/math.cfm
2. http://www.sosmath.com/
3. http://www.mathworld.wolfram.com/

## INTERDISCIPLINARY MINOR

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22MM101025 | **LINEAR ALGEBRA** | 3 | - | - | - | 3 |

**Pre-Requisite** **22MM101024-Rings and Fields**

**Anti-Requisite** --

**Co-Requisite** --

**COURSE DESCRIPTION**: This course provides a discussion on matrix factorizations, linear systems, Eigenvalues and Eigenvectors, vector spaces, linear transformations, and orthogonality.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Demonstrate the concepts of matrix factorizations and solutions of the linear system.

**CO2** Apply the concepts of vector spaces and subspace on problems of computational systems.

**CO3** Apply the concepts of Basis and Linear transformation on problems of computational systems

**CO4** Use the inner product spaces for the study of orthogonality and to construct orthonormal basis.

**CO-PO Mapping Table:**

| Learning Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | | | |
| **CO1** | 3 | 3 | | 3 | 2 | - | - | - | - | | | |
| **CO2** | 2 | 3 | | 2 | 2 | - | - | - | - | | | |
| **CO3** | 3 | 3 | - | 2 | 1 | - | - | - | - | | | |
| **CO4** | 2 | 3 | | 3 | 2 | - | - | - | - | | | |
| **Course Correlation Mapping** | **3** | **3** | - | **3** | **2** | **-** | **-** | **-** | - | | | |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

## COURSE CONTENT

**Module 1: MATRICES AND LINEAR SYSTEM OF EQUATIONS** ***(10 Periods)***

Elementary Row-operations, Elementary Matrices, Echelon form, Rank of a matrix by row-reduction, Solutions of system of linear equations by row reduction, Matrix Factorization, LU factorization, LDU factorization.

**Module 2: VECTOR SPACES** ***(09 Periods)***

Vector spaces, Sub-spaces, Four fundamental subspaces of a matrix, Span, Linearly independent and dependent.

**Module 3 BASIS OF A VECTOR SPACE** ***(10 Periods)***

Basis, Basis extension theorem, construction of Basis, dimensions, Finite dimensional vector space.

**Module 4 LINEAR TRANSFORMATION** ***(08 Periods)***

Linear transformation, Kernal and range of linear transformation, Basic properties, Invertible linear transformation, Rank- Nullity theorem, Matrix of linear transformation.

**Module 5 INNER PRODUCT SPACES** ***(08 Periods)***

Inner product, Norm, Distance, Inner product space, Orthogonal and orthonormal basis, Gram-Schmidt orthogonalization, Singlular Value Decomposition for square matrices.

***Total Periods: 45***

## EXPERIENTIAL LEARNING

1. Let Breakfast consists of orange juice, cereal, and eggs with the following nutritional information:

| | OJ | Cereal | Eggs |
|---|---|---|---|
| Protein | 0% | 10% | 20% |
| Vitamin C | 20% | 15% | 0% |
| Calories | 100 | 120 | 100 |

   If you must have 30% protein, 30% Vitamin C and 300 calories for your breakfast, How many servings of OJ, Cereal, and Eggs should you have?
2. Solve for the Eigen values and Eigen vectors of 2x2 matrix on paper and larger matrices using MATLAB.
3. Check that the complex numbers $\mathbb{C} = \{x + iy / i^2 = -1, x, y \in \Re\}$, satisfy all of the conditions in the definition of vector space over $\mathbb{C}$. Make sure you state carefully what your rules for vector addition and scalar multiplication.

## RESOURCES

**TEXT BOOKS:**


1. Peter Selinger, Matrix theory and linear algebra, 1st Edition, creative commons license, 2018.
2. Stephen H. Friedberg, Arnold J. Insel and Lawrence E. Spence, Linear Algebra, Pearson Education, 5th Edition, 2022.

**REFERENCE BOOKS:**


1. Kuladeep Sing, Linear Algebra step by step, Oxford University press, 1st edition, 2014.
2. David Poole, *Linear Algebra: A Modern Introduction*, Brooks/Cole, 2nd edition, 2005.
3. Edgar G. Goodaire, Linear Algebra, Cambridge University Press, 1st Edition, 2014.


**VIDEO LECTURES:**

1. https://nptel.ac.in/courses/111106051
2. https://nptel.ac.in/courses/111106135

**Web Resources:**

1. https://catalogimages.wiley.com/images/db/pdf/9781119570271.excerpt.pdf
2. https://web.northeastern.edu/dummit/docs/linalgprac_5_eigenvalues_and_diagonalization.pdf
3. https://web.auburn.edu/holmerr/2660/Textbook/vectorspace-print.pdf
4. https://textbooks.math.gatech.edu/ila/linear-transformations.html
5. https://linear.axler.net/InnerProduct.pdf

# University Elective

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22ME101704 | MANAGING INNOVATION AND ENTERPRENEURSHIP | 3 | - | - | - | 3 |

**Pre-Requisite** -
**Anti-Requisite** -
**Co-Requisite** -

**COURSE DESCRIPTION:**
Evolution of entrepreneurship from economic theory Managerial and entrepreneurial competencies; Concepts of Shifting Composition of the Economy Purposeful Innovation & Sources of Innovative Opportunity; The Innovation Process; Innovative Strategies; Entrepreneurial Motivation; Entrepreneurs versus inventors; Ethics and International Entrepreneurship; Strategic Issues in International Entrepreneurship; Problem solving Innovation and Diversification

**COURSE OUTCOMES:**
After successful completion of the course, students will be able to:

**CO1.** Demonstrate the principles of innovation process for establishing Industrial ventures.
**CO2.** Identify and analyze the gaps in an organization for innovation in the context of developed economies
**CO3.** Develop a comprehensive and well-planned business structure for a new venture.
**CO4.** Demonstrate knowledge on intellectual property rights, patents, trademarks, copyrights, trade secrets and commercialization of intellectual property.
**CO5.** Apply ethics in constructive innovation framework and problem solving.

## CO-PO Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | 3 | 1 | 1 | | 1 | 1 | 1 | 1 | | | 1 | |
| CO2 | 3 | 2 | 1 | | 1 | | | | | | 1 | |
| CO3 | 3 | 3 | 1 | 1 | 1 | | | | | | 1 | |
| CO4 | 3 | 2 | 1 | 1 | 1 | 1 | | | | | 1 | |
| CO5 | 3 | 3 | 3 | 1 | 1 | 1 | | | | | 2 | |
| **Course Correlation Mapping** | **3** | **2** | **1** | **1** | **1** | **1** | **1** | **1** | | | **1** | |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1: CREATIVITY AND INNOVATION** ***(09 Periods)***

Introduction, Levels of innovation, Purposeful innovation and the sources of innovative opportunity, The innovation process, Innovative strategies, Strategies that aim at introducing and innovation, Dynamics of ideation and creativity – Inbound, Outbound; Context and process of new product development, Theories of outsourcing.

**Module 2: PARADIGMS OF INNOVATION** ***(09 Periods)***

Systems approach to innovation, Innovation in the context of developed economies and Emerging economies, Examining reverse innovation and

itsapplication,Performancegap,Infrastructuregap,Sustainabilitygap,Regulatory gap, Preference gap, organizational factors effecting innovation at firm level.

**Module 3: SOUCES OF FINANCE AND VENTURE CAPITAL** ***(09 Periods)***

Importance of finance, Comparison of venture capital with conventional development capital, Strategies of venture funding, Investment phases, Investment process, Advantages and disadvantages of venture capital, Venture capital developments in India.

**Module 4: INTELLECTUAL PROPERTY INNOVATION AND ENTREPRENEURSHIP** ***(09 Periods)***

Introduction to Entrepreneurship, Evolution of entrepreneurship from economic theory, Managerial and entrepreneurial competencies, Entrepreneurial growth and development, Concepts, Ethics and Nature of International Entrepreneurship, Intellectual property – forms of IP, Patents, Trademarks, Design registration, Copy rights, Geographical indications, Patent process in India.

**Module 5: OPEN INNOVATION FRAME WORK & PROBLEM SOLVING** ***(09 Periods)***

Concept of open innovation approach, Difference between open innovations and Cloud innovation approaches, Limitations and Opportunities of open innovation frame work, Global context of strategic alliance, Role of strategic alliance, Problem Identification and Problem Solving, Innovation and Diversification

**Total Periods:45**

## EXPERIENTIAL LEARNING

1. Identify the Innovative Marketing Strategies for Startups
2. Identify the Coca-cola Company Intellectual Property Rights

*(Note: It's an indicative one. Course instructor may change the activities and the same shall be reflected in course handout)*

## CASE STUDIES/ARTICELS:

Contemporary relevant case studies/ Articles will be provided by the course instructor at the beginning.

1. Tesla Inc.: Disrupting the Automobile Industry
   This case study examines how Tesla Inc. disrupted the traditional automobile industry through its innovative electric vehicles and sustainable energy solutions. It discusses the sources of innovative opportunity that Tesla leverages, the ideation and creativity dynamics involved in new product development, and the strategies that the company uses to introduce and market its innovations.
2. Google Inc.: Innovation in Developed Economies
   This case study explores how Google Inc. became a global leader in the technology industry through its innovative search engine, advertising, and cloud computing solutions. It highlights the performance gap that Google addressed, the regulatory and sustainability gaps that it leveraged, and the impact of its innovation strategies on the company's growth and profitability.
3. Flipkart: From Startup to Unicorn
   This case study examines how Flipkart, an Indian e-commerce company, secured venture capital funding to become one of the largest online marketplaces in India. It discusses the importance of finance in entrepreneurship, the advantages and disadvantages of venture capital, and the strategies that Flipkart used to attract venture funding.

4. Patanjali Ayurved: Building a Brand through Intellectual Property
   This case study explores how Patanjali Ayurved, an Indian consumer goods company, built a strong brand through its intellectual property strategies. It discusses the forms of IP that Patanjali leverages, the patent process in India, and the impact of IP on the company's growth and profitability.

5. Procter & Gamble: Innovation through Open Innovation
   This case study analyzes how Procter & Gamble, a global consumer goods company, leveraged open innovation to achieve unprecedented success in product development and marketing. It discusses the difference between open and cloud innovation approaches, the limitations and opportunities of open innovation, and the role of strategic alliances in global innovation.

## RESOURCES

### TEXT BOOKS:


1. Vinnie Jauhari, Sudhanshu Bhushan, *Innovation Management*, Oxford University Press, 1st Edition, 2014.
2. Drucker, P.F., *Innovation and Entrepreneurship*, Taylor & Francis, 2nd Edition, 2007.


### REFERENCE BOOKS:


1. Robert D Hisrich, Claudine Kearney, *Managing Innovation and Entrepreneurship,* Sage Publications, 1st Edition, 2014.
2. V.K. Narayanan, *Managing Technology and Innovation for Competitive Advantage,* Pearson India, 1st Edition, 2002.


### VIDEO LECTURES:

1. https://www.youtube.com/watch?v=wWsl48VLfVY
2. https://www.youtube.com/watch?v=dDpQ9ALKX0U
3. https://www.youtube.com/watch?v=Eu_hkxkJGTg

## University Elective

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22ME101703 | **MANAGEMENT SCIENCE** | 3 | - | - | - | 3 |

**Pre-Requisite** -
**Anti-Requisite** -
**Co-Requisite** -

**COURSE DESCRIPTION:**
Concepts of Management; Concepts Related to ethics and social responsibility; Human Resource Management; Operations Management; Statistical Process Control; Inventory Management; Marketing; Project Management; Project Crashing.

**COURSE OUTCOMES:**
After successful completion of the course, students will be able to:

**CO1** Demonstrate the concepts of management, its functions and processes used in optimum resource utilization within the context of ethics and social responsibility.
**CO2** Apply the concepts of HRM for selection and management of human resources.
**CO3** Analyze different operations management problems using quality management tools to produce effective, efficient and adoptable products/services
**CO4** Identify different marketing strategies to maximize enterprise profitability and customer satisfaction within the realistic constraints
**CO5** Develop network models in time-cost trade-off for effective project management.

## CO-PO Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | 3 | 1 | 1 | | 1 | 1 | 1 | 1 | | | 1 | |
| CO2 | 3 | 2 | 1 | | 1 | | | | | | 1 | |
| CO3 | 3 | 3 | 1 | 1 | 1 | | | | | | 1 | |
| CO4 | 3 | 2 | 1 | | 1 | 1 | | | | | 1 | |
| CO5 | 3 | 3 | 3 | 1 | 1 | 1 | | | | | 2 | |
| **Course Correlation Mapping** | **3** | **2** | **1** | **1** | **1** | **1** | **1** | **1** | | | **1** | |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1: MANAGERIAL FUNCTION AND PROCESS** ***(10 Periods)***
Concept and foundations of management, Evolution of management thought; Managerial functions – Planning, Organizing, Directing and Controlling; Decision-making; Role of manager, managerial skills; Managing in a global environment, Flexible systems management; Social responsibility and managerial ethics; Process and customer orientation; Managerial processes on direct and indirect value chain.

**Module 2: HUMAN RESOURCE MANAGEMENT** ***(08 Periods)***
Human Resource challenges; Human Resource Management functions; Human Resource Planning; Job analysis; Job evaluation, Recruitment and selection; Training and Development; Promotion and transfer; Performance management; Compensation management and benefits; Employee morale and productivity; Human Resource Information System.

**Module 3: OPERATIONS MANAGEMENT** ***(10 Periods)***
Fundamentals of Operations Management, Services as a part of operations management; Facilities location and layout; Line balancing; Quality management – Statistical Process

Control, Total Quality Management, Six sigma; Role and importance of materials management, Value analysis, Make or Buy decision, Inventory control, Materials Requirement Planning, Enterprise Resource Planning, Supply Chain Management.

**Module 4: MARKETING MANAGEMENT** ***(08 Periods)***

Concept, evolution and scope; Marketing strategy formulation and components of marketing plan; Segmenting and targeting the market; Positioning and differentiating the market offering, Analyzing competition; Product strategy; Pricing strategies; Designing and managing marketing channels; Integrated marketing communications.

**Module 5: PROJECT MANAGEMENT** ***(09 Periods)***

Project management concepts; Project planning – Work Breakdown Structure, Gantt chart; Project scheduling – Critical Path Method, Program Evaluation and Review Technique, Crashing the project for time-cost trade off; Resource Levelling.

**Total Periods: 45**

## EXPERIENTIAL LEARNING

1. Find the social responsibilities in the context of management theoretically and practically in an organization? Explain them by taking a real case study in any organization (preferably in your organization).
2. Gaining market share should be one of management's primary goals because of its effect on operations and profitability. Comment. What Strategies Do Companies Employ to Increase Market Share?
3. A Gantt chart is a visualization that helps in scheduling, managing, and monitoring specific tasks and resources in a project. Prepare a gantt chart for Online food ordering system.

*(Note: It's an indicative one. Course instructor may change the activities and the same shall be reflected in course handout)*

## RESOURCES

**TEXT BOOKS:**

1. MartandT. Telsang, *Industrial Engineering and Production Management,* S. Chand, 3rd Edition, 2018.
2. Koontz and Weihrich, *Essentials of Management*, TMH, New Delhi, 11th Edition, 2020.

**REFERENCE BOOKS:**

1. O.P. Khanna, *Industrial Engineering and Management,* Dhanpat Rai and Sons, 2018.
2. N.D. Vohra, *Quantitative Techniques in Management,* TMH, New Delhi, 5th Edition, 2014.
3. L.M. Prasad, *Principles and practice of Management,* S. Chand and Sons, 2019.

**VIDEO LECTURES:**

1. https://archive.nptel.ac.in/courses/122/106/122106032/
2. https://www.digimat.in/nptel/courses/video/122102007/L01.html

## UNIVERSITY ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22ME101702 | **HUMAN RESOURCE MANAGEMENT** | 3 | - | - | - | 3 |

**Pre-Requisite** -
**Anti-Requisite** -
**Co-Requisite** -

**COURSE DESCRIPTION:**
Concepts of HRM; Environmental Scanning; Human Resource Planning; Job analysis; Job design; Job evaluation; Recruitment; Selection; Placement; Orientation; Training and Development; Performance appraisal; Merit rating; Compensation; Industrial relations; Trade unions; Industrial disputes; Ethical issues; Employee safety.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:
**CO1.** Demonstrate the knowledge on the principles, processes and practices of human resource management.
**CO2.** Analyze the key issues related to administering the human elements such as motivation, recruitment, training and development, compensation, appraisal, and career development.
**CO3.** Provide solutions to plan and manage human resource functions effectively within organization.
**CO4.** Apply HRM concepts and techniques in strategic planning to improve organizational effectiveness.
**CO5.** Evaluate HRM related social, cultural and safe responsibilities and issues in a global context.

## CO-PO Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 2 | 1 | 1 | - | 1 | - | - | - | - | - | - |
| **CO2** | 3 | 3 | 1 | 1 | - | 1 | - | - | - | - | - | - |
| **CO3** | 3 | 2 | 3 | 1 | - | - | - | - | - | - | - | - |
| **CO4** | 2 | 1 | 1 | 1 | 3 | 1 | - | - | - | - | - | - |
| **CO5** | 3 | 1 | 1 | 1 | 1 | 1 | 2 | 3 | - | - | - | - |
| **Course Correlation Mapping** | **3** | **2** | **1** | **1** | **2** | **2** | **2** | **3** | | | | |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1: INTRODUCTION TO HRM & HRP** ***(09 Periods)***
**Introduction to Human Resource Management (HRM):** Objectives, Scope and significance of HRM, Functions of HRM, Prospects in HRM, Environmental scanning.

**Human Resource Planning (HRP):** Introduction, Nature and importance of HRP, Factors affecting HRP, The planning process, Human resource planning and the Government, Requisites for successful HRP, Barriers to HRP.

**Module 2: RECRUITMENT AND PLACEMENT** ***(09 Periods)***
Job Analysis – Nature and process of job analysis, Methods of collecting job data, Potential problems with job analysis, Requisites for job analysis; Job Design - Factors, Job design approaches, Contemporary issues; Job evaluation - Process, Methods; Recruitment - Nature, Purposes and importance, Factors governing recruitment, Recruitment process, Evaluation and control; Selection – Nature, Process, Barriers to effective selection, Evaluation of selection process, Placement; Separation.

**Module 3: HUMAN RESOURCE DEVELOPMENT AND COMPENSATION** ***(09 Periods)***

Orientation - Orientation programme, Requisites of an effective programme, Evaluation of orientation programme, Problems of orientation; Training and development – Nature, Inputs, Training process, Methods, Impediments to effective training, Management development, Career development, Talent management; Performance Appraisal - Nature, Appraisal process, Challenges of performance appraisal; Merit rating; Compensation - Philosophy, Components, Theories, Factors influencing employee compensation, Challenges, Wage and salary administration.

**Module 4: INDUSTRIAL RELATIONS AND TRADE UNIONS** ***(09 Periods)***

**Industrial Relations (IR):** Nature of IR, Importance of Peaceful IR; Approaches to IR - Unitary Approach, Pluralistic approach, Marxist approach; Parties to IR; IR strategy; Industrial Disputes - Nature, Causes, and Settlement.

**Trade unions:** Nature of trade unions, Strategic choices before unions, Union tactics, Trade union movement in India, Trends in trade union movement, Managing unions; Indian Factories Act; Employee's compensation Act; Industrial disputes Act.

**Module 5: ETHICAL ISSUES AND SAFETY ADMINISTRATION** ***(09 Periods)***

**Managing Ethical Issues in HRM:** Nature of ethics, Sources of business ethics, Myths about ethics, Ethical dilemmas, HR ethical issues, Managing ethics, Improving ethical decision making.

**Employee Safety**: Safety, Need for safety, Types of accidents, Safety programme, ISO safety standards.

**Total Periods: 45**

## EXPERIENTIAL LEARNING

1. What are the challenges that are faced by HR in effective performance management including performance appraisal in MNCs? Discuss in detail in the contemporary of HRM.
2. Evaluate employee relations in a comparative perspective across few countries of your choice. Describe in brief by taking a case study.
3. Visit an organization or industry and Evaluate HRM related social, cultural, ethical and environmental responsibilities and issues in a global context.

*(Note: It's an indicative one. Course instructor may change the activities and the same shall be reflected in course handout)*

**RESOURCES**

**TEXT BOOKS:**


1. Aswathappa K, *Human Resource Management,* Tata McGraw Hill Private Limited, 8th edition, 2017.
2. Garry Dessler and Biju Varkkey, *Human Resource Management,* Pearson India, 16th Edition, 2020.


**REFERENCE BOOKS:**


1. Raymond A. Noe, John R. Hollenbeck, *HRM: Gaining a Competitive Advantage*, TMH, 7th edition, 2010.
2. Bohlander George W, Snell Scott, *Principles of Human Resource Management,* Cengage Learning, 16th edition, 2016.
3. Edwin B. Flippo, *Personnel Management,* McGraw-Hill International editions, 6th edition, 1984.


**VIDEO LECTURES:**

1. https://nptel.ac.in/courses/122105020
2. https://onlinecourses.nptel.ac.in/noc20_mg15/preview
3. https://www.digimat.in/nptel/courses/video/122105020/L01.html

**UNIVERSITY ELECTIVE**

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22LG101701** | **BUSINESS COMMUNICATION AND CAREER SKILLS** | 3 | - | - | - | 3 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Nature and Scope of Communication, Corporate Communication, Writing Business Messages & Documents, Careers & Résumés, and Interviews.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Demonstrate knowledge of professional communication by analyzing and applying the styles and strategies of business communication in Communication Networks, Interpersonal, and Informal communication.

**CO2.** Analyze the limitations of communication by applying and demonstrating corporate and cross-cultural communication strategies effectively in a business context and Crisis Management situations.

**CO3.** Apply appropriate strategies and techniques in writing business messages, business letters, and résumé for effective professional communication and career building.

**CO4.** Demonstrate appropriate communication techniques and answering strategies by analyzing the expectations during presentations and interviews.

## CO-PO Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 1 | - | - | 2 | - | - | - | - | 3 | - | - |
| **CO2** | 1 | 2 | - | - | 2 | - | - | - | - | 3 | 1 | - |
| **CO3** | 1 | - | - | - | 2 | - | - | - | - | 3 | - | - |
| **CO4** | 1 | 2 | - | - | 2 | - | - | - | - | 3 | - | - |
| **Course Correlation Mapping** | **2** | **2** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **3** | **1** | **-** |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

## COURSE CONTENT

**Module 1: NATURE AND SCOPE OF COMMUNICATION** ***(9 Periods)***

Introduction – Communication Basics – Functions of Communication – Communication Networks – Interpersonal Communication – Informal Communication – Communication Barriers – Roles of a Manager.

**Module 2: CORPORATE COMMUNICATION** ***(9 Periods)***

Introduction – Corporate Communication – Cross-Cultural Communication; Concept & Styles – Corporate Communication Strategy – Corporate Citizenship – Crisis Communication: Case Study.

**Module 3: WRITING BUSINESS MESSAGES & DOCUMENTS** ***(9 Periods)***

Introduction – Importance of Written Business Communication – Types of Business Messages – Five Main Stages of Writing Business Messages – Business Letter Writing – Kinds of Business Letters – Common Components of Business Letters – Strategies for Writing the Body of a Letter.

**Module 4: CAREERS AND RÉSUMÉS** ***(9 Periods)***

Introduction – Career Building – Résumé Formats: Traditional, Electronic and Video Résumé – Sending Résumés – Follow-up Letters – Business Presentations and Speeches: Planning –Structuring – Organizing – Delivery.

**Module 5: INTERVIEWS** ***(9 Periods)***

Introduction – General Preparation for an Interview – Success in an Interview – Important Non-verbal Aspects – Types of Interviews – Styles of Interviewing – Types of Interviewing –Online Recruitment Process.

***Total Periods: 45***

## EXPERIENTIAL LEARNING

1. People often get confused in identifying or using English vocabulary on most occasions. Prepare a list of confusing words and find methods to overcome the difficulties in using those words to uplift the career of professionals.
2. Organizations and institutions use modern technology in communicating with their colleagues, clients, and stakeholders. Make a PowerPoint presentation on the modern communication system of any organization and its role in the success of the organization and its career.
3. As a student in the modern technological world, organizing or attending webinars is inevitable. Analyze the pros and cons of video conferencing by organizing webinars and preparing a report.
4. Form a team and act as a team leader. Prepare a performance appraisal report of the team using visual aids to support the presentation.
5. Make a detailed study on social networking and its impact on modern business and Career.

*(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)*

## RESOURCES

**TEXT BOOKS:**

1. Meenakshi Raman, Prakash Singh, *Business Communication*, Oxford University Press, New Delhi, 2nd edition, 2012.
2. Neera Jain, Sharma Mukherji, *Effective Business Communication*, Tata Mc Graw–Hill

**REFERENCE BOOKS:**

1. Courtland L. Bovee et al., *Business Communication Today*, Pearson, New Delhi, 2011.
2. Krizan, *Effective Business Communication*, Cengage Learning, New Delhi, 2010.

**VIDEO LECTURES:**

1. https://nptel.ac.in/courses/110105052
2. https://edurev.in/courses/14522_Business-Communication-The-Ultimate-Guide

**Web Resources:**

1. http://www.career.vt.edu/interviewing/TelephoneInterviews.html
2. http://job-search-search.com/interviewing/behavioral_interviews
3. https://goo.gl/laEHOY (dealing with complaints)
4. http://www.adm.uwaterloo.ca/infocecs/CRC/manual/resumes.html
5. https://goo.gl/FEMGXS
6. http://www.resumania.com/arcindex.html

## UNIVERSITY ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22MG101701 | ENTREPRENEURSHIP FOR MICRO, SMALL AND MEDIUM ENTERPRISES | 3 | - | - | - | 3 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** To understand the setting up and management of MSMEs and initiatives of Government and other institutions support for growth and development of MSMEs

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Understand the basic of SME and challenges of MSMEs

**CO2.** Explain the opportunities to Set-Up SSI/SME Units and role of rural & women entrepreneurship.

**CO3.** Illustrate roles of various institutions supporting MSMEs.

**CO4.** Understand Management of MSME, NPA & sickness units

**CO5.** Evaluate role of Government in Promoting Entrepreneurship

**CO-PO Mapping Table:**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | 2 | 1 | 2 | 1 | - | - | - | - | - | - | - | - |
| CO2 | 1 | 1 | 2 | - | - | | 2 | | 1 | | | - |
| CO3 | 2 | 2 | 1 | - | - | - | - | 1 | - | - | 2 | |
| CO4 | 3 | 1 | 2 | - | - | - | - | - | - | - | - | 2 |
| CO5 | 2 | 2 | 1 | - | - | 1 | - | - | - | - | - | 1 |
| **Course Correlation Mapping** | **2** | **2** | **2** | **2** | **1** | **1** | **2** | **1** | 1 | **-** | **2** | **2** |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1: Introduction2** ***(07 Periods)***

Concept & Definition, Role of Business in the modern Indian Economy SMEs in India, Employment and export opportunities in MSMEs. Issues and challenges of MSMEs

**Module 2: MSME Setting** ***(09 Periods)***

Identifying the Business opportunity, Business opportunities in various sectors, formalities for setting up an enterprise - Location of Enterprise – steps in setting up an enterprise – Environmental aspects in setting up, Incentives and subsidies.

**Module 3: MSMEs Supporting Institutions** ***(09 Periods)***

Forms of Financial support, Long term and Short term financial support, Sources of Financial support, Development Financial Institutions, Investment Institutions, Central level institutions, State level institutions, Other agencies, Commercial Bank – Appraisal of Bank for loans

**Module 4: Management of MSME** ***(10 Periods)***

Management of Product Line; Communication with clients – Credit Monitoring System - Management of NPAs - Restructuring, Revival and Rehabilitation of MSME, Problems of entrepreneurs – sickness in SMI – Reasons and remedies –– Evaluating entrepreneurial performance

**Module 5: Entrepreneurship Promotion** ***(10 Periods)***

MSME policy in India, Agencies for Policy Formulation and Implementation: District Industries Centers (DIC), Small Industries Service Institute (SISI), Entrepreneurship Development Institute of India (EDII), National Institute of Entrepreneurship & Small Business Development (NIESBUD), National Entrepreneurship Development Board (NEDB)

***Total Periods: 45***

## EXPERIENTIAL LEARNING

6. Present a case study on MSMEs Business Strategies.
7. Collect the data about nearby MSMEs and Present their structures in a PPT
8. Discuss in the group MSMEs opportunities in terms of Orientation and Develop mentation.

*(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)*

## RESOURCES

**TEXT BOOKS:**


5. Vasant Desai, *Small Scale Industries and Entrepreneurship*, Himalaya Publishing House, 2003..
6. Poornima M Charanthimath, *Entrepreneurship Development Small Business Enterprises*, Pearson, 2006.


**REFERENCE BOOKS:**


13. Suman Kalyan Chaudhury, *Micro Small and Medium Enterprises in India Hardcover*, Raj Publications, 2013.
14. Aneet Monika Agarwal, *Small and medium enterprises in transitional economies, challenges and opportunities*, DEEP and DEEP Publications
15. Paul Burns & Jim Dew Hunt, *Small Business Entrepreneurship*, Palgrave Macmillan publishers, 2010.


**VIDEO LECTURES:**

1. https://sdgs.un.org/topics/capacity-development/msmes
2. https://blog.tatanexarc.com/msme/msme-schemes-in-india-for-new-entrepreneurs-and-start-ups/

**Web Resources:**

6. ncert.nic.in/textbook/pdf/kebs109.pdf
7. https://www.jetir.org/papers/JETIR1805251.pdf

**UNIVERSITY ELECTIVE**

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22SS101704 | **INDIAN HISTORY** | 3 | - | - | - | 3 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Introduction; Ancient India; Classical and Medieval era; Modern India; India after independence.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Demonstrate contextual knowledge in the evolution of ancient and medieval Indian History and acquire an awareness of societal and cultural transformation.

**CO2** Analyze the situations before and after Independence and assess the societal reforms implemented in India after Independence.

**CO3** Practice culture transformations and appreciate its influence to adapt themselves in global scenarios.

## CO-PO Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | 2 | - | - | - | - | 1 | - | - | - | - | - | - |
| CO2 | 1 | 2 | - | - | - | 1 | - | - | - | - | - | - |
| CO3 | 1 | 1 | - | - | - | 2 | - | - | - | - | - | - |
| Course Correlation Mapping | 2 | 1 | - | - | - | 2 | - | - | - | - | - | - |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1: INTRODUCTION TO INDIAN HISTORY** ***(08 Periods)***

Elements of Indian History; History Sources: Archaeology, Numismatics, Epigraphy & Archival research; Methods used in History; History & historiography; Sociological concepts-structure, system, organization, social institutions, Culture and social stratification (caste, class, gender, power), State& Civil Society.

**Module 2: ANCIENT INDIA** ***(09 Periods)***

Mohenjo-Daro civilization; Harappa civilization; Mauryan Empire.

**Module 3: CLASSICAL & MEDIEVAL ERA** ***(12 Periods)***

Classic Era (200 BC - 1200 AD); Hindu - Islamic Era (1200 - 1800 AD).

**Module 4: MODERN INDIA** ***(06 Periods)***

Age of Colonialism (17th - 19th centuries); First war of Indian Independence; Freedom Struggle (1857-1947)

**Module 5: INDIA AFTER INDEPENDENCE (1947 - )** ***(10 Periods)***

The Evolution of the Constitution and Main Provisions; Consolidation of India as a Nation; Politics in the States; Indian economy; Modernization and globalization, Secularism and communalism, Nature of development, Processes of social exclusion and Inclusion, Changing Nature of Work and Organization.

***Total Periods: 45***

## EXPERIENTIAL LEARNING

1. Prepare a write-up on how to safeguard ancient monuments.
2. Analyze the most famous historically important place you visited.
3. Prepare a presentation on the ancient Seven Wonders of the World with their significance and how they are destroyed.
4. Prepare a presentation on "Wars of the past not only destroyed people and their livelihood but also the people's tradition and culture."
5. Prepare a poster on " Continents that No Longer Exist" with causes

*(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)*

## RESOURCES

**TEXT BOOKS:**

1. K. Krishna Reddy, *Indian History,* Tata McGraw-Hill, 21st reprint, 2017.

**REFERENCE BOOKS:**

1. Guha, Ramachandra, *India after Gandhi*, Pan Macmillan, 2007.
2. Romila Thapar, *Early India***,** Penguin India, New Delhi 2002.

## UNIVERSITY ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22SS101706 | **WOMEN EMPOWERMENT** | 3 | - | - | - | 3 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Concept & Framework, Status of Women, Women's Right to Work, International Women's Decade, and Women Entrepreneurship.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Demonstrate the knowledge of the characteristics and achievements of empowered women and women's empowerment techniques by analyzing women's legal and political status.

**CO2** Apply the knowledge of women's rights by analyzing various societal issues and obstacles in different fields, including science and technology.

**CO3** Demonstrate the knowledge of the significance of women's participation in policy debates, National conferences, and common forums for equality and development by identifying and analyzing issues.

**CO4** Analyze the concept of women's entrepreneurship, government schemes, and entrepreneurial challenges and opportunities.

### CO-PO Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | 3 | 1 | - | - | 1 | 3 | - | 1 | – | – | - | - |
| CO2 | 3 | 1 | - | - | - | 2 | - | - | - | – | - | - |
| CO3 | 3 | 1 | - | - | - | 2 | - | - | - | 3 | - | - |
| CO4 | 3 | 1 | - | - | - | - | - | - | - | - | 2 | - |
| Course Correlation Mapping | 3 | 1 | - | - | 1 | 3 | - | 1 | – | 3 | 2 | - |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1: CONCEPT & FRAMEWORK** ***(09 Periods)***

Introduction– Empowered Women's Characteristics – Achievements of Women's Empowerment **Concept of Empowerment:** Meaning & Concept – Generalizations about Empowerment – Empowerment Propositions – Choices women can make for empowerment – Women's participation in decision making, development process & in Governance. **Framework for Empowerment** – Five levels of equality – Tenets of Empowerment– Elements – Phases and aspects – Techniques – Categories and Models – Approaches.

**Module 2: STATUS OF WOMEN** ***(09 Periods)***

Legal Status: Present Scenario – Call for Social Change – Significant Trends – Legal & Schemes – Personal Law – Joint Family – Criminal Law – Shift towards Dowry – Deterrent Punishment – Criminal Law (II Amendment) – Discrimination in Employment.

Political Status: Present Scenario – Political Participation & its NatureSocio–economic Characteristics – Political Mobilization: Mass Media – Campaign Exposure – Group Orientation – Awareness of issues and participation – Progress & Future Thrust.

**Module 3: WOMEN'S RIGHT TO WORK** ***(09 Periods)***

Introduction – Present Scenario – Changes in Policy & Programme – National Plan of Action– Women's Cells and Bureau – Increase in the work participation rate – Discrimination in the labour market – Women in unorganized sector – Issues and Obstacles– Women in Education – Women in Science & Technology – Case Study: Linking Education to Women's Access to resources.

**Module 4: WOMEN'S PARTICIPATORY DEVELOPMENT** ***(09 Periods)***

Dynamics of social change – conscious participation – Information Explosion – Organized Articulation – National Conference – Common Forums – Participatory Development – New Issues Identified – Role of other Institutions.

**Module 5: WOMEN ENTREPRENEURSHIP** ***(09 Periods)***

Introduction – Definition – Concept – Traits of women Entrepreneurs – Role of Women Entrepreneurs in India – Reasons for Women Entrepreneurship – Government schemes & Financial Institutions to develop Women Entrepreneurs – Key policy recommendations – Project Planning – Suggestions and measures to strengthen women entrepreneurship – Growth & Future challenges – Training and Opportunities – Case Study: Training Women as Hand–pump Mechanics– Case Study: Literacy for Empowering Craftswomen

***Total Periods: 45***

## EXPERIENTIAL LEARNING

1. Prepare poster presentation on "impact of women's self-help groups on their empowerment and socio-economic development."
2. Prepare a comparative analysis chart on the status of women in various countries.
3. Prepare a presentation on women and cultural responsibilities in different societies.
4. Prepare a presentation on the women of the past, present and future in terms of responsibilities and duties.
5. Prepare a presentation on the great women entrepreneurs of India.

*(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)*

## RESOURCES

**TEXT BOOKS:**


1. SahaySushama, *Women and Empowerment,* Discovery Publishing House, New Delhi, 2013.
2. NayakSarojini, Jeevan Nair, *Women's Empowerment in India*, Pointer Publishers, Jaipur, 2017.


**REFERENCE BOOKS:**


1. Baluchamy. S, *Women's Empowerment of Women*, Pointer Publishers, Jaipur, 2010.
2. Khobragade Grishma, *Women's Empowerment: Challenges and Strategies Empowering Indian Women*, Booksclinic Publishing, Chhattisgarh, 2020.


**Web Resources:**

1. https://www.economicsdiscussion.net/entrepreneurship/women–entrepreneurs–in–india
2. https://www.businessmanagementideas.com/entrepreneurship–2/women entrepreneurs

## UNIVERSITY ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22CE101703 | PLANNING FOR SUSTAINABLE DEVELOPMENT | 3 | - | - | - | 3 |

**Pre-Requisite** --

**Anti-Requisite** --

**Co-Requisite** --

**COURSE DESCRIPTION:** This course provides a detailed discussion on sustainable development, environmental impact, sustainable policies, governance, theories and strategies, media and education for sustainability.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Compare sustainable development theories in national and global context to protect the society and environment.

**CO2** Analyze the unforeseen environmental impacts on sustainable development to protect the society and environment.

**CO3** Analyze policies and governance for sustainable development considering ethics, economics, society and environment.

**CO4** Analyze systems and strategies for sustainable development using appropriate tools and techniques considering ethics, economics, society and environment.

**CO5** Analyze the role of media and education in sustainable development using appropriate tools and techniques considering ethics, society and environment besides communicating effectively.

## CO-PO Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | 3 | 3 | - | - | - | 2 | 2 | - | - | - | - | - |
| CO2 | 3 | 3 | - | - | - | 2 | 2 | - | - | - | - | 1 |
| CO3 | 3 | 3 | - | - | - | 2 | 2 | 2 | - | - | 1 | - |
| CO4 | 3 | 3 | - | - | 2 | 2 | 2 | 2 | - | - | 1 | - |
| CO5 | 3 | 3 | - | - | 2 | 2 | 2 | 2 | - | 1 | - | - |
| **Course Correlation Mapping** | **3** | **3** | **-** | **-** | **2** | **2** | **2** | **2** | - | **1** | **1** | **1** |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1: SUSTAINABLE DEVELOPMENT** ***(09 Periods)***

Definition and concepts of sustainable development, Capitalization of sustainability-National and global context; Sustainable development goals, Emergence and evolution of sustainability and sustainable development, Theories of sustainability, Case studies.

**Module 2: ENVIRONMENTAL IMPACT** ***(09 Periods)***

Climate change – Science, Knowledge and sustainability; Unforeseen environmental impacts on development, Challenges of sustainable development, Centrality of resources in sustainable development, Case studies.

**Module 3: SUSTAINABLE POLICIES AND GOVERNANCE** ***(09 Periods)***

Governance - Democracy and Eco–welfare; Global civil society and world civil politics, Civic environmentalism, Policy responses to sustainable development, Economics of sustainability, Social responsibility in sustainability, National action, ISO 14001: Environmental management system.

**Module 4: SUSTAINABLE SYSTEMS AND STRATAGIES** ***(09 Periods)***

Need for system innovation, Transition and co–evolution, Theories and methods for sustainable development, Strategies for eco–innovation, Ecological foot print analysis, Socio ecological indicators – Eco labels; Policy programmes for system innovation, Case studies.

**Module 5: MEDIA AND EDUCATION FOR SUSTAINABILITY** ***(09 Periods)***

Role of emerging media, Remarkable design and communication art, Activism and the public interest, Education for sustainability, Participation in decision making, Critical thinking and reflection, Case studies.

***Total Periods: 45***

## EXPERIENTIAL LEARNING

1. Submit a study report on the importance and implementation of United Nationals sustainable goals 17 among all the ratified nations.
2. Submit a study report on any one case study that the challenges being faced during the sustainable development goals implementation.
3. Submit a study report on the social responsibility in implementation of sustainability concept.
4. Prepare and submit a report on any two case studies that how the eco labels put on their products shall make the consumers feel satisfaction over the sustainable development.
5. Submit a report on the communication art and activism through media which makes the public interest that helps to contribute towards sustainable development.

## RESOURCES

**TEXT BOOKS:**

1. John Blewitt, *Understanding Sustainable Development*, Earth Scan Publications Ltd., 2nd Edition, 2008.
2. Jennifer A. Elliot, *An Introduction to Sustainable Development*, Earth Scan Publications Ltd., 4th Edition, 2006.

**REFERENCE BOOKS:**

1. Peter Rogers, Kazi F Jalal and John A Boyd, *An Introduction to Sustainable Development*, Earth Scan Publications Ltd., 2006.
2. Simon Dresner, *The Principles of Sustainability*, Earth Scan Publications Ltd., 2nd Edition, 2008.
3. Peter Bartelmus, *Environment Growth and Development: The Concepts and Strategies of Sustainability*, Routledge, 3rd Edition, 2003.
4. Gabriel Moser, Enric Pol, Yvonne Bernard, MiriliaBonnes, Jose Antonio Corraliza and Maria Vittoria Giuliani, *People Places and Sustainability*, Hogrefe& Huber Publishers, 2nd Edition, 2003.

**VIDEO LECTURES:**

1. https://www.youtube.com/watch?v=a5i9RVyhBtc
2. https://www.youtube.com/watch?v=fH_iIVPTujE
3. https://www.youtube.com/watch?v=c2eNrFK5M8I
4. https://www.youtube.com/watch?v=qfOgdj4Okdw
5. https://www.youtube.com/watch?v=_qLqLJq2954

**WEB RESOURCES:**

1. https://civil.gecgudlavalleru.ac.in/images/admin/pdf/1594706742_III-II-OE-Planning-for-Sustainable-Development.pdf
2. https://www.academia.edu/26950843/Sustainable_Development_in_Practice_Case_Studies_for_Engineers_and_Scientists
3. https://www.academia.edu/24286208/The_Role_of_the_Professional_Engineer_and_Scientist_in_Sustainable_Development
4. https://byjusexamprep.com/liveData/f/2022/8/sustainable_development_goals_upsc_notes_43.pdf
5. https://sdgs.un.org/sites/default/files/2020-10/course%201_Peter_Tarr%20%20-%20%20Compatibility%20Mode.pdf

**UNIVERSITY ELECTIVE**

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22CM101701 | **BANKING AND INSURANCE** | 3 | - | - | - | 3 |

**Pre-Requisite**

**Anti-Requisite**

**Co-Requisite**

**COURSE DESCRIPTION**: Introduction to Banking; Bank-Customer Relationship; Electronic Payment System and Business Models; Introduction to Risk and Insurance; Insurance Overview.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Demonstrate the importance of Banking and functions of the Reserve Bank of India and its role in the country's sustainable development.

**CO2** Demonstrate the role, relationships, and operations between Banker and Customer.

**CO3** Demonstrate the Online Banking system, various types of Electronic Payments, and Business models.

**CO4** Demonstrate the concept of risk and principles, functions, and, types of Insurance companies.

**CO5** Understand the principles of insurance and its functions.

## CO-PO Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| **CO1** | 3 | | | | | | | 2 | | | | 1 |
| **CO2** | 3 | | | | | | | 2 | | | | 1 |
| **CO3** | 3 | | | | | | | 2 | | | | 1 |
| **CO4** | 3 | | | | | | | 2 | | | 1 | 1 |
| **CO5** | 3 | | | | | | | 2 | | | 1 | 1 |
| **Course Correlation Mapping** | **3** | | | | | | | **2** | | | **1** | **1** |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1: INTRODUCTION TO BANKING** ***(09 Periods)***

Meaning - Importance of banking- Functions of banking - Reserve Bank of India: Functions – Role of RBI in sustainable development.

**Module 2: BANK-CUSTOMER RELATIONSHIP (09 Periods)**

Debtor-creditor relationship, deposit products or services, payment, and collection of cheques. Accounts – Types of accounts, the procedure for opening and closing an account - Loans and Advances- principles of lending.

**Module 3 ELECTRONIC PAYMENT SYSTEM&BUSINESS MODELS (09 Periods)**

Introduction to Online Banking - types of e-payment system, e-cash, NEFT, RTGS, Credit cards, Electronic Wallet and Debit cards. **Business models**- B2B, B2C, C2C, and B2G.

**Module 4 INTRODUCTION TO RISK AND INSURANCE (09 Periods)**

**Insurance**: Definition, Insurance as risk mitigation mechanism, elements of insurance. Concept of risk, risk *Vs* uncertainty.

**Module 5 INSURANCE OVERVIEW** ***(09 Periods)***

Principles of insurance - insurance types - LIC & GIC – insurance functions, IRDA - Insurance Players in India.

***Total Periods: 45***

## EXPERIENTIAL LEARNING

1. Make a PowerPoint presentation on the banking system in India.
2. Submit a report on the working of insurance companies.
3. Prepare a report on the functions of RBI & IRDA in India.
4. Submit a report on electronic banking facilities provided by Indian banks.

*(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)*

## RESOURCES

**TEXT BOOKS:**

1. RanganadhaChary, A.V. and Paul, R.R., *Banking and Financial system*, Kalyani Publisher, New Delhi, 3rdedition, 2016.
2. Sharma, R.K., Shashi K. Gupta and Jagwant Singh, *Banking and Insurance*, Kalyani Publishers, New Delhi, 17th edition, 2014

**REFERENCES BOOKS:**

1. *Indian Institute of Banking & Finance, Digital Banking*, Taxman Publications Pvt. Ltd., 2016 edition, 2016.
2. Jyotsna Sethi and Nishwan Bhatia, *Elements of Banking and Insurance*, PHI Learning Pvt. Ltd., 2nd edition, 2012.

**VIDEO LECTURES:**

1. https://www.youtube.com/watch?v=a1_p8zhbAfE
2. https://www.youtube.com/watch?v=bxNw9VB5Y_0

**WEB RESOURCES:**

1. https://unacademy.com/content/railway-exam/study material/economics/importance-of-banking-sector-in-the-country/
2. https://www.geeksforgeeks.org/ life-insurance-meaning-elements-and-types-of-life-insurance-policies/

## UNIVERSITY ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22CM101702 | **COST ACCOUNTING AND FINANCIAL MANAGEMENT** | 3 | - | - | - | 3 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION**: Cost accounting; cost sheet & preparation of cost sheet; standard costing & variance analysis; financial management & ratio analysis; introduction to investment**.**

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Demonstrate the concepts of Cost Accounting and Management Accounting and the elements of costing.

**CO2** Determine the Cost of Production for pricing decisions.

**CO3** Apply the Standard Costing and Variance techniques for the control of the cost of production

**CO4** Analyze the Profitability and financial condition of an organization using Ratios.

**CO5** Apply Capital Budgeting techniques for making investment decisions in an organization.

## CO-PO Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | | | | 2 | | | 1 | | | | |
| **CO2** | 3 | | | | 2 | | | 1 | | | 1 | |
| **CO3** | 3 | | | | 2 | | | 1 | | | 1 | |
| **CO4** | 3 | | | | 2 | | | 1 | | | 1 | |
| **CO5** | 3 | | | | 2 | | | 1 | | | | |
| **Course Correlation Mapping** | **3** | | | | **2** | | | **1** | | | **1** | |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

## COURSE CONTENT

**Module 1: COST ACCOUNTING** ***(09 Periods)***

Meaning of Cost and Cost Accounting, Objectives, Scope, Advantages, and Disadvantages – Cost Accounting *Vs* Management Accounting – Elements of Costing – Installation of costing system – Material Control, Labor Control, Overhead Control.

**Module 2: COST SHEET & PREPARATION OF COST SHEET (09 Periods)**

Analysis of Cost – Preparation of cost sheet, estimate, tender, and quotation (Simple problems) – Importance of Costing while pricing the products

**Module 3 STANDARD COSTING & VARIANCE ANALYSIS (09 Periods)**

Introduction to Standard Costing & Variances – Variance Analysis: Material variances, Labor variances (Simple Problems).

**Module 4 FINANCIAL MANAGEMENT & RATIO ANALYSIS (09 Periods)**

Meaning, Objectives - Nature and Scope, Importance of FM – Ratio Analysis**:** Types of Ratios: Solvency Ratios, Liquidity Ratios, Turnover Ratios, and Profitability Ratios - Financial Statement Analysis through Ratios (Simple Problems).

**Module 5 INTRODUCTION TO INVESTMENT *(09 Periods)***

Investment - Meaning and Definition- concept of risk and returns - Capital budgeting techniques – Security Analysis and Portfolio Management (Basic concepts).

***Total Periods: 45***

## EXPERIENTIAL LEARNING

1. Prepare a report on the role of cost accountants in the growth of a company.
2. To visit the manufacturing unit to observe how they used various techniques for analyzing the financial health of a company.
3. Prepare a report on factors influencing the form of business organization.
4. Prepare the cost sheet with practical examples of any two manufacturing companies.

*(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)*

## RESOURCES

**TEXT BOOKS:**

1. S.P. Jain and K.L. Narang: *Cost Accounting*, Kalyani Publishers, Ludhiana, 10th edition, 2016.
2. I.M. Pandey, *Financial Management*, Vikas Publishing House Pvt. Ltd., 14th edition, 2016.

**REFERENCE BOOKS:**

1. The Institute of Company Secretaries of India, *Cost and Management Study Material*, New Delhi.
2. CA Saravana Prasath, *Cost Accounting and Financial management*, Wolters Kluwer India Pvt. Ltd., New Delhi, 2018.

**VIDEO LECTURES:**

1 https://www.youtube.com/watch?v=ESqO8sFgQa0&list=PLLhSIFfDZcUVE2kzOhEubO9rkvUOAgZbz

2 https://www.youtube.com/

watch?v=tzasFmP1CpAhttps://www.youtube.com/watch?v=tzasFmP1CpA

**WEB RESOURCES:**

1 https://www.tutorialspoint.com/

accounting_basics/management_versus_cost_accounting.htm

2 https://www.netsuite.com
/portal/resource/articles/financial-management/financial-management.shtml

## UNIVERSITY ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22SS101702 | GENDER AND ENVIRONMENT | 3 | - | - | - | 3 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Gender and the environment relationship, Gendered Roles in the Family & Community, Gender and sustainable development, Gender in environmental justice, Gender & Environmental Security.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Apply the knowledge of gender & environmental connections by analyzing key issues and topics within global environmental politics in environmental decision-making.

**CO2** Demonstrate knowledge of the concepts of gender and sustainable development through debates and policy documents.

**CO3** Analyze the concept of environmental security and justice by identifying the sources of insecurity.

## CO-PO Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | 3 | 1 | - | - | - | 3 | 3 | - | - | - | - | - |
| CO2 | 3 | - | - | - | - | 2 | 3 | 1 | - | 2 | - | - |
| CO3 | 3 | 1 | - | - | - | 3 | 3 | - | - | - | - | 2 |
| **Course Correlation Mapping** | **3** | **1** | **-** | **-** | **-** | **3** | **3** | **1** | **-** | **2** | **-** | **2** |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1: GENDER AND ENVIRONMENT RELATIONSHIP** ***(09 Periods)***

Introduction – Gender and Environment – Development of gender roles – Society, gender & environment – Understanding environmental politics – Gender-environment connections–Eco-feminism – Cultural eco-feminism – Social eco-feminism – Feminist political ecology

**Module 2: GENDERED ROLES IN THE FAMILY & COMMUNITY** ***(09 Periods)***

Organization of the household – Domestic division of labour – Food: growing, harvesting, shopping, preparing, and cooking

Gender & Power – Planning – Politics – NGO – Gendering of environmental protest –

Environmental decision-making

**Module 3: GENDER AND SUSTAINABLE DEVELOPMENT** ***(09 Periods)***

Concept of sustainability & its achievement – Concept of sustainable development – Ecological Modernization – Gender & sustainability debates – Gender & sustainable development debates - Gender in policy documents – Gender, poverty & equity in sustainable development

**Module 4: GENDER IN ENVIRONMENTAL JUSTICE** ***(09 Periods)***

Normative Concerns ( Fairness, Inequality & Justice) –Making sense of Environmental justice – Ecological debt, Transnational harm, & human rights – Ecological justice – Gender &Environmental Justice – Gender, Vulnerability & risk – Women in environmental justice movements – Knowledge & participation – Gender, sustainability & justice as guiding concepts.

**Module 5: GENDER AND ENVIRONMENTAL SECURITY** ***(09 Periods)***

Connections between security & the environment – **Gender, environment & security:** Sustainability as security – poverty & insecurity – Insecurity as injustice – Competing ways of thinking security – Reflecting on sources of insecurity – **Case Study** – Food Security - **Case Study** – The impacts of natural disasters

***Total Periods: 45***

## EXPERIENTIAL LEARNING

1. Prepare a poster presentation on the impact of globalization on family structure and society.
2. Prepare a presentation on the family setup of different countries and their peculiar customs.
3. Prepare poster presentation on "Ancient hominin walked like a human but climbed like an ape."
4. Find out the problems of present society and being part of future generations how you may help to strengthen environmental security.

*(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)*

## RESOURCES

**TEXT BOOKS:**


1. Nicole Detraz, *Gender and the Environment,* Polity Press, Cambridge, UK. 2017
2. Susan Buckingham- Hatfield, *Gender and Environment*, Routledge, London. 2000


**REFERENCE BOOKS:**


1. Promillakapur ed., *Empowering Indian Women*, Publication Division, Government of India, New Delhi. 2000.
2. Ronnie Vernooy, Ed., *Social and Gender Analysis Natural Resource Management: Learning Studies and Lessons from Asia,* Sage, New Delhi. 2006
3. Swarup Hemlata and Rajput, Pam, *Gender Dimensions of Environmental and Development Debate: The Indian Experience,* In Sturat S. Nagel, (ed). *India's Development and Public Policy*. Ashgate, Burlington. 2000

**UNIVERSITY ELECTIVE**

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22SS101703 | **INDIAN ECONOMY** | 3 | - | - | - | 3 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** Introduction; Elementary Economic Analysis; Economic Planning; Time Value of Money; Value Analysis/Value Engineering.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1** Understand the basic concepts of economics, economic analysis, economic planning and strata.

**CO2** Demonstrate knowledge in capital budgeting, evaluation of engineering projects, depreciation policy and familiarize with the concepts of value analysis vs value engineering.

**CO3** Analyze and apply financial information for the evaluation of finance.

## CO-PO Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | 3 | - | - | - | - | 2 | - | - | - | - | - | - |
| CO2 | 3 | - | - | - | - | 2 | - | - | - | - | - | 2 |
| CO3 | 3 | - | - | - | - | 2 | - | - | - | - | - | 2 |
| Course Correlation Mapping | 3 | - | - | - | - | 2 | - | - | - | - | - | 2 |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1: INTRODUCTION** ***(09 Periods)***

Economics-Flow in an Economy, Law of Supply and Demand; Micro and Macro Economics; Relationship between Science, Engineering, Technology and Economic Development; Concept of Engineering Economics-Types of Efficiency, Definition and Scope of Engineering Economics.

**Module 2: ELEMENTARY ECONOMIC ANALYSIS** ***(09 Periods)***

Economic Analysis – Meaning, Significance, Simple Economic Analysis; Material Selection for a Product, Substitution of Raw Material; Design Selection for a Product; Material Selection-Process Planning, Process Modification.

**Module 3: ECONOMIC PLANNING** ***(09 Periods)***

Introduction - Need For Planning in India, Five-year plans(1951-2012), NITI Aayog (from 2014 onwards); Inclusive Growth-Meaning, Significance, Need for inclusive growth in India, Strategy for more inclusive growth, Challenges and Prospects; Employment and Inclusive Growth in India, Role of engineers in sustaining inclusive growth.

**Module 4: TIME VALUE OF MONEY** ***(12 Periods)***

Concepts and Application; Capital Budgeting-Traditional and Modern Methods; Simple and Compound Interest, Cash Flow Diagram, Principle of Economic Equivalence; Evaluation of Engineering Projects - Present Worth Method, Future Worth Method, Annual Worth Method, Internal Rate of Return Method, Cost-benefit Analysis in Public Projects; Depreciation Policy-Depreciation of Capital Assets, Causes of Depreciation, Straight Line Method and Declining Balance Method.

**Module 5: VALUE ANALYSIS/VALUE ENGINEERING** ***(06 Periods)***

Introduction-Value Analysis, Value Engineering, Functions, Aims; Value Analysis vs Value Engineering; Value Engineering Procedure- Advantages, Application Areas.

***Total Periods: 45***

## EXPERIENTIAL LEARNING

1. Prepare a poster presentation on the impact of globalization on family structure and society.
2. Prepare a presentation on family setups of different countries and their peculiar customs if any.
3. Prepare a poster presentation on "Ancient hominin walked like a human but climbed like an ape."
4. Find out the problems of present society and being part of future generations and how you may help to strengthen environmental security.

*(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)*

## RESOURCES

**TEXT BOOKS:**


1. Panneerselvam. R., *Engineering Economics*, PHI Learning Private Limited, New Delhi, 2nd edition, 2013.
2. Jain. T. R., V. K. Ohri, O. P. Khanna., *Economics for Engineers*, VK Publication, 1st edition, 2015.


**REFERENCE BOOKS:**


1. DuttRudar & Sundhram K. P. M., *Indian Economy*, S. Chand, New Delhi, 62nd revised edition, 2010.
2. Misra, S. K. & V. K. Puri., *Indian Economy*: *Its Development Experience*, Himalaya Publishing House, Mumbai, 32nd edition, 2010.

## UNIVERSITY ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22SS101701 | **CONSTITUTION OF INDIA** | 3 | - | - | - | 3 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** This course provides and in-depth knowledge about Constitution of India's Preamble and its Philosophy; Union Legislature; Federalism in India; Judiciary and Public Services; Nation Building. The students can gain first-hand information and knowledge about these dynamics and accordingly act based on these sources in their professional and routine activities.

**COURSE OUTCOMES:** After successful completion of this course, the students will be able to:

**CO1:** Demonstrate knowledge in the Parliamentary proceedings, Election Commission, Public Services and Foreign Policy of India.

**CO2:** Apply the reasoning informed by the various aspects of the Constitution and its provisions to assess societal issues and the consequent responsibilities relevant to the professional engineering practice.

## CO-PO Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | 1 | - | - | - | - | 3 | 2 | - | - | - | - | - |
| CO2 | 2 | - | - | - | - | 3 | - | 3 | - | - | - | - |
| **Course Correlation Mapping** | **2** | **-** | **-** | **-** | **-** | **3** | **2** | **3** | **-** | **-** | **-** | **-** |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

## COURSE CONTENT

**Module 1: PREAMBLE AND ITS PHILOSOPHY** ***(9 Periods)***

Introduction to Indian Constitution; Evolution of Indian Constitution; preamble and its philosophy

**Module 2: UNION LEGISLATURE** ***(9 Periods)***

The Parliament, Parliamentary Structure, Process of Legislation; President of India – Powers and Functions; Prime Minister and Council of Ministers; Constitution Amendment Procedure.

**Module 3: FEDERALISM IN INDIA** ***(9 Periods)***

Centre-State Administrative Relationship; Governors – Powers and Functions; State Legislature - Composition and powers; Chief Ministers - Powers and Functions; The Election Commission – Powers and Functions.

**Module 4: JUDICIARY AND PUBLIC SERVICES** ***(9 Periods)***

The Union Judiciary - Supreme Court and High Court; Fundamental Rights and Duties All India Services - Central Civil Services -State Services - Local Services.

**Module 5: INTERNATIONAL PARTICIPATION** ***(9 Periods)***

Foreign Policy of India; International Institutions Influence: UNO, WTO, WHO, SAARC, International Summits: BRICS, NSS, UNEP – India's Role in International Negotiations; Environmentalism in India.

***Total Periods: 45***

## EXPERIENTIAL LEARNING

1. Review newspapers and submit a report on critical analysis of Indian Civil Servants exercise of powers, in the awake of constitutionally assigned authority.
2. Visit your village Panchayat office or Municipality office and generate a report on your observations about maintained Constitutional symbolism.
3. Watch few videos on recent Indian Independence Day and Republic Day celebrations as marked in New Delhi and present a detailed report, by considering the following aspects:
    a) Comparatively analyze the speeches of the President of India and Prime Minister of India as delivered on these two occasions.
    b) Compare these two events relevance in terms of Indian Armed Forces presence.
    c) Observe, compare and analyse 'flag code' relevance as marked in these two events.
4. Watch a few videos on recent 'proceedings' of any state Legislative Assembly session and submit a detailed report.

*(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)*

## RESOURCES

**TEXT BOOKS:**

1. Briji Kishore Sharma, *Introduction to the Constitution of India*, Prentice Hall of India, 2005

**REFERENCE BOOKS:**

1. Mahendra Pal Singh,V. N. Shukla's, *Constitution of India*, Eastern Book Company, 2011.
2. Pandey J. N., *Constitutional Law of India*, Central Law Agency, 1998

**VIDEO LECTURES:**

1. Doctrine of Basic Structure: https://www.youtube.com/watch?v=cvUf9ZeEe8Y
2. Significance of the Constitution: https://www.youtube.com/watch?v=vr1Dc_-ZKbQ

**Web Resources**:

1. The Constitution of India: https://www.youtube.com/watch?v=of2SoO8i8mM
2. Protection of Constitutional Democracy: https://www.youtube.com/watch?v=smJ99cdPrns

## UNIVERSITY ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22ME101701 | GLOBAL STRATEGY AND TECHNOLOGY | 3 | - | - | - | 3 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:**

Introduction to strategic management; Strategic management process; Principles of good strategy; Globalization strategies; Research and Development strategies; Technology Management and Transfer; Elements of Transfer Process; Corporate Governance in the Indian scenario.

**COURSE OUTCOMES:**

After successful completion of the course, students will be able to:

**CO1** Demonstrate the knowledge on strategic management, its approaches, and tools through ethical decision making.

**CO2** Analyse the globalization challenges for scrupulous selection of globalization strategies.

**CO3** Apply the R&D strategies and trends to enhance the technological breakthroughs for new products and applications.

**CO4** Demonstrate the knowledge on technology management and transfer that strengthen the economy and accelerate the application of technology and resources.

**CO5** Analyze the challenges of corporate governance in Indian scenario for the effective development of value-oriented organizations.

## CO-PO Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | 3 | 2 | 1 | - | 1 | 1 | - | 1 | - | - | 1 | - |
| CO2 | 3 | 2 | 1 | - | 1 | 1 | - | - | - | - | 1 | - |
| CO3 | 3 | 2 | 1 | - | 1 | 1 | - | - | - | - | 1 | - |
| CO4 | 3 | 2 | 1 | - | 1 | 1 | - | - | - | - | 1 | - |
| CO5 | 3 | 2 | 1 | - | 1 | 1 | - | 1 | - | - | 1 | - |
| **Course Correlation Mapping** | **3** | **2** | **1** | **-** | **1** | **1** | **-** | **1** | **-** | **-** | **1** | **-** |

**Correlation Levels: 3: High; 2: Medium; 1: Low**

## COURSE CONTENT

**Module 1: STRATEGIC MANAGEMENT (09 Periods)**

Introduction, Classes of decisions, Levels of strategy, Core competence, Strategic intent and stretch, Approaches to strategy making, Roles of different strategists, Strategic Management-Process, Benefits, Limitations; Ethics in strategic decision making, Principles of good strategy, Strategic Management in India; Common managerial strategy formulation tools.

**Module 2: GLOBALIZATION (09 Periods)**

Definition, Stages, Essential conditions for globalization, Globalization strategies, Competitive advantage of Nations and regions, Factors affecting Globalization,

Globalization of Indian business.

**Module 3: RESEARCH & DEVELOPMENT STRATEGIES (09 Periods)**
Concept, Evolution of R and D Management, R and D as a business, R and D as competitive advantage, Elements of R and D strategies, Integration of R and D, Selection and implementation of R and D strategies, R and D trends and challenges.

**Module 4: TECHNOLOGY MANAGEMENT AND TRANSFER (09 Periods)**
**Technology Management:** Introduction, Technology-Definition, Components, Classification Features; Technology Management-Concept, Nature; Drivers of Management of Technology-Significance, Scope, Responding to technology challenges.
**Technology Transfer:** Introduction, Definition, Classification, Significance, Elements of process, Types of Technology Transfer, Package, Modes of Transfer, Routes, Channels and Effectiveness of Technology Transfer.

**Module 5: CORPORATE GOVERNANCE: THE INDIAN SCENARIO (09 Periods)**
Emergence of corporate governance in India-Landmarks, Models, Codes and status in India, Role and Responsibilities of Regulators, The Board of Directors; Corporate Governance- Specific issues in India, Family-owned Business, Corporate Governance and the Indian ethos.

**Total Periods: 45**

**EXPERIENTIAL LEARNING**

1. Case studies: Using real-world examples of global businesses and their technological strategies, students can examine the challenges and opportunities presented by different markets and technologies. This can involve analyzing data, conducting market research, and making decisions based on their findings.

2. Simulation games: Students can participate in simulation games that allow them to make decisions about global strategy and technology in a virtual environment. This can help them understand the complexities of international business, such as navigating different cultures, regulations, and economic systems.

3. Industry partnerships: Partnerships with technology companies and global businesses can provide students with hands-on experience in global strategy and technology. This can include internships, shadowing, or working on real projects with industry professionals.

4. Project-based learning: Students can work on real-world projects that require them to apply their knowledge of global strategy and technology. This can include developing a business plan for a new product or service, designing a marketing campaign for a global audience, or analyzing the impact of a new technology on a specific industry.

5. Field trips: Visiting international businesses or attending technology conferences can provide students with a first-hand look at global strategy and technology in action. This can help them understand the challenges and opportunities of different markets and technologies, as well as connect with industry professionals.

*(Note: It's an indicative one. Course instructor may change the activities and the same shall be reflected in course handout)*

**CASE STUDIES:**
1. Tesla: Can Elon Musk's electric car company succeed globally?
2. Uber: How the ride-sharing giant is expanding its global footprint.

3. Alibaba: How China's e-commerce giant is competing on the global stage.
4. Airbnb: How the home-sharing platform is disrupting the global hotel industry.
5. Netflix: How the streaming service is expanding globally and adapting to local markets.

**ARTICLES:**

1. "Digital Transformation: Why it Matters for Global Business" by Forbes
2. "How AI is Changing Global Business Strategy" by Harvard Business Review
3. "The Future of Globalization: Exploring the Role of Technology" by World Economic Forum
4. "Globalization 4.0: What it Means for Technology and Strategy" by McKinsey & Company
5. "How Technology is Transforming Global Supply Chains" by MIT Sloan Management Review

## RESOURCES

**TEXT BOOKS:**

1. Francis Cherunilam, *Strategic Management*, Himalaya Publishing House, 3rdEdition, 2002.

2. C. S. G. Krishnamacharyulu and Lalitha Ramakrishnan, *Management of Technology*, Himalaya Publishing House, Second Edition, 2012.

**REFERENCE BOOKS:**

1. White and Bruton, *The Management of Technology and Innovation: A Strategic Approach*, Cengage Learning, 1stEdition, 2007.
2. S.K.Mandak, *Ethics in Business and Corporate Governance*, TMH, 2ndEdition, 2012.

**VIDEO LECTURES:**

1. https://www.digimat.in/nptel/courses/video/110106157/L01.html
2. https://www.digimat.in/nptel/courses/video/110106157/L43.html

## UNIVERSITY ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| **22EE101704** | **GREEN TECHNOLOGIES** | 3 | - | - | - | 3 |

**Pre-Requisite** -
**Anti-Requisite** -
**Co-Requisite** -

**COURSE DESCRIPTION:** This course provides a detailed discussion on green technology concepts, the role of industry and government in establishing green energy footprints and cleaner development mechanisms. It also presents energy-efficient and sustainable green production systems, concepts of energy ecosystems, and concepts of green buildings.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Understand the green technology concepts and the consequences of greenhouse gas emissions.
**CO2.** Acquire basic knowledge on cleaner development mechanism, the importance of re-use of materials, and the oxidation technology for wastewater.
**CO3.** Go beyond energy-efficient machinery, biofuels, and environmentally friendly materials.
**CO4.** Acquire basic knowledge on man-made ecosystems, sources, and control of pollution.
**CO5.** Understand the concepts and requirements for green buildings.

### CO-PO Mapping Table

| Course Outcome | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | - | - | - | - | - | 3 | - | - | - | - | |
| **CO2** | 3 | - | - | - | - | - | 3 | - | - | - | - | |
| **CO3** | 3 | - | - | - | - | - | 3 | - | - | - | - | |
| **CO4** | 3 | - | - | - | - | - | 3 | - | - | - | - | |
| **CO5** | 3 | - | - | - | - | - | 3 | - | - | - | - | |
| **Course Correlation Mapping** | **3** | **-** | **-** | **-** | **-** | **-** | **3** | - | - | - | - | |

***Correlation Levels:*** ***3: High;*** ***2: Medium;*** ***1: Low***

## COURSE CONTENT

**Module 1: INTRODUCTION TO GREEN TECHNOLOGY** ***(09 Periods)***

Green technology-definition, importance, factors affecting green technology. Global atmosphere- green house gases, global warming, acid rain, ozone depletion and photochemical smog. Role of industry, government and institutions; industrial ecology, role of industrial ecology in green technology.

**Module 2: CLEANER DEVELOPMENT TECHNOLOGIES** ***(08 Periods)***

Cleaner development mechanisms, role of industry; reuse, reduce and recycle, raw material substitution; wealth from waste; carbon credits, carbon trading, carbon sequestration, eco labeling. Oxidation technology for wastewater treatment - cavitation, fenton chemistry, photocatalysis and hybrid processes.

**Module 3: ENERGY EFFICIENT SYSTEMS AND PROCESSES** ***(09 Periods)***

Energy efficient motors, energy efficient lighting, control and selection of luminaries; bio-fuels, fuel cells- working, selection of fuels, Green manufacturing systems, selection of recyclable and environment friendly materials in manufacturing, design and implementation of sustainable green production systems.

**Module 4: ENERGY ECOLOGY AND ENVIRONMENT** ***(08 Periods)***

Concept and theories of ecosystems - energy flow in major manmade ecosystems-agricultural, industrial and urban ecosystems - sources of pollution from energy technologies and its impact on atmosphere - air, water, soil, and environment - environmental laws on pollution control – innovation and sustainability: - eco-restoration / phyto-remediation, renewable energy technologies, industrial ecology and agro ecology.

**Module 5: GREEN BUILDINGS** ***(10 Periods)***

Definition- Features and benefits, Fundamental planning decisions for energy efficient building- site selection, buildings forms and orientations, building fabrics and insulation, ventilation, passive solar features. Eco-friendly and cost effective materials, energy management. Rooftop solar photovoltaic system and solar tracking system, alternating roofing systems.

***Total Periods: 45***

## EXPERIENTIAL LEARNING

1. The student shall prepare a report on the causes of global warming and should suggest possible remedies for reducing the global warming
2. The student shall prepare a report on the wastewater management system.
3. The student shall prepare a report on controlling pollution in the environment.
4. The student shall observe the various considerations in a greenhouse building and should prepare the report on the observations made and should suggest possible avenues for improvement.

*(Note: It's an indicative one. Course instructor may change the activities and the same shall be reflected in course handout)*

## RESOURCES

**TEXT BOOKS:**


1. Khan B.H, *Non conventional energy resources*, Tata McGraw-Hill, New Delhi 2006.
2. Paul L. Bishop, *Pollution prevention –Fundamentals and Practices*, McGraw-Hill-international 2000.


**REFERENCE BOOKS:**


1. P. Aarne Veslind, *Introduction to environmental engineering*, Cenage Learning 2010.
2. Joseph A. Salvato, *Environmental engineering,* Wiley
3. Tom D Reynolds, *Unit operations and processes in environmental engineering*, PWS Publishing.
4. D. Y. Goswami, F. Kreith and J. F. Kreider, *Principles of Solar Engineering*, Taylor and Francis.
5. C. S. Solanki, *Solar Photovoltaics: Fundamental Applications and Technologies*, Prentice Hall.


**WEB RESOURCES:**


1. N. Vinutha bai, R. Ravindra, Energy efficient and green technology concepts, International Journal of Research in Engineering and Technology p 253-258, Volume: 03 Special Issue: 06, 2014, eISSN: 2319-1163 pISSN: 2321-7308.

## UNIVERSITY ELECTIVE

| Course Code | Course Title | L | T | P | S | C |
|---|---|---|---|---|---|---|
| 22CB101702 | **INTRODUCTION TO ETHICAL HACKING** | 3 | - | - | - | 3 |

**Pre-Requisite** -

**Anti-Requisite** -

**Co-Requisite** -

**COURSE DESCRIPTION:** This course provides a detailed discussion on ethical hacking overview, role of security and penetration testers, foot printing, reconnaissance and scanning networks, enumeration and vulnerability analysis, system hacking, network protection systems.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Understand and recognize role of security and penetration testers to protect the system from malware attacks.

**CO2.** Apply the foot printing tools to find the vulnerabilities in the system.

**CO3.** Analyze vulnerabilities to find the system security loopholes or flaws in networked systems within a given range of IP

**CO4.** Apply the web attackers tools to assess the website's security

**CO5.** Identify the possible incidents and threats, alert administrators, and prevent potential attacks using IDS

## CO-PO Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 2 | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 3 | 2 | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 3 | 3 | 3 | - | - | - | - | - | - | - | - | - |
| **CO4** | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - |
| **CO5** | 3 | 2 | 3 | 2 | | | | | | | | |
| **Average** | 3 | 3 | 3 | 2 | | | | | | | | |
| **Course Correlation mapping** | **3** | **3** | **3** | **2** | | | | | | | | |

***Correlation Levels: 3: High; 2: Medium; 1: Low***

## COURSE CONTENT

**Module 1: INTRODUCTION** ***(10 Periods)***

Ethical Hacking Overview, Role of Security and Penetration Testers .Penetration, Testing Methodologies, Laws of the Land, Overview of TCP/IP, The Application Layer, The Transport Layer, The Internet Layer, IP Addressing, Network and Computer Attacks, Malware, Protecting Against Malware Attacks, Intruder Attacks, Addressing Physical Security.

**Module 2: FOOT PRINTING, RECONNAISSANCE AND SCANNING NETWORKS** ***(09 Periods)***

Foot printing Concepts, Foot printing through Search Engines, Web Services, Social Networking Sites, Website, Email, Competitive Intelligence, Foot printing through Social Engineering, Foot printing Tools, Network Scanning Concepts, Port-Scanning Tools, Scanning Techniques, Scanning Beyond IDS and Firewall

**Module 3: ENUMERATION AND VULNERABILITY ANALYSIS** ***(09 Periods)***

Enumeration Concepts, NetBIOS Enumeration, SNMP, LDAP, NTP, SMTP and DNS

Enumeration, Vulnerability Assessment Concepts, Desktop and Server OS Vulnerabilities, Windows OS Vulnerabilities, Tools for Identifying Vulnerabilities in Windows, Linux OS Vulnerabilities, Vulnerabilities of Embedded Oss.

**Module 4: SYSTEM HACKING** ***(10 Periods)***

Hacking Web Servers, Web Application Components, Vulnerabilities, Tools for Web Attackers and Security Testers Hacking Wireless Networks, Components of a Wireless Network, Wardriving, Wireless Hacking, Tools of the Trade.

**Module 5: NETWORK PROTECTION SYSTEMS** ***(07 Periods)***

Access Control Lists, Cisco Adaptive Security Appliance Firewall, Configuration and Risk Analysis Tools for Firewalls and Routers, Intrusion Detection and Prevention Systems, Network, Based and Host-Based IDSs and IPSs, Web Filtering, Security Incident Response Teams, Honeypots.

***Total Periods: 45***

## EXPERIENTIAL LEARNING

1. List out various ways used to Protect Yourself from Hackers.
2. Demonstrate how do White Hackers work?
3. Demonstrate The bug bounty program.

*(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)*

## RESOURCES

### TEXT BOOKS:


1. Michael T. Simpson, Kent Backman, and James E. Corley, *Hands-On Ethical Hacking and Network Defense, Course Technology*, Delmar Cengage Learning, 2010.
2. Patrick Engebretson, *The Basics of Hacking and Penetration Testing*, SYNGRESS, Elsevier, 2013.


### REFERENCE BOOKS:


1. Dafydd Stuttard and Marcus Pinto, *The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws*, Wiley, 2nd Edition, 2011.
2. Justin Seitz, *Black Hat Python: Python Programming for Hackers and Pentesters*, 2nd Edition, 2014.


### VIDEO LECTURES:

1. https://www.coursera.org/learn/ethical-hacking-essentials-ehe
2. https://www.udacity.com/course/ethical-hacker-nanodegree--nd350

### WEB RESOURCES:

1. https://github.com/PacktPublishing/Python-Ethical-Hacking
2. https://www.youtube.com/watch?v=x3IwvPvDpKE