Sri Ramakrishna Institute of Technology
(An Autonomous Institution)
Pachapalayam, Perur Chettipalayam, Coimbatore – 641 010
www.srit.org :: Phone – 0422-2605577

# B.Tech. – Information Technology

# I to VIII Semester Curriculum and Syllabus

# R-2017

## B.Tech – Information Technology

| SEMESTER I | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Category** | **L** | **T** | **P** | **C** | **CA** | **FE** | **Total** |
| 1 | UICH001 | Technical English | **HS** | 2 | 0 | 1 | 3 | 40 | 60 | 100 |
| 2 | UICH009 | Information Technology Professionals and Society | **HS** | 2 | 0 | 0 | 2 | 40 | 60 | 100 |
| 3 | UICM001 | Engineering Mathematics - I | **BS** | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 4 | UICP001 | Engineering Physics | **BS** | 3 | 0 | 1 | 4 | 40 | 60 | 100 |
| 5 | UICC001 | Engineering Chemistry | **BS** | 3 | 0 | 1 | 4 | 40 | 60 | 100 |
| 6 | UICE004 | Computing Fundamentals and C Programming | **ES** | 2 | 0 | 2 | 4 | 40 | 60 | 100 |
| 7 | UICE001 | Basic Civil and Mechanical Engineering | **ES** | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 8 | UICE015 | Engineering Workshop | **ES** | 0 | 0 | 2 | 2 | 60 | 40 | 100 |
| | | | **Total** | **19** | **1** | **7** | **27** | | | |

| SEMESTER II | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Category** | **L** | **T** | **P** | **C** | **CA** | **FE** | **Total** |
| 1 | UICH002 | Business English | **HS** | 2 | 0 | 1 | 3 | 40 | 60 | 100 |
| 2 | UICM002 | Engineering Mathematics - II | **BS** | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 3 | UICC002 | Ecology and Environmental Science | **BS** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | UICE002 | Basic Electrical and Electronics Engineering | **ES** | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 5 | UICE013 | Engineering Materials | **ES** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | UICE020 | Object Oriented Programming with C++ | **ES** | 2 | 0 | 2 | 4 | 40 | 60 | 100 |
| 7 | UICE010 | Engineering Graphics | **ES** | 2 | 0 | 2 | 4 | 40 | 60 | 100 |
| | | | **Total** | **19** | **1** | **5** | **25** | | | |

| SEMESTER III | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Category** | **L** | **T** | **P** | **C** | **CA** | **FE** | **Total** |
| 1 | UICM003 | Transforms and Partial Differential Equations | **BS** | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 2 | UICH003 | Economics for Engineers | **HS** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | UITC001 | Data Structures | **PCC** | 3 | 0 | 1 | 4 | 40 | 60 | 100 |
| 4 | UITC002 | Java Programming | **PCC** | 3 | 0 | 1 | 4 | 40 | 60 | 100 |
| 5 | UITC003 | Computer Organization and Architecture | **PCC** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | UITC004 | Principles of Communication | **PCC** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 7 | UICE006 | Digital Principles and System Design | **ES** | 3 | 0 | 1 | 4 | 40 | 60 | 100 |
| | | | **Total** | **21** | **1** | **3** | **25** | | | |

| SEMESTER IV | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Category** | **L** | **T** | **P** | **C** | **CA** | **FE** | **Total** |
| 1 | UICM007 | Probability and Statistics | **BS** | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 2 | UITC005 | Database Management Systems | **PCC** | 3 | 0 | 1 | 4 | 40 | 60 | 100 |
| 3 | UITC006 | Operating Systems | **PCC** | 3 | 0 | 1 | 4 | 40 | 60 | 100 |
| 4 | UITC007 | Theory of Computation | **PCC** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | UITC008 | Information Theory and Coding | **PCC** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | UITC009 | Principles of Microprocessors and Microcontrollers | **PCC** | 3 | 0 | 1 | 4 | 40 | 60 | 100 |
| 7 | XXXXXXX | Generic Elective – I | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| | | | **Total** | **21** | **1** | **3** | **25** | | | |

| SEMESTER V | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Category** | **L** | **T** | **P** | **C** | **CA** | **FE** | **Total** |
| 1 | UITC010 | Design and Analysis of Algorithms | **PCC** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | UITC011 | Software Engineering | **PCC** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | UITC012 | Computer Networks | **PCC** | 3 | 0 | 1 | 4 | 40 | 60 | 100 |
| 4 | UITC013 | Principles of Compiler Design | **PCC** | 3 | 0 | 1 | 4 | 40 | 60 | 100 |
| 5 | UITC201 | Web Programming | **PCC** | 3 | 0 | 1 | 4 | 40 | 60 | 100 |
| 6 | XXXXXXX | Generic Elective – II | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| | | | **Total** | **18** | **0** | **3** | **21** | | | |

| SEMESTER VI | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Category** | **L** | **T** | **P** | **C** | **CA** | **FE** | **Total** |
| 1 | UITC202 | Cloud Computing | **PCC** | 3 | 0 | 1 | 4 | 40 | 60 | 100 |
| 2 | UITC203 | Cryptography and Network Security | **PCC** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | XXXXXXX | Professional Elective – I | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | XXXXXXX | Professional Elective – II | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | XXXXXXX | Generic Elective – III | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | UITC014 | Industrial Design Project (Course Work) | **IDP** | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 7 | UITC015 | Industrial Design Project (Practical) | **IDP** | 0 | 0 | 2 | 2 | 60 | 40 | 100 |
| | | | **Total** | **15** | **0** | **7** | **22** | | | |

| SEMESTER VII | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Category** | **L** | **T** | **P** | **C** | **CA** | **FE** | **Total** |
| 1 | UITC204 | Big Data Analytics | **PCC** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | XXXXXXX | Professional Elective - III | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | XXXXXXX | Professional Elective - IV | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | XXXXXXX | Professional Elective – V | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | XXXXXXX | Generic Elective – IV | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | UITC016 | Industrial Design Project - Phase II | **IDP** | 0 | 0 | 6 | 6 | 60 | 40 | 100 |
| 7 | UITC017 | Final Year Project - Phase I | **FYP** | 0 | 0 | 2 | 2 | 60 | 40 | 100 |
| | | | **Total** | **15** | **0** | **8** | **23** | | | |

| SEMESTER VIII | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Category** | **L** | **T** | **P** | **C** | **CA** | **FE** | **Total** |
| 1 | UITC205 | Machine Learning | **PCC** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | XXXXXXX | Professional Elective – VI | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | UITC018 | Final Year Project - Phase II | **FYP** | 0 | 0 | 6 | 6 | 60 | 40 | 100 |
| | | | **Total** | **6** | **0** | **6** | **12** | | | |

| PROFESSIONAL ELECTIVE – I | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Category** | **L** | **T** | **P** | **C** | **CA** | **FE** | **Total** |
| 1 | UITE201 | Python Programming | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | UITE202 | Mobile Computing | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | UITE203 | Distributed Systems | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | UITE204 | Digital Signal Processing | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | UITE205 | Computer Graphics and Multimedia | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |

| PROFESSIONAL ELECTIVE – II | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Category** | **L** | **T** | **P** | **C** | **CA** | **FE** | **Total** |
| 1 | UITE206 | Advanced Java Programming | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | UITE207 | Ad Hoc and Sensor Networks | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | UITE208 | PHP and MySQL | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | UITE209 | Digital Image Processing | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | UITE210 | User Experience Design | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |

| PROFESSIONAL ELECTIVE – III | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Category** | **L** | **T** | **P** | **C** | **CA** | **FE** | **Total** |
| 1 | UITE211 | Advanced Web Programming | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | UITE212 | Communication Switching Techniques | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | UITE213 | Web Engineering | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | UITE214 | Pattern Recognition | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | UITE215 | Management Information System | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |

| PROFESSIONAL ELECTIVE – IV | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Category** | **L** | **T** | **P** | **C** | **CA** | **FE** | **Total** |
| 1 | UITE216 | Programming with Open Source Software | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | UITE217 | Internet of Things | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | UITE218 | Advanced Database Technology | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | UITE219 | Soft Computing | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | UITE220 | Embedded System Design | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |

| PROFESSIONAL ELECTIVE – V | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Category** | **L** | **T** | **P** | **C** | **CA** | **FE** | **Total** |
| 1 | UITE221 | Software Testing | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | UITE222 | C# .Net Frameworks | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | UITE223 | Natural Language Processing | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | UITE224 | Unix Internals | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | UITE225 | Software Defined Networks | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |

| PROFESSIONAL ELECTIVE – VI | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Category** | **L** | **T** | **P** | **C** | **CA** | **FE** | **Total** |
| 1 | UITE226 | Graph Theory | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | UITE227 | Information Technology Essentials | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | UITE228 | Operations Research | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | UITE229 | Software Project Management | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | UITE230 | Game Programming | **PE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |

## LIST OF GENERIC ELECTIVES

| OFFERED BY DEPARTMENT OF CIVIL ENGINEERING | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Category** | **L** | **T** | **P** | **C** | **CA** | **FE** | **Total** |
| 1 | UCEG001 | Environmental Impact Assessment | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | UCEG002 | Disaster Mitigation and Management | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | UCEG003 | Global Warming and Climate Changes | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | UCEG004 | GIS for Natural Resources Management | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | UCEG005 | Principles of Remote Sensing | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |

| OFFERED BY DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Category** | **L** | **T** | **P** | **C** | **CA** | **FE** | **Total** |
| 1 | UCSG001 | Fundamentals of Information Security | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | UCSG002 | Introduction to Computer Networks | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | UCSG003 | Introduction to Software Engineering | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | UCSG004 | Python Programming for Engineers | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | UCSG005 | Soft Computing and its Applications | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |

| OFFERED BY DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Category** | **L** | **T** | **P** | **C** | **CA** | **FE** | **Total** |
| 1 | UEEG001 | Energy Management Systems | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | UEEG002 | Medical Instrumentation | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | UEEG003 | PLC Programming | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | UEEG004 | Renewable Energy Systems | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | UEEG005 | Virtual Instrumentation & Data Acquisition | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |

| OFFERED BY DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Category** | **L** | **T** | **P** | **C** | **CA** | **FE** | **Total** |
| 1 | UECG001 | Electronic Measurements | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | UECG002 | Introduction to Embedded Systems | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | UECG003 | Microcontrollers and its Applications | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | UECG004 | Nano Electronics and Sensors | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | UECG005 | Principles of VLSI Systems | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |

| OFFERED BY DEPARTMENT OF MECHANICAL ENGINEERING | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Category** | **L** | **T** | **P** | **C** | **CA** | **FE** | **Total** |
| 1 | UMEG001 | Automotive Fundamentals | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | UMEG002 | Computer Aided Design | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | UMEG003 | Introduction to Power Plant Engineering | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | UMEG004 | Introduction to Robotics | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | UMEG005 | 3D Printing | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |

| OFFERED BY DEPARTMENT OF SCIENCE AND HUMANITIES | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Category** | **L** | **T** | **P** | **C** | **CA** | **FE** | **Total** |
| 1 | UHSG001 | Indian Constitution, Democracy and World Affairs | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | UPHG001 | Fundamentals of Astrophysics | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | UCHG001 | Fundamentals of Biochemistry | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | UMHG001 | Statistical Inferences and Applications | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |

| OFFERED BY DEPARTMENT OF MANAGEMENT | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Category** | **L** | **T** | **P** | **C** | **CA** | **FE** | **Total** |
| 1 | UMGG001 | Entrepreneurship Development | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | UMGG002 | Intellectual Property Rights | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | UMGG003 | Total Quality Management | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | UMGG004 | Human Rights And Human Values | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | UMGG005 | Supply Chain Management And Logistics | **GE** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |

# SEMESTER I

| UICH001 | TECHNICAL ENGLISH | L | T | P | C |
|---|---|---|---|---|---|
| | | 2 | 0 | 1 | 3 |

**Course Objectives**

- To equip the students with the LSRW skills.
- To perceive the art of effective speaking and writing through various grammar exercises.
- To enable the act of interpreting Comprehension passages and essays.
- To develop test-taking strategies and skills for BEC Prelims.

**Course Content**

**Importance of Communication**

Listening: Listening to audio files and answering the given questions, Speaking: Self-introduction and Peer introduction, Speak about one's native place/important festivals/ History of a company, Reading: Note-Making on the given text, Skimming and Scanning for specific information, Writing: Parts of Speech, Word formation with Prefix and Suffix, Regular and Irregular verbs, Articles, Tenses, Countable and Uncountable Nouns, Set phrases for e-mails and Letters, sending a group e- mail.

**Formal Communication**

Listening: Listening to motivational talks / TED talks, Telephone Conversation (information about orders and deliveries), Speaking: Role-Play (a telephone call to a supplier), Describing a product and how it is advertised, Reading: Reading Comprehension exercise, Writing: Subject-Verb Agreement, Comparative Adjectives, Expansion of Compound Nouns, Prepositions, Formal letter writing (A letter responding to an invitation and promotional letters), E-mail to Manager.

**Writing Strategies**

Listening: Listening to statistical information (short extracts), Speaking: Role-Play (Making an appointment), Planning a sales event, Reading: Finding key points from the given text, Writing: Cause and Effect, Compare and Contrast, Gerunds and Infinitives, Paragraph writing, Instructions, E-mail (confirming a booking/requesting information), Translating and interpreting written or spoken content from one language to another.

**Presentation Skills**

Listening: Listening to Mock Group Discussion and evaluating, Speaking: Making presentation on the given topic / Describing the given data and trends, Sales talk (Discussing on company information), Reading: Interpreting pictures of Flowchart/Pie chart/Bar chart, Writing: Letter to express an interest in a new product, Process Description, Recommendations.

**Technical Communication**

Listening: Listening to interviews (frequently asked questions and responses), Speaking: Giving impromptu talks, Giving a summary of an article, Reading: Business Report, E-mail to a Recruitment Agency, Writing: Resume Writing, Purpose and Function, Wh- questions.

**List of Exercises**

1. Self and Peer Introduction
2. Telephonic Conversation
3. Listening Comprehension
4. Oral Presentation on a given topic
5. Mock interview

**References**


1. Ian wood, Anne Williams with Anna Cowper, "Pass Cambridge BEC Preliminary", 2nd Edition, Cengage Learning, 2015.
2. Whitby, Norman, "Business Benchmark Pre-intermediate to Intermediate Business preliminary", 1st Edition Cambridge University Press, 2014.
3. Rizvi M.Ashraf, "Effective Technical Communication", Tata McGraw-Hill Publishing Company Limited, 4th Edition, 2010.
4. Gerson Sharon J, Steven M.Gerson, "Technical Writing-Process and Product", Pearson Education Pvt. Ltd. 3rd Edition, 2009.
5. Douglas Stone, Bruce Patton, Sheila Heen, "Difficult Conversations: How to Discuss" Kindle Publication, 1st Edition, 2010.

| UICH009 | INFORMATION TECHNOLOGY PROFESSIONALS AND SOCIETY | L | T | P | C |
|---|---|---|---|---|---|
| | | 2 | 0 | 0 | 2 |

**Course Objectives**

- The main objective of this course is to expose students about Graduate Attributes, Technology Education and their responsibilities in the society.
- This course will guide the students to evaluate and discuss issues related to code of ethics.

**Course Content**

Engineering – Definition – Engineering Education – Graduate Attributes – Engineering functions – Role and Responsibilities of Engineers – Professional Societies and their codes of ethics – Constraints in Engineering.

Introduction to Information Technology – Pillars of Information Technology – Scope of Information Technology – Competencies – Industry Perspectives on Information Technology - Role of IT Professionals in Society.

The concept of profession – Importance of ethics in Engineering – Role of codes of ethics – Professional responsibilities of Engineers – Overview of ethical theories and applications – Social and ethical responsibilities of Engineers – Whistle blowing and beyond, Case studies.

Reliability, risk and safety – Risk management – Engineering and the environment – Ethics and the environment – Sustainable Engineering – Global and Cultural considerations – Specific case examples – Challengers Incidents.

**References**


1. Kim Strom Gottfried, “Straight Talk about Professional Ethics”, Lyceum Books, 2nd Edition, 2014.
2. “Information Technology Curricula 2017”. Association for Computing Machinery, 2017.
3. Ramesh Chandra Das, “Social, Health, and Environmental Infrastructures for Economic Growth”, IGI Global Disseminator of Knowledge, 2017.
4. Steven P. Nichols, “Professional responsibility: The role of the engineer in society”, Science and Engineering Ethics, September 1997, Volume 3, Issue 3, pp 327–337.
5. Kenneth K. Humphreys, “What Every Engineer Should Know about Ethics”, CRC Press, 1999.

| UICM001 | ENGINEERING MATHEMATICS - I | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 1 | 0 | 4 |

**Course Objectives**

- Able to adopt the concepts of Eigenvalues and Eigenvectors of matrices and apply them in various Engineering fields.
- Able to make the student knowledgeable in the area of infinite series and their convergence.
- Able to develop the skills of solving problems under several variable calculus.

**Course Content**

**Matrices**

Eigenvalue and Eigenvectors – Properties – Cayley-Hamilton Theorem (without proof) - Diagonalization – Similarity and Orthogonal transformation – Quadratic forms – Orthogonal reduction– Applications.

**Sequences and Infinite Series**

Sequences – Convergence of series – General properties – Series of positive terms – Tests of convergence (Comparison test, Integral test, Comparison of ratios and D'Alembert's ratio test) – Alternating series – Series of positive and negative terms – Leibnitz rule (statement only) - Absolute and conditional convergence.

**Differential Calculus**

Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes - Evolute as envelope of normals – Applications.

**Functions of Several Variables**

Partial derivatives – Total derivative – Differentiation of implicit functions – Change of variables – Jacobian – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

**Multiple Integrals**

Double Integrals (Cartesian and polar) – Change of order of integration – Change of variables – Triple integrals – Transformation – Spherical and Cylindrical coordinates – Applications to area and volume.

**References**


1. Grewal. B.S, "Higher Engineering Mathematics", 43rd Edition, Khanna Publications, Delhi, 2016.
2. Srimanta Paul and Subodh C. Bhunia, "Engineering Mathematics", Oxford University Press, 1st Edition, 2015.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India, 2016.
4. James Stewart, "Calculus, Early Transcendental", 7th Edition, Cengage learning, New Delhi, 2015.
5. Ramana B.V, "Higher Engineering Mathematics", 6th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2010.
6. Ravish R Singh and Mukul Bhatt, "Engineering Mathematics", 1st Edition, Tata McGraw Hill Education, New Delhi, 2016.

| UICP001 | ENGINEERING PHYSICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 1 | 4 |

**Course Objectives**

- To understand the properties of materials, concept of quantum mechanics, working of lasers and fiber optics.
- To perform experiments using semiconductor, laser and fiber optics.
- To apply the concept of physics in different engineering application and to solve scientific problems.

**Course Content**

**Properties of Matter**

Hooke's law - stress - strain diagram - modulus of elasticity - elastic constants - relation between elastic moduli - Poisson's ratio - expressions for Poisson's ratio in terms of elastic constants - work done in stretching a wire - work done in twisting a wire - Applications: twisting couple on a cylinder, rigidity modulus of a wire.

**Thermal Physics**

Fundamental modes of heat transfer - effect of temperature on thermal conductivity of solids, liquids and gases - Conduction in solids - Lee's disc method - flow of heat through a compound material -Application: Thermal insulation of buildings.

**Principles of Quantum Mechanics**

Blackbody Radiation - Quantum of energy and Planck's hypothesis - Rayleigh-Jeans Law - Photoelectric effect - Concept of photon mass - Compton effect - de-Broglie hypothesis - Davisson and Germer experiment - Schrödinger wave equations - Applications: Particle in one dimensional box - Quantum tunneling in p-n junction diode.

**Laser and Fiber optics**

Spontaneous emission - stimulated emission - Types of laser - pumping - ND-YAG laser - $CO_2$ laser- semiconductor laser (homojunction and heterojunction) - Engineering applications: holography (construction and reconstruction of hologram). Fiber optic materials - concept of light

flow – modes of propagation of light through different media - types of optical fibers – acceptance angle - Applications: Temperature and displacement sensor, Fiber endoscope.

**Fundamentals of Nanoscience**

Introduction – classification – density of states of 1D, 2D, 3D – morphology (particles, nanowires and nanotubes) – Optical properties.

**List of Experiments**

1. Determination of moment of inertia of the metallic disc and rigidity modulus of the Wire using Torsional Pendulum.
2. Determination of thermal conductivity of a bad conductor using Lee's Disc method.
3. Determination of energy band gap in a semiconductor by using P-N junction diode.
4. Determination of thickness of a thin sheet of paper using Air Wedge method.
5. (i) Determination of particle size using laser.
   (ii) Determination of acceptance angle and numerical aperture of an optical fiber.

**References**


1. Dattu R Joshi, "Engineering Physics", Tata McGraw Hill Publications, New Delhi, 1st Edition, 2010.
2. Vijayakumar S, "Engineering Physics – I", Wiley Publications, 2014.
3. Halliday, Resnick and Walker, "Fundamentals of Physics", Wiley International Publications, Extended 10th Edition, 2015.
4. Edelstein A S and Cammearata R C., "Nanomaterials: Synthesis, Properties and Applications",Institute of Physics Publishing, Bristol and Philadelphia, 1996.
5. Marikani A, "Engineering Physics", PHI Learning Pvt. Ltd., New Delhi, 2nd Edition, 2013.
6. Mani Naidu S, "Engineering Physics", Pearson Education, Delhi, 2010.

| UICC001 | ENGINEERING CHEMISTRY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 1 | 4 |

**Course Objectives**

- To learn the electrochemical principles, various types of electrodes and understand the mechanism of corrosion and prevention methods.
- To conversant with Principles and generation of energy in batteries and fuel cells.
- To acquire knowledge on the quality of water and its treatment method for domestics and industrial applications.
- To be able to develop experimental skill in quantitative analysis of materials by volumetric and instrumental methods and apply in engineering industries.

**Course Content**

**Electrochemistry**

Electrolytic Conductance – Specific, Equivalent and Molar conductance (Definitions only) – Conductance measurement – Conductometric titrations – Electrochemical cells – Nernst Equation (Problems), Electrode potential – Electrodes – Standard Hydrogen Electrode (SHE), Saturated Calomel Electrode (SCE) and Glass Electrode – EMF Series and its applications.

**Corrosion science and prevention**

Definition – Impact in Industries – Mechanism (Dry and Electrochemical) – Types – Galvanic and Differential aeration corrosion – Corrosion prevention – Impressed current technique, sacrificial anodic protection – Inhibitors – Synthetic and Green.

**Batteries**

Batteries – Characteristics – Current, Power, Capacity, Classification of batteries – Primary (Alkaline battery) – Secondary batteries (Lead acid and Nickel – Cadmium) and Flow batteries (Hydrogen – Oxygen and Methanol – Oxygen fuel cells) – Modern batteries – Lithium Ion batteries – Applications.

**Water treatment**

Importance of water – Water sources – Impurities – Carbonate and Non Carbonate Hardness (simple problems) – Potable water and its specifications, Steps involved in treatment of potable

water – Disinfection of potable water by Chlorination, UV treatment and Ozonisation. Industrial water treatment methods – Demineralisation – Desalination (Reverse Osmosis).

**Polymers**

Polymers – Types (Natural and Synthetic) – Functionality – Degree of polymerization – Engineering polymers – Acrylonitrile Butadiene Styrene (ABS) , Polystyrene and Teflon – Structure and Industrial applications – Compounding of plastics – Fabrication – Extrusion moulding only – Management of waste plastics.

**List of Experiments**

1. Estimation of acidity of industrial effluent by conductometric titration.
2. Estimation of iron by Potentiometry.
3. Determination of corrosion rate by weight loss method.
4. Determination of percentage purity of bleaching powder.
5. Estimation of hardness of water by Complexometric method.

**References**


1. Vairam.S, Kalyani P, Suba Ramesh, "Engineering Chemistry", John Wiley & Sons, 1st Edition, 2016.
2. Palanna O G, "Engineering Chemistry", Tata McGraw – Hill Education, 1st Edition, 2009.
3. Renu Bapna and Renu Gupta, Engineering Chemistry, Macmillan Publishers India, 1st Edition, 2010.
4. Jeffery G. H, and Basset J., "Vogel's text book of quantitative chemical analysis", Prentice Hall, 5th Edition, 2012.
5. Qanungo, Kushal, "Engineering Chemistry", Prentice Hall India Limited, 1st Edition, 2009.

| UICE004 | COMPUTING FUNDAMENTALS AND C PROGRAMMING | L | T | P | C |
|---|---|---|---|---|---|
| | | 2 | 0 | 2 | 4 |

**Course Objectives**

- To learn the fundamental components and operating principles of digital computer.
- To find solutions to complex engineering problems by developing computer programs using C language.

**Course Content**

**Introduction**

Generation and Classification of Computers - Basic Organization of a Computer – Number System – Binary – Decimal – Conversion – Problems. Need for logical analysis and thinking – Algorithm – Pseudo code – Flow Chart.

**C Programming Basics**

Problem formulation – Problem Solving – Introduction to C programming – fundamentals – structure of a C program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in C – Managing Input and Output operations – Decision Making and Branching – Looping statements – Solution to complex Engineering, Scientific and statistical problems using appropriate control flow statements.

**Arrays and Strings**

Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String – String operations – String Arrays. Simple programs – sorting – searching – matrix operations.

**Functions and Pointers**

Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion – Pointers – Definition – Initialization – Pointers arithmetic – Pointers and arrays – Example Problems.

**Structures and Unions**

Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure – Union – Programs using structures and Unions – Storage classes, Pre-processor directives – File Handling.

**List of Experiments**

1. Experiments to solve domain specific complex Engineering problems using appropriate control structures and expressions. Proper formatting of Input / Output statements is mandatory.
2. Experiments to manipulate strings using appropriate data types and string handling functions.
3. Experiments to represent and perform operations on domain specific Engineering, Scientific data using arrays. Proper formatting of Input / Output statements is mandatory.
4. Experiments to represent and perform memory aware operations on domain specific Engineering, Scientific data using pointers. Proper formatting of Input / Output statements is mandatory.
5. Experiments to demonstrate the power of modular programming using functions.
6. Experiments to represent complex scientific data using user defined data types and perform operations to generate required output.
7. Experiments that demonstrate the use of operating system files to store output of computation through C language file handling features.

**References**


1. Paul Deitel, Harvey Deitel "C How to Program", 3rd Edition, Pearson Education Asia.
2. Behrouz A. Forouzan, Richard F. Gilberg, "Computer Science: A Structured Programming Approach Using C", 3rd Edition, Course Technology Inc, 2005.
3. E Balagurusamy, "Computing Fundamentals and C Programming", McGraw Hill Education; 1st Edition, 2008
4. Greg Perry, Dean Miller, "C Programming Absolute Beginner's Guide", 3rd Edition, Pearson Education, 2014.
5. Henry S. Warren Jr., "Hacker's Delight", 2nd Edition, Pearson Education, 2013.

| UICE001 | BASIC CIVIL AND MECHANICAL ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 4 | 0 | 0 | 4 |

**Course Objectives**

- To enable the students to acquire fundamental knowledge in Civil and Mechanical Engineering disciplines.
- To understand and acquire knowledge about Construction materials, Roads, Surveying and Sources of water.
- To understand and acquire knowledge about various power plants, IC Engines and Refrigeration and Air Conditioning.

**Course Content**

**Civil Engineering**

Properties and uses of construction materials – stones, bricks, cement, concrete and steel. Site selection for buildings – Component of building – Foundation– Shallow and deep foundations – Brick and stone masonry – Plastering – Lintels, beams and columns – Roofs.

Roads–Classification of Rural and urban Roads– Pavement Materials–Traffic signs and road marking – Traffic Signals. Surveying –Classification–Chain Survey–Ranging–Compass Survey– exhibition of different survey equipment.

Sources of Water – Dams– Water Supply–Quality of Water–Wastewater Treatment – Sea Water Intrusion – Recharge of Ground Water.

**Mechanical Engineering**

Introduction, Classification of Power Plants – Working principle of Steam, Gas, Diesel, Hydro–electric and Nuclear Power plants – OTEC cycle, solar power generation and geo thermal energy.

Introduction, working principle of Petrol and Diesel Engines. Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines.

Terminology of Refrigeration and Air Conditioning. Overview of Refrigerants. Principle of vapour compression and absorption system. Types of air conditioners (Window, Split, Centralized)

**References**


1. Palanichamy, M.S, “Basic Civil Engineering”, Tata Mc Graw Hill, New Delhi, 2010.
2. Suresh Gobi, “Basic Civil Engineering”, Pearson Publishers, 1st Edition, 2009.
3. EI– Wakil M.M, “Power Plant Technology”, McGraw–Hill, 2012.
4. Joseph Heitner, “Automotive Mechanics,” 2nd Edition, East–West Press, 1999.
5. Arora, C.P., "Refrigeration and Air Conditioning", 3rd Edition, McGraw Hill, New Delhi, 2010.

| UICE015 | ENGINEERING WORKSHOP | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 2 |

**Course Objective**

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.
- To impart the knowledge of Electronic Components, functionality of measuring equipment and building circuits on PCB Board.

**Course Content**

**I. CIVIL ENGINEERING PRACTICE LAB**

**Buildings**

Study of plumbing and carpentry components of residential and industrial buildings.

**Plumbing Works**

a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
b) Study of pipe connections requirements for pumps and turbines.
c) Preparation of plumbing line sketches for water supply and sewage works.

**Hands–on–exercise**

a) Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
b) Demonstration of plumbing requirements of high–rise buildings.

**Carpentry using Power Tools only**

1. Study of the joints in roofs, doors, windows and furniture.

**Hands–on–exercise**

a) Wood work, joints by sawing, planning and cutting.

**II. MECHANICAL ENGINEERING PRACTICE LAB**

**Welding & Sheet metal**

1. Preparation of arc welding of butt joints, lap joints, tee joints and corner joints.
2. Forming of simple objects using sheet metal – Trays, funnels.

**Machining practices**

1. Simple turning, taper turning, drilling taping practice.

**Study**

1. Study of centrifugal pump
2. Study of air conditioner

**Demonstration**

1. Demonstration on foundry operations.

**III. Electrical Engineering Practice Lab**

Familiarization of wiring tools, lighting and wiring accessories, various types of wiring systems; Wiring of one lamp controlled by one switch; Study of Electric shock phenomenon, precautions, preventions and earthing; Wiring of one lamp controlled by two SPDT Switch and one 3 pin plug socket independently; Familiarization of types of Fuse, MCB; Wiring of fluorescent lamp controlled by one switch from panel with MCB; Familiarization with measuring instruments to measure current, voltage and power in AC/DC circuits.

**IV. Electronics Engineering Practice Lab**

1. Study of Electronic Components and instruments– Resistors, Capacitors, Inductors, Diodes and multimeter.
2. Measurement of AC signal parameters (voltage, period, frequency) using CRO.
3. Measurement of ripple factor of half wave rectifier and full wave rectifier.
4. Study of logic gates –AND, OR, XOR and NOT.
5. Soldering practice using general purpose PCB – Components, Devices and Circuits.

**References**


1. Bawa H.S., "Workshop Practice", Tata McGraw – Hill Publishing Company Limited, New Delhi, 2007.
2. W A J Chapman, "Workshop Technology", Oxford IBH, 2007.
3. Uppal S. L., "Electrical Wiring & Estimating, Khanna Publishers", 5th edition, 2003.
4. John H. Watt, Terrell Croft: "American Electricians' Handbook: A Reference Book for the Practical Electrical Man" McGraw–Hill, 2002.
5. Thomas L. Floyd and Steve Wetterling, "Laboratory Exercises for Electronic Devices", Pearson Education Limited, 10th Edition, 2017.

# SEMESTER II

| UICH002 | BUSINESS ENGLISH | L | T | P | C |
|---|---|---|---|---|---|
| | | 2 | 0 | 1 | 3 |

**Course Objectives**

- To comprehend the techniques of correspondence that improves the listening and drafting skills.
- To facilitate the students to use the language efficiently at work place.
- To improve decision making and problem solving skills through reading practice.
- To develop test-taking strategies and skills for BEC Vantage.

**Course Content**

**Fundamentals of Communication**

Listening: Listening and noting specific information, Speaking : Extempore, Taking and Leaving Voice mail messages, Reading: scanning for gist and specific information, Writing: Discourse Markers, Writing a message, a memo (communicating policies, procedures within an organisation) or an email (business e-mail for appointment, enquiry, email with attachments).

**Written Business Correspondence**

Listening: Listening to identify topic, context, function, Speaking: Talking about present circumstances, past experiences and future plans, Reading: understanding text structure, Writing: Formal Letters (Calling for quotation, Placing Order, Complaint, Enquiry), Reports, Introduction to Blogs, Tweet, Social Networks, If Conditional, Adverbs / Adjectives.

**Career Oriented Communication**

Listening: Listening to different Accents/Intonation/Vowels/Consonants, Speaking: speculating about Brands and Marketing, Reading: Reading Comprehension (vocabulary and structure), Writing: Tag Questions, Modal Verbs, Writing Business Correspondence (explaining, apologising, reassuring, complaining), Reports (describing, summarising), Preperation of Agenda, Notices and Minutes of the Meeting.

**Oral Presentation and Professional Speaking**

Listening: Listening for details and main ideas, Speaking: Giving personal information, Making a longer speech, Giving information and expressing and justifying opinions, Reading: Reading

different kinds of texts, Interpretation of Graphics, Writing: Active / Passive Voice, Set phrases (requesting information, agreeing to requests).

**Personality Development**

Listening: Listening to longer conversations/Monologues, Speaking: Expressing and justifying opinions, speculating, comparing and contrasting, agreeing and disagreeing. A 'mini-presentation' on a business theme, Reading: understanding sentence structure and finding errors, Writing: Reported Speech, Proposals (describing, summarising, recommending, persuading).

**List of Exercises**

1. Extempore
2. Social Networking
3. Technical Presentation
4. Marketing a product
5. Group Discussion

**References**


1. Ian wood, Anne Williams with Anna Cowper, "Pass Cambridge BEC Vantage", 2nd Edition, Cengage Learning, 2015.
2. Brook-Hart, Guy, "Business Benchmark", Cambridge University Press, 1st Edition, 2014.
3. Stephen E. Lucas, "The Art of Public Speaking", Mc Graw Hill Publications, 5th Edition, 2014.
4. Emilia Hardman, "Active Listening 101: How to turn down your volume to turn up your Communication Skills", Kindle Publication, 2nd Edition, 2012.
5. Patterson, Kerry, Joseph Grenny, Ron McMillan, Al Switzler, "Crucial Conversations Tools for Talking When Stakes Are High", Kindle Publication, 2nd Edition, 2011.

| UICM002 | ENGINEERING MATHEMATICS - II | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 1 | 0 | 4 |

**Course Objectives**

- Able to build mathematical models in terms of differential equations.
- Able to acquaint the knowledge on vector calculus, complex variables, conformal mappings and complex integration to solve various Engineering problems.
- Able to understand Laplace transform to represent system dynamic models and evaluate their time responses.

**Course Content**

**Ordinary Differential Equations**

Homogeneous linear ODEs of second order – Non-homogeneous linear ODEs of second order with constant coefficients – Euler Cauchy's equation – Wronskian – Variation of Parameters – Modeling with Differential Equations.

**Vector Calculus**

Gradient of scalar field – Directional derivative – Divergence of vector field – Curl of vector field – Line integrals – Green's theorem in the plane – Gauss divergence theorem – Stokes theorem – (without proof) – Applications.

**Analytic Functions**

Analytic functions – Necessary and sufficient conditions – Cauchy-Riemann equations – Properties – Construction of analytic functions – Bilinear transformation – Conformal mapping: $w = z + c$, $w = c\,z$, $w = 1/z$ – Applications.

**Complex Integration**

Complex integration – Statement of Cauchy's integral theorem – Cauchy's integral formula – Laurent's series expansions – Singular points – Residues – Cauchy's residue theorem – Application of complex integration : Evaluation of real Integrals.

**Laplace Transforms**

Laplace transform – Properties – Initial and Final Value Theorems – Periodic functions: sine wave, square and triangular waves - Inverse Laplace Transform – Simple system dynamic models - Transfer Functions – Poles and Zeroes - Response of First-Order Systems - Solution of RC Free, Step and Sinusoidal Responses - Convolution theorem.

**References**


1. Grewal. B.S, "Higher Engineering Mathematics", 43rd Edition, Khanna Publications, Delhi, 2016.
2. Srimanta Paul and Subodh C. Bhunia, "Engineering Mathematics", Oxford University Press, 1st Edition, 2015.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India, 2016.
4. Ravish R Singh and Mukul Bhatt, "Engineering Mathematics", 1st Edition, Tata McGraw Hill Education, New Delhi, 2016.
5. Ramana B.V, "Higher Engineering Mathematics", 6th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2010.

| UICC002 | ECOLOGY AND ENVIRONMENTAL SCIENCES | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To understand the functions of natural system and various man induced activities that are affecting the nature in a destructive manner.
- To generate awareness about strategies to control, reduce and monitor all environmental threats.
- To manage various natural resources to attain environmental sustainability.

**Course Content**

**Ecology and Biodiversity**

Ecology – ecosystem – biomes – physical and chemical components of ecosystem – biological components of ecosystem – forest ecosystem – desert ecosystem and pond ecosystem – Energy flow in ecosystem – nitrogen cycle – carbon dioxide cycle – phosphorous cycle – food pyramid – Ecological succession – types – Biodiversity – need for biodiversity – values of biodiversity – hot spots of biodiversity – endangered and endemic species – Conservation of biodiversity – in – situ and ex – situ conservation.

**Natural Resources**

Earth structure – internal and external earth processes – plate tectonics – erosion – weathering – deforestation – Anomalous properties of water – hydrological cycle – Effect of modern agriculture – fertilizers & pesticides – eutrophication – biomagnifications – Land degradation and mining – Desertification – soil erosion, methods of control of soil erosion – Renewable energy resources – wind, solar, geothermal, tidal and OTEC.

**Case Studies**: Loss of Forest Cover and Land Degradation in Jhum in India's North – East, Bijolia mining area in Rajasthan, Landslides in Nilgiris.

**Environmental Pollution**

Introduction – Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – Solid waste management: causes, effects and control measures of municipal solid wastes – Role of an individual in prevention of pollution – pollution case studies.

**Case Studies:** Polluted Rivers – Ganga, Yamuna and Noyyal River, Foundries in Haora, Zero waste management in Vellore.

**Environmental Threats**

Acid rain, greenhouse effect, global warming – Disaster management – flood, drought, earthquake, tsunami – Threats to biodiversity – destruction of habitat, habitat fragmentation, hunting, over exploitation, man – wildlife conflicts – The IUCN red list categories, status of threatened species.
**Case Studies:** Neutrino Project in Tamil Nadu.

**Social Issues and Environmental Legislations**

Environmental Protection – Role of Government, Legal aspects, Initiatives by Non–governmental Organizations – Sustainable development – sustainable technologies, need for energy and water conservation, rain water harvesting, water shed management, waste land reclamation, environment protection act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation – central and state pollution control boards – Public awareness, women and child welfare programs – Role of information technology in human and health.

**Case Studies:** Save the Children India, Rain water harvesting in urban areas – Women empowerment.

**References**


1. Tyler Miller G., "Environmental Science", Cengage Learning, 11th Edition, 2015.
2. Benny Joseph., "Environmental Studies", Tata McGraw Hill Education, 2nd Edition, 2008.
3. George Tchobanoglous, Howard S. Peavy, Donald R. Rowe., "Environmental Engineering", McGraw Hill Education, 1st Edition, 2013.
4. Henry J.G. and Heinke G.W., "Environmental Science and Engineering", Prentice Hall, 2nd Edition, 2007.
5. Masters G.B., "Introduction to Environmental Engineering and Science", Pearson Education, 3rd Edition, 2008.

| UICE002 | BASIC ELECTRICAL AND ELECTRONICS ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 4 | 0 | 0 | 4 |

**Course Objectives**

- To impart the basic knowledge about the Electric and Magnetic circuits.
- To inculcate the knowledge on the AC fundamentals.
- To understand the working of various Electrical Machines and Electronic Components.

**Course Content**

Review of Ohm's Law & Kirchhoff's laws–series and parallel circuits, equivalent resistance, star/delta conversion. Concepts of AC circuits – RMS value, average value, form and peak factors – real and reactive power – power factor, Mesh and Nodal Analysis.

Construction, Principle of operation and characteristics of DC generator and motor, transformer, synchronous machines and Induction machines. Basic ideas about energy audit and importance of energy saving.

Introduction to different types of electronic components (Diode, Transistor), Half and full wave rectifier (Qualitative analysis only), capacitive filters, zener voltage regulator, RC coupled amplifier, frequency response, colpitts oscillator.

**References**


1. A Fitzgerald, Charles Kingsley, Stephen Umans, "Electric Machinery", 7th edition, McGraw–Hill, 2013.
2. Robert Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", Prentice Hall, 11th Edition 2015.
3. Mahmood Nahvi, Joseph A Edminister, "Electric Circuits", Mcgraw Hill Education, 5th Edition, 2010.
4. Bhattacharya.S.K, "Basic Electrical and Electronics Engineering", 1st Edition, Pearson Education, 2011.
5. P.S. Dhogal, "Basic Electrical Engineering – Vol. I& II", 42nd Reprint, McGraw–Hill, 2012.

| UICE013 | ENGINEERING MATERIALS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To impart knowledge on structure of engineering materials and their influence on mechanical, chemical, electrical and magnetic properties.
- To acquire scientific understanding of engineering materials for relevant engineering applications.

**Course Content**

**Semiconducting materials**

Fermi-Dirac distribution function – effect of temperature – density of states – carrier concentration in metals – elemental – compound semiconductor – Concept of Fermi level and its variation with temperature and impurity – Position of Fermi level in intrinsic semiconductor and in extrinsic semiconductor – Conductivity of semiconductor – band gap energy and their determination – Hall effect in semiconductor.

**Superconducting materials**

Super Conductor: Properties, types and occurrence: BCS theory (qualitative) – applications (SQUID, cryotron, magnetic levitation).

**Magnetic materials**

Classification of magnetic materials based on spin – Hard and soft magnetic materials – Ferrites, garnets and magnetoplumbites – Magnetic bubbles and their applications – Magnetic thin films – Introduction to spintronics and devices (Giant magnetoresistance, Tunnel magnetoresistance and colossal magnetoresistance).

**Dielectric materials**

Polarization mechanisms in dielectrics - Frequency and temperature dependence of polarization mechanism – Dielectric loss – Dielectric waveguide and dielectric resonator antenna – Piezoelectric, pyroelectric and ferroelectric materials and their applications.

**Nanomaterials**

Introduction – surface area to volume ratio – quantum confinement – properties of nanomaterials – synthesis of nanomaterials by ball milling – plasma arcing-pulsed laser deposition and sol-gel methods – carbon nanotubes – properties and applications – applications of nanomaterials in environmental and health care.

**References**


1. Banerjee G K, "Electrical and Electronics Engineering Materials", Prentice Hall of India Pvt. Ltd, New Delhi, 2015.
2. Marikani A, "Materials Science", Prentice Hall of India Pvt. Ltd, Delhi, 2017.
3. Raghavan V, "Material Science and Engineering", Prentice Hall of India Pvt. Ltd, 6th Edition, Delhi, 2015.
4. William D. Callister, "Material Science and Engineering", Jr. Wiley India Ltd, 9th Edition, 2014.
5. Vijaya M S and Rangarajan G, "Materials Science", Tata McGraw – Hill, New Delhi, 3rd Edition, 2006.

| UICE020 | OBJECT ORIENTED PROGRAMMING WITH C++ | L | T | P | C |
|---|---|---|---|---|---|
| | | 2 | 0 | 2 | 4 |

**Course Objectives**

- Be able to program using C++ features such as composition of objects, function overloading, operator overloading and dynamic memory allocation.
- Be able to solve moderate complex problems using Object Oriented concepts such as inheritance, polymorphism, file I/O, exception handling in C++.

**Course Content**

**Introduction to Object Oriented Programming**

Basic Concepts and benefits of OOP – Tokens – Keywords - Identifiers - Basic data types - Derived data types - Reference variables - Type modifiers - Type casting - Operators and control statements - Input and output statements. Classes and Objects - Class specification - Member function definition - Constructors - Parameterized constructors - Overloaded Constructors - Constructors with default arguments - Copy constructors - access qualifiers - Static data members and member functions - Instance creation - Array of objects - Introduction to friend function - Destructors.

**Polymorphism and Inheritance**

Operator Overloading: Operator function - Overloading unary and binary operator - Overloading the operator using friend function - Stream operator overloading - Data Conversion. Inheritance: Basic Principle - Use of Inheritance - Defining Derived classes - Single Inheritance - Protected Data with private inheritance - Multiple Inheritance - Multi level inheritance - Hierarchical Inheritance - Hybrid Inheritance. Virtual Functions: Need for virtual function - Pointer to derived class objects - Definition of virtual functions - Pure virtual functions - Abstract classes - Virtual destructors - Dynamic Binding.

**I/O Streams and Generic Programming**

Streams: Streams in C++ - Stream classes - Formatted and unformatted data - Manipulators - User defined manipulators - File streams - File pointer and manipulation - File open and close -

Sequential and random access. Generic Programming With Templates: Introduction - Function templates - Class templates.

**List of Experiments**

Simple application problems that can be solved using the following concepts.

**C++**

1. Programs using Classes , Objects, Constructors and Destructors
2. Programs using Function, Operator Overloading and Inheritance
3. Programs using Virtual functions and Pointers
4. Programs using Files and Streams
5. Programs using Exception handling and Templates

**References**


1. Herbert Schildt, "C++ The Complete Reference", 5th Edition, Tata McGraw Hill, New Delhi, 2014.
2. Bjarne Stroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley, May 2013.
3. Deitel and Deitel, "C++ How to Program", Ninth Edition, Prentice Hall India Learning Private Limited, 2014.
4. Stanley B. Lippman, Josee Lajoie, Barbara E. Moo, "C++ Primer", 5th Edition, Addison Wesley, 2012.
5. Stephen Prata, "C++ Primer Plus", 6th Edition, Developer's Library, Addison Wesley, 2011.

| UICE010 | ENGINEERING GRAPHICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 2 | 0 | 2 | 4 |

**Course Objectives**

- To enable the students to communicate the concepts, ideas, and basic designs through graphical representations as per standards.
- Impart knowledge to interpret engineering drawings.

**Course Content**

**Geometrical Constructions and Free Hand Sketching**

Lettering – Types of lines – Dimensioning – Geometrical constructions – Principles of Orthographic projection – Orthographic projection of simple Engineering components using first angle Projection – Free Hand sketching only.

**Projection of Points, Lines and Plane Surfaces**

Projection of points – Projection of straight lines (only First angle projections) inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method – Projection of planes inclined to both the principal planes by rotating object method.

**Projection of Solids**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

**Projection of Sectioned Solids and Development of Surfaces**

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

**Isometric and Perspective Projections**

Principles of isometric projection – isometric scale – isometric projections of simple solids and Truncated solids – Prisms, pyramids, cylinders, cones – combination of two solid objects in simple

vertical positions – Perspective projection of simple solids by visual ray method. Introduction to CAD and their use

**References**


1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2014.
2. Gary Bertoline., and Eric Wiebe., "Technical Graphics Communication",McGraw–Hill, 4th Edition, 2009.
3. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 2014.
4. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2009.
5. David E. Goetsch, William S. Chalk, Raymond L. Rickman and John Nelson, "Technical Drawing and Engineering Communication", Delmar Cengage Learning, 6th Edition, 2005.

# SEMESTER III

| UICM003 | TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 1 | 0 | 4 |

**Course Objectives**

- To impart knowledge in solving first and higher order partial differential equations.
- To construct full range and half range Fourier series expansion including Harmonic analysis.
- To develop methods to solve PDE using Fourier series solutions.
- To understand different types of Fourier transform and apply them to solve complex engineering problems.
- To familiarize Z transforms techniques to solve engineering problems.

**Course Content**

**Partial Differential Equations**

Formation of PDE by elimination of arbitrary constants and functions - Solutions of first order equations - Standard types and equations reducible to standard types - Singular solutions - Lagrange's linear equation - Solution of second and higher order homogeneous and non-homogeneous linear equations with constant coefficients – Non linear equations of first order – Charpit's method.

**Fourier Series**

Dirichlet's conditions - Expansion of periodic functions into Fourier series - Change of interval - Fourier series for even and odd functions - Half-range expansions – Root mean square value of a function – Parseval's identity - Harmonic analysis.

**Applications to Partial Differential Equations**

Classification of second order linear partial differential equations - Solutions of one dimensional wave equation – one dimensional heat equation - Steady state solution of two-dimensional heat equation - Fourier series solutions.

**Fourier Transform**

Statement of Fourier integral theorem (without proof) - Fourier transform pairs - Fourier Sine and Cosine transforms - Properties - Transforms of simple functions - Convolution theorem - Parseval's identity – Finite Fourier Sine and Cosine transform.

**Z - Transform**

Z- transforms - Elementary properties – Inverse Z - transform (using partial fraction and residues) - Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

**References**


1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2016.
2. Bali N., and Goyal M., "Transforms and Partial Differential Equations", University Science Press, New Delhi, 2010.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India, 2016.
4. Veerarajan T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 3rd Edition, 2012.
5. Dennis G. Zill, "Advanced Engineering Mathematics", 6th Edition, Jones and Bartlett Learning, LLC, an Ascend Learning Company, 2016.
6. Peter V. O'Neil, "Advanced Engineering Mathematics", 8th Edition, Cengage Learning, Boston, USA, 2016.
7. Donald. A. McQuarrie, "Mathematical Methods for Scientists and Engineers", Viva Books Pvt. Ltd, New Delhi, 1st Edition, Reprint 2015.

| UICH003 | ECONOMICS FOR ENGINEERS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To provide a broad understanding of various perspectives of economics.
- To equip the students with necessary knowledge of economic concepts that can be applied in the engineering field.
- To enhance the knowledge of the students on the impact of inflation.

**Course Content**

**Introduction**

Economics – Policy and scope-Micro and macroeconomics–Relationship between Science, Engineering, Technology and Economic Development.

**Production and Demand**

Production: Factors of production - Production Possibility Curve - Demand analysis: Law of Demand, exceptions- Elasticity of Demand.

**Cost and Break even Analysis**

Concepts of cost of production - different types of costs; accounting cost, sunk cost, marginal cost, opportunity cost – Break even analysis.

**Capital Budgeting**

Capital budgeting techniques: Payback period method, IRR and NPV – Replacement and maintenance analysis – types of maintenance – replacement of an asset.

**Inflation and Globalization**

Inflation – types – measures to control inflation – fiscal policy – monetary policy Globalisation and international business.

**References**


1. Gupta, G.S. “Managerial Economics”, 2nd Edition, Tata McGraw Hill, 2013.
2. Joel Dean, “Managerial Economics”, Prentice Hall India, 2014.

3. John A. White, Kellie S. Grasman, Kenneth E. Case, Kim LaScola Needy, and David B. Pratt, “Fundamentals of Engineering Economic Analysis” 1st Edition, Wiley, August 2013.
4. R.M.Joshi, “International Business”, Oxford higher Education 2012.
5. P K Jain and M. Y Khan, “Financial Management: Text, Problems and Cases” 7th Edition, McGraw Hill Education, 2014

| UITC001 | DATA STRUCTURES | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 1 | 4 |

**Course Objectives**

- To understand the basic concepts of data structures.
- To apply the concepts of linear and nonlinear data structures for various suitable problem.
- To apply and select the appropriate data structures for various application.

**Course Content**

**Linear Data Structures**

Linear and multi-dimensional arrays and their representation, operations on arrays Linear linked list and their operations, doubly linked list and their operations-Sequential and linked representations, operations on stacks, evaluation of postfix expressions, conversion from infix to postfix representation-Sequential representation of queue, linear queue, circular queue, operations on linear and circular queue, linked representation of a queue and operations on it, DE queue, priority queue.

**Non-Linear Data Structures**

Basic terminology, sequential and linked representations of trees, traversing a binary tree using recursive and non-recursive procedures, inserting a node, deleting a node, AVL trees and B-trees, Red black tree -Representing a heap in memory, operations on heaps, application of heap in implementing priority queue and heap sort algorithm-Basic terminology, representation of graphs, traversal of a graph-BFS, DFS and applications of graphs.

**Hashing & Hash Tables**

Comparing direct address tables with hash tables, hash functions, concept of collision and its resolution using open addressing and separate chaining, double hashing and rehashing.

**List of Experiments**

Simple application problems that can be solved using the following concepts.

**C++**

1. Implementation of Array operations.
2. Implementation of Stacks, Queues and Linked List using arrays.

3. Implementation of Stacks & queues using linked lists.
4. Implementation of Tree traversal.
5. Implementation of BFS and DFS.

**References**


1. Weiss Mark Allen, "Data Structures and Algorithm Analysis in C++", Pearson Education; 4th Edition, 2014.
2. Aho, Ullman and Hopcroft," Data Structures and algorithms", Pearson education, 2011.
3. Narasimha Karumanchi,"Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles", 5th Edition, 2016.
4. Horowitz and Sahni, "Fundamentals of Data structures", Galgotia publications,2nd Edition, 2008.
5. Robert L. Kruse,Bruce P. Leung ,Clovis L. Tondo, "Data Structures and Program Design in C",2nd Edition,1997.

| UITC002 | JAVA PROGRAMMING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 1 | 4 |

**Course Objectives**

- Be able to program using Java features such as classes and objects, Inheritance and Packages.
- Be able to solve moderate complex problems using Object Oriented concepts such as polymorphism, file I/O, exception handling in Java.

**Course Content**

**Introduction to Java**

Overview - The JAVA Environment - Data types - Keywords - Scoping rules - Automatic Type Conversion - Type Casting and Arrays - Operators - Operators Precedence & Associativity - Expression. Flow control - new features from Java5 to Java 7 enhanced for loop, switch statements, handling Strings - Entry point for Java Programs.

**Classes and Objects**

Abstract classes - Inheritance - Types - Single - Multilevel - Hierarchical - Interfaces - Defining - Implementing - Packages - Introduction - Importing Packages - Implementation - Multithreaded Programming - Thread Model - Creating a Thread - Creating Multiple Thread - Thread Exceptions - Thread Priority - Synchronization - Interthread Communication.

**Information Hiding and Reusability**

Inheritance: Inheritance basics - Using super - Method Overriding - Constructor call - Dynamic method dispatch - Abstract class - Using final with inheritance - Packages: Default Package - Importing Packages- Interface: Multiple Inheritance in Java - Extending interface - Wrapper class.

**Exception, Concurrency and I/O Streams**

Exception handling mechanism - new look try/catch mechanism in Java 7. I/O Basics: Bytestream & Character Stream - Getting user input- Reading console input & Writing console output - Reading and Writing files - new filesystem API NIO2 Multithreading: Thread class & Runnable Interface - Inter Thread Communication - Synchronization of threads using Synchorized keyword and lock method -thread pool and Executors framework - Futures and callables-Fork - Join in Java 7 - Deadlock conditions.

**List of Experiments**

Simple application problems that can be solved using the following concepts

**Java**

1. Programs on inheritance encapsulation, access modifiers and packages
2. Programs on Polymorphism using abstract classes and interface
3. Programs on Exception handling
4. Programs on Multi-threading
5. Programs on File Handling

**References**


1. Herbert Schildt, "Java The Complete Reference", 9th Edition, McGraw Hill Education, 2017.
2. Cay S. Horstmann, "Core Java Volume - 1 Fundamentals", 10th Edition, Prentice Hall, 2016.
3. Deitel and Deitel, "Java How to Program", 10th Edition, Pearson Education India, 2016.
4. Joel Murach, "Murach's Java Programming", 5th Edition, Mike Murach & Associates, 2017.
5. Joshua Bloch, "Effective Java", 2nd Edition, Pearson Education, 2016.

| UITC003 | COMPUTER ORGANIZATION AND ARCHITECTURE | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Able to understand the basic structure and operations of digital computer.
- Be familiar with arithmetic and logic units along with hierarchical memory system.
- Able to expose the concept of pipelining and identify the different ways of Communication in I/O System

**Course Content**

**Introduction and Instructions**

Functional Units – Basic Operational Concepts – Structure – Performance and Metrics – Instructions – operations and operands – representing instructions – Logical operations – control operations – Addressing and addressing modes.

**Computer Arithmetic**

ALU Design - Fixed point arithmetic operation – Addition and subtraction – Multiplication – Division – Floating Point arithmetic operations.

**Processor and Control Unit**

Basic MIPS Implementation - Building data path – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions.

**Memory and Input and Output organization**

Memory hierarchy - Memory Technologies – Basics of Caches – Measuring and improving cache performance – Virtual Memory –Transaction- Look aside Buffer (TLB) - Input/output system, programmed I/O, DMA and interrupts, I/O processors.

**Parallel processing**

Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware multithreading – Multicore processors – RISC and CISC Architecture – Superscalar Architecture.

**References**


1. David A. Patterson and John L. Hennessey, “Computer organization and design”, Morgan Kaufman / Elsevier, 5th Edition, 2014.
2. Morris Mano M, “Computer System Architecture”, Pearson Education, New Delhi, 2011.
3. Govindarajalu, “Computer Architecture and Organization - Design Principles and Applications”, Tata McGraw Hill, 2010.
4. William Stallings, “Computer Organization and Architecture - Designing for Performance”, PHI Learning, New Delhi, 2008
5. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, “Computer Organisation”, 6th Edition, McGraw-Hill Inc, 2012.

| UITC004 | PRINCIPLES OF COMMUNICATION | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To understand the concepts of analog and digital communication techniques.
- To learn data and pulse communication techniques.
- To learn source and error control coding.
- To gain knowledge on multi-user radio communication.

**Course Content**

**Analog Communication**

Introduction to Communication Systems: Modulation – Types – Need for Modulation, Theory of Amplitude, Frequency and Phase Modulation – Evolution and Description of SSB Techniques – Comparison of Analog Communication System (AM – FM – PM).

**Digital Communication**

Amplitude Shift Keying (ASK) – Frequency Shift Keying (FSK) – Phase Shift Keying (PSK) – 8 PSK – 16 PSK - Quadrature Amplitude Modulation (QAM) – 8 QAM – 16 QAM – Bandwidth Efficiency – Comparison of Digital Communication System (ASK – FSK – PSK – QAM).

**Data and Pulse Communication**

Introduction to Data Communication – Standards Organizations for Data Communication – Data Communication Circuits – Data Communication Codes – Error Detection and Correction Techniques – Serial and Parallel Interfaces. Pulse Communication – Types – Pulse code Modulation (PCM) – Comparison of Pulse Communication System (PAM – PPM – PCM – PWM).

**Source and Error Control Coding**

Entropy, Mutual Information, Source encoding theorem, Shannon fano coding, Huffman coding, convolution codes, Viterbi decoding algorithm.

**Multi-User Radio Communication**

Global System for Mobile Communications (GSM) – Code division multiple access (CDMA) – Cellular Concept and Frequency Reuse – Channel Assignment and Hand off – Bluetooth – Satellite Communication – Keplers Law, LEO, MEO and GEO Orbits, Link model.

**References**


1. Wayne Tomasi, “Advanced Electronic Communication Systems”, 6th Edition, Pearson Education, 2011.
2. Simon Haykin, “Communication Systems”, 4th Edition, John Wiley & Sons, 2010.
3. Rappaport T.S, "Wireless Communications: Principles and Practice", 2nd Edition, Pearson Education, 2010.
4. B. P.Lathi, “Modern Analog and Digital Communication Systems”, 3rd Edition, Oxford University Press, 2011.
5. H.Taub, D L Schilling and G Saha, “Principles of Communication”, 3rd Edition, Pearson Education, 2014.

| UICE006 | DIGITAL PRINCIPLES AND SYSTEM DESIGN | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 1 | 4 |

**Course Objectives**

- To understand the fundamentals of number systems, boolean algebra
- To study the concepts of combinational circuits and sequential circuits.
- To understand the concepts of memories.

**Course Content**

**Boolean Algebra and Logic Gates**

Review of Number Systems – Arithmetic Operations – Binary Codes – Boolean Algebra and Theorems – Boolean Functions – Simplification of Boolean Functions using Karnaugh Map and Tabulation Methods – Logic Gates – NAND and NOR Implementations. Case Study on simplification methods.

**Combinational Logic**

Combinational Circuits – Analysis and Design Procedures – Circuits for Arithmetic Operations, Code Conversion – Decoders and Encoders – Multiplexers and Demultiplexers. Case study on combinational circuits.

**Sequential Logic**

Synchronous: Sequential Circuits – Latches and Flip Flops – Analysis and Design Procedures – State Reduction and State Assignment – Shift Registers – Counters – Asynchronous: Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race-free State Assignment – Hazards. Case study on sequential circuits.

**Memory and Programmable Logic**

RAM and ROM – Memory Decoding – Error Detection and Correction – Programmable Logic Array – Programmable Array Logic – Sequential Programmable Devices – Application Specific Integrated Circuits. Case Study on Memory.

**Hardware Description Language**

Introduction to VHDL – VHDL Models of Combinational circuits, VHDL for Sequential Logic Circuits. Case Study on VHDL.

**List of Experiments**

1. Design of combinational circuits Code converters.
2. Design of combinational circuits using MSI devices
3. Design of flip-flops using logic gates
4. Synchronous and asynchronous counters
5. Shift registers & Counters

**References**


1. John F. Wakerly, "Digital Design Principles and Practices", 4th Edition, Pearson Education, 2008.
2. Charles H. Roth, Larry L Killey, "Fundamentals of Logic Design", 7th Edition, CL Engineering, 2015.
3. Donald D. Givone, "Digital Principles and Design", Tata Mcgraw Hill, 2002.
4. Kharate G. K., "Digital Electronics", Oxford University Press, 2010.
5. Blaine C. Readler, "VHDL by Examples", Full Arc Press, 2014.

# SEMESTER IV

| UICM007 | PROBABILITY AND STATISTICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 1 | 0 | 4 |

**Course Objectives**

- To learn the basic concepts of commonly used probability distributions.
- To expose the concept of two dimensional random variables.
- To gain Knowledge on theory of estimation.
- To assess the sampling involved in real life problems.
- To introduce the design of experiments.

**Course Content**

**Random Variables & Distributions**

Random variables - Discrete and continuous distributions - Mathematical Expectation - Moment about origin - Central moments - Moment generating function of probability distribution. Binomial - Poisson – Uniform - normal distributions.

**Two Dimensional Random variables**

Joint probability distributions- Marginal probability distributions – Conditional probability distributions - Covariance – Correlation and Linear Regression – Applications to open Channel flow and warehouse construction.

**Sampling and Estimation**

Sampling distribution of mean and sampling distribution of variance – Point Estimation – Good Estimator – Unbiased – Consistency – Sufficiency – Method of Moments – Method of maximum likelihood.

**Testing of Hypothesis**

Type I & type II errors – Large Sample test for single mean and difference of means – Tests based on t, chi-square and F distributions for mean and variance – Contingency table – Goodness of fit.

**Analysis of Variance**

One way classifications, two way classifications, completely Randomized design, Randomized block design, Latin Square method.

**References**


1. Oliver C. Ibe“Fundamentals of Applied Probability and Random Processes", Elsevier, 2nd Edition, 2014.
2. Peyton Z. Peebles, "Probability, Random Variables and Random Signal Principles", Tata McGraw- Hill, 4th Edition, 2017.
3. Yates. R.D. and Goodman. D.J., "Probability and Stochastic Processes", John Wiley & Sons, 3rd Edition, 2014.
4. Miller. S.L. and Childers. D.G., "Probability and Random Processes with Applications to Signal Processing and Communications", Academic Press 2nd Edition, 2012.
5. Cooper. G.R., McGillem. C.D., "Probabilistic Methods of Signal and System Analysis", Oxford University Press, New Delhi, 3rd Indian Edition, 2012.
6. Kandasamy P, Thilagavathy K and Gunavathy K., “Probability, Statistics and Random Processes” S.Chand& Co, Ramnagar, New Delhi, Reprint 2013.
7. Veerarajan. T, “Probability, Statistics and Random Processes”, 3rd Edition, Tata McGraw-Hill Education, 2013.

| UITC005 | DATABASE MANAGEMENT SYSTEMS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 1 | 4 |

**Course Objectives**

- To understand the fundamental concepts of database management systems.
- Be familiar knowledge about the data model, SQL and relational database design.
- Be familiar with the basic issues of transaction processing, concurrency control and file organization.

**Course Content**

**Introduction**

Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS. Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, and Extended E-R features.

**Relational Model and SQL**

Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications of the Database. Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, view Nested Sub queries, Database application development using SQL, Stored procedures and triggers. Functional Dependency, Different anomalies in designing a Database., Normalization using functional dependencies, Decomposition, Boyce-Code Normal Form, 3NF, Normalization using multi-valued dependencies, 4NF, 5NF , Query Processing and optimization.

**Transaction Concept and File organization**

Transaction processing, Concurrency control and Recovery Management - transaction model properties, state serializability, lock base protocols, two phase locking. File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records, Types of Single-Level Index, Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree tree – Advanced Database Management – NoSQL – XMLDB – Mobile Databases.

**List of Experiments**

1. Creation of a Database using DDL and DML.
2. Creation of a Database Views, DCL and TCL.
3. Creating a database to set various constraints.
4. Creating of Nested Queries.
5. Creation of PL/SQL Procedures functions and Triggers.

**References**


1. H.F.Korth and A.Silberschatz,"Database System concepts", McGraw-Hill**,** 6th Edition, 2010.
2. Elmasri, Navathe, "Fundamentals of database Systems", 7th Edition, Pearson Education, 2017.
3. Fred R McFadden, Jeffery A Hoffer, Mary B. Prescott, "Modern Database Management", 12th Edition, Addison Wesley, 2015.
4. Raghu Ramakrishnan, "Database Management Systems", McGraw-Hill**,** 3rd Edition, 2014.
5. Bipin C Desai, "An Introduction to Database Systems", Galgotia Publications Pvt Limited, Revised Edition, 2012.

| UITC006 | OPERATING SYSTEMS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 1 | 4 |

**Course Objectives**

- To understand the basic concepts and functions of OS environment.
- To know the internal structure & operations of OS and develop system programs using system calls.
- To learn about Processes, various memory management schemes and File Systems.

**Course Content**

**Introduction to OS**

**Operating System:** overview - structures- services - systems calls - system programs- operating systems generation. Simple Monitor - Performance - Multiprogramming - time-sharing, Real Time systems - Protection - process concepts – scheduling.

**Process Management**

Process synchronization : the critical-section problem - Peterson's - synchronization Hardware, semaphores - monitors. **CPU Scheduling:** Scheduling concepts and algorithms, Algorithms evaluation – Deadlocks- prevention – avoidance – detection – recovery.

**Memory Management**

**Memory Management:** Swapping - Contiguous memory allocation – paging - segmentation, virtual memory - demand paging - page- replacement algorithms – thrashing.

**File Management**

**File Systems:** File Concept – Access methods - Directory structure – Implementation – Allocation methods-File protection**. Disk Scheduling:** Physical characterization, Disk Management and scheduling, RAID structure.

**List of Experiments**

1. Implement CPU scheduling Algorithms.
2. Implement Bankers Algorithm.
3. Implement producer-consumer problem using semaphore
4. Implement Page replacement algorithms.
5. Implement file allocation strategies.

**References**


1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts", 9th Edition, 2013.
2. William Stallings "Operating Systems - Internals and Design Principles ", 2017 ISBN-0134670957.
3. Andrew S Tanenbaum, "Modern Operating Systems", 4th Edition,2015, PHI ISBN-013359162X
4. D.M.Dhamdhere, "Operating systems- A Concept based Approach". 2nd Edition,2009
5. Naresh Chauhan, " Principles of Operating Systems", Oxford University Press, 2014

| UITC007 | THEORY OF COMPUTATION | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Understand various Computing models like Finite State Machine, Pushdown Automata, and Turing Machine.
- Be aware of Decidability and Un-decidability of various problems.
- Learn types of grammars

**Course Content**

**Introduction to Finite Automata, Regular Languages and Finite Automata**

Basic Mathematical Notation and techniques- Finite State systems – Finite Automaton – DFA & NDFA – Finite Automaton with €- moves-Regular Languages- Regular Expression – Equivalence of NFA and DFA – Equivalence of NDFA's with and without €-moves – Equivalence of finite Automaton and regular expressions –Minimization of DFA- Pumping Lemma for Regular sets.

**Context Free Grammars and Normal Form and Pushdown Automata**

Derivations and Languages – Ambiguity- Relationship between derivation and derivation trees – Simplification of CFG – Elimination of Useless symbols - Unit productions - Null productions – Greiback Normal form (GNF) - Chomsky normal form (CNF)- Definition of push down automaton - Language accepted by push down automaton- pushdown automata and context free languages - deterministic push down automata and deterministic context free languages- Grammar for deterministic context free languages.

**Turing Machines, Measuring and Classifying Complexity**

Definitions of Turing machines – Models– Computable languages and functions- Techniques for Turing machine construction – Multi head and Multi tape Turing Machines - The Halting problem – Partial Solvability – Problems about Turing machine- Universal Turing machine- Tractable and Intractable problems- P and NP completeness - Polynomial time reductions.

**References**


1. John E. Hopcroft, Rajeev Motwani and Jeffery D. Ullman, Automata Theory, Languages, and Computation (3rd. Edition), Pearson Education, 2014.
2. John C Martin, “Introduction to Languages and the Theory of Computation”, McGraw Hill, New Delhi, 2010.
3. Peter Linz, “An Introduction to Formal Language and Automata”, Jones and Barlett India Pvt. Ltd, New Delhi, 2011.
4. Kavi Mahesh, “Theory of Computation: A Problem Solving Approach”, Wiley Publications, New Delhi, 2011.
5. Kamala Krithivasan and Rama. R, “Introduction to Formal Languages, Automata Theory and Computation”, Pearson Education 2009.

| UITC008 | INFORMATION THEORY AND CODING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- The main objective of this course is to understand the basics of information theory, error control codes, encoding and decoding of data streams to students.
- This course will the make the students to understand the different compression techniques and multimedia techniques.

**Course Content**

**Information Entropy Fundamentals**

Uncertainty, Information and Entropy – Discrete Memory less channels – channel capacity – channel coding Theorem – Channel capacity Theorem.

**Data, Voice, Audio and Video Coding**

Differential Pulse code Modulation – Adaptive Differential Pulse Code Modulation – Adaptive subband coding – Delta Modulation– Coding of speech signal at low bit rates (Vocoders, LPC). Linear Predictive coding – code excited LPC – Perceptual coding, MPEG audio coders – Dolby audio coders – Video compression – Principles – Introduction to H.261 & MPEG Video standards.

**Error Control Coding and Compression Techniques**

Linear Block codes – Syndrome Decoding – Minimum distance consideration – cyclic codes – Generator Polynomial – Parity check polynomial – Encoder for cyclic codes – calculation of syndrome – Convolutional codes. Compression: Principles – Arithmetic coding – Image Compression – Graphics Interchange format – Tagged Image File Format – Introduction to JPEG standards.

**References**


1. Simon Haykin, “Communication Systems”, 4th Edition, John Wiley and Sons, 2001.
2. Fred Halsall, “Multimedia Communications, Applications Networks Protocols and Standards”,Pearson Education, Asia 2002.
3. Mark Nelson, “Data Compression Book”, BPB Publication 1992.
4. Watkinson J, “Compression in Video and Audio”, Focal Press, London, 1995.
5. R Bose, “Information Theory, Coding and Cryptography”, TMH 2007.

| UITC009 | PRINCIPLES OF MICROPROCESSORS AND MICROCONTROLLERS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 1 | 4 |

**Course Objectives**

- To create a strong foundation by studying the basics of Microprocessors and interfacing to various peripherals which will lead to a well-designed Microprocessor and microcontroller based System.
- The course is a pre-requisite for all further courses in embedded systems and the students can model microprocessor and microcontroller based embedded devices.
- The accompanying lab is designed to provide practical hands-on experience with microprocessor & microcontroller applications on interfacing techniques.

**Course Content**

**Processor Architecture**

Introduction to microprocessors- 8086 Architecture - Programmable registers, address and data busses, memory interfacing, Pin diagram descriptions - signals, Minimum mode and Maximum mode CPU module.

**8086 Programming**

Instruction formats, addressing modes, Data transfer instructions, string instructions, logical instructions, arithmetic instructions, control transfer instructions, process control instructions - Assembler directives - Assembly Language programs for logical, arithmetic, delay and interrupt programming.

**I/O Interfacing**

Peripheral Interface using 8255 in I/O and BSR mode - 8279 Keyboard/Display controller - 8251 USART- Timer/Counter (8253) - ADCs and DACs –Programmable DMA Controller(8257). Power and energy consumption of processor.

**8051 Microcontroller**

Architecture of 8051 – Register set - I/O Pins, Ports and Circuits - Instruction set - Addressing modes - Assembly language programs for arithmetic and Logical operations.

**Interfacing using 8051 Microcontroller**

Programming 8051Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - Stepper Motor Interfacing – Application of 8051 in power optimization- - Case study of MSP430 - Power and real-world constraints.

**List of Experiments**

1. Sorting and searching a character using 8086.
2. Generation of Waveforms using 8086.
3. Interfacing a stepper motor with 8086.
4. Serial and parallel communication of 8 bit data using 8086.
5. Square and 2's complement of a number using 8051.

**References**


1. Doughlas V. Hall, "Microprocessors and Interfacing, Programming and Hardware", TMH, 2012.
2. A. K. Ray, K. M. Bhurchandi, "Advanced Microprocessor and Peripherals", 2nd Edition, Tata McGraw-Hill, 2012.
3. Muhammad Ali Mazidi, "The 8051 Microcontroller and Embedded Systems", Pearson Education, 2013.
4. Subrata Ghoshal, "8051 Microcontrollers: Internals, Instructions, Programming &Interfacing", 2nd Edition, Pearson education, 2014.
5. John Paul Shen, Mikko H. Lipasti "Modern Processor Design: Fundamentals of Superscalar Processor", Waveland Press, Inc, 2013.

# SEMESTER V

| UITC010 | DESIGN AND ANALYSIS OF ALGORITHMS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To know the basics of computational complexity analysis and various algorithm design paradigms.
- Provide students with solid foundations to deal with a wide variety of computational problems.
- To provide a thorough knowledge of the most common algorithms and data structures.
- To analyze a problem and identify the computing requirements appropriate for its solutions.

**Course Content**

**Introduction**

Basic Algorithm, Pseudo code for expressing algorithms, Performance Analysis, Asymptotic Notation, Algorithm Design techniques, Growth of Functions, Mathematical analysis of Recursive and Non-recursive Algorithms.

**Divide-and-conquer algorithms**

Binary search, finding maximum and minimum, quick sort, merge sort, heap sort, Multiplication of Large Integers, Strassen's Matrix multiplication.

**Greedy method Techniques**

Knapsack problem, Minimum cost spanning tree, Dijkstra's Algorithm.

**Dynamic Programming techniques**

Floyd-Warshall algorithm, Optimal binary search trees, 0/1 knapsack problem, Hamiltonian circuit Problem.

**Backtracking techniques**

Eight Queens's problem - Sum of subsets - Hamiltonian cycle, Knapsack problem, Traveling Salesman problem.

**Branch and Bound techniques**

Travelling salesman problem, 0/1 knapsack Problem, Assignment Problem, Computational complexity, Necessity of approximation scheme, Polynomial time approximation schemes, NP-Hard and NP-Complete problems.

**References**


1. Horowitz E. Sahani S: “Fundamentals of Computer Algorithm”, Galgotia Publications, 2000.
2. Anany Levitin, “Introduction to the Design & Analysis, of Algorithms”, Pearson Education, 2000.
3. Aho, Hop croft, Ullman, "The Design and Analysis of Computer Algorithm", Pearson Education, 2000.
4. Parag H. Dave, Himanshu B. Dave “Design and Analysis of Algorithms” Pearson Education, 2008.
5. Donald E. Knuth, “The Art of Computer Programming”, Volumes 1& 3 Pearson Education, 2009. Steven S. Skiena, “The Algorithm Design Manual”, Second Edition, Springer, 2008.

| UITC011 | SOFTWARE ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Basic Knowledge related to Software Engineering.
- Principles of Design Engineering.
- Fundamentals of Testing.
- Basics of Project Management Concepts.

**Course Content**

**Software Process and Requirements**

Introduction to software Engineering - Software Process Models - The Unified Process- Software Requirements - Requirement Engineering Process- Classical analysis - Data Modeling Concepts – Data Flow Model.

**Design Concepts**

Design Engineering – Design Process and Quality – Design Concept – Model –Architectural Design: Software architecture - Data design - Architectural styles and patterns - Architectural Design - Mapping Data-Flow into a Software Architecture -Modeling Component-Level Design - Component - Design Class-Based Components - Conducting Component level Design - Performing User interface design: Golden rules - User interface analysis and design - interface analysis - interface design steps - Design evaluation.

**Testing**

Fundamentals of Testing – Verification and Validation - Blackbox Testing – Whitebox Testing – Basis Path Testing – Control Structure Testing - Software Testing Strategies – Strategic Issues – Regression Testing - Unit Testing – Integration Testing – Validation Testing – System Testing - Debugging.

**Project Management**

Project Management Concepts – Process and Project metrics – Estimation: LOC and FP Based Estimation, COCOMO Model – Make/Buy Decision - Planning – Project Plan, Planning Process - Project Scheduling: – Scheduling, Earned Value Analysis - Risk Management – Risk

Identification – Risk Projection – Risk Refinement – RMMM – Software Maintenance – Reengineering.

**References**


1. Roger S Pressman and Bruce R Maxim, "Software Engineering - A Practitioner's Approach", 8th Edition, Tata McGraw-Hill, International Edition, 2014.
2. Ian Sommerville, "Software Engineering", 10th Edition, Pearson Education Asia, 2015.
3. Rajib Mall, "Fundamentals of Software Engineering", 4th Edition, PHI Learning, 2014
4. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
5. Shari Lawrence Pfleeger, "Software Engineering Theory and Practice", 4th Edition, Pearson Education, New Delhi, 2009.

| UITC012 | COMPUTER NETWORKS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 1 | 4 |

**Course Objectives**

- Build an understanding of the fundamental concepts of computer networking.
- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
- Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

**Course Content**

**Introduction of Computer Networks**

Uses of Computer Networks, Network Hardware, Network Software, Reference Models. The Physical Layer: The Theoretical Basis for Data Communication**,** Guided Transmission Media, Digital Subscriber Lines, Switching.

**Data Link Layer**

Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols. The Medium Access Control Sub-layer: Multiple Access Protocols-ALOHA, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited-Contention Protocols, Ethernet**,** Data Link Layer Switching.

**The Network Layer and Routing**

Network Layer Design Issues, Routing Algorithms - Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing. Broadcast Routing, Multicast Routing, Congestion control algorithms, Quality of Service-Application Requirements, Traffic Shaping, Packet Scheduling and Admission Control. Internetworking, the Network Layer in the Internet-The IP version 4.0 protocol, IP Addresses, IP Version 6.0, Internet Control Protocols.

**The Transport Layer**

The Transport Service-Services Provided to the Upper Layers, Transport Service Primitives, Elements of Transport Protocols-Addressing, Connection establishment, Connection Release, Error Control and Flow Control. The Internet Transport Protocols: Introduction to UDP, Remote procedure call, Real-Time transport protocols, Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release.

**The Application Layer**

DNS- The Domain Name System, Electronic mail.

**List of Experiments**

1. Familiarization with Networking Components and devices: LAN Adapters, Hubs, Switches, Routers etc.
2. Familiarization with Transmission media and Tools: Co-axial cable, UTP Cable, Crimping Tool, Connectors etc.
3. Study of various LAN topologies and their creation using network devices, cables and computers.
4. Implementation of file and printer sharing.
5. Subnet planning and its implementation.
6. Implementation of various routing protocols like Link State Routing and Distance vector routing

**References**


1. Behrouz Forouzan, “Data Communications and Networking”, 4th Edition, McGraw Hill, 2016.
2. Behrouz Forouzan, “TCP/IP Protocol Suite”, 3rd Edition, McGraw Hill, 2013.
3. James F. Kurose, “Computer Networking- A Top-Down approach”, 6th edition, Pearson, 2016.
4. Andrew Tanenbaum, “Computer Networks”, 4th Edition, Prentice Hall.
5. Fred H alsall, “Computer Networking and the Internet”, 5th Edition, Addison Welsey.

| UITC013 | PRINCIPLES OF COMPILER DESIGN | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 1 | 4 |

**Course Objectives**

- Learn the design principles of a Compiler.
- Learn the various parsing techniques and different levels of translation.
- Learn how to optimize and effectively generate machine codes.

**Course Content**

**Lexical Analysis**

Structure of a Compiler, the Phases, Cousins, the Grouping of Phases, Compiler Construction Tools, Applications of Compiler Technology, The Role of the Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, The Lexical Analyzer, Generator Lex.

**Syntax Analysis, Intermediate Code Generation and Run-time Environments**

Syntax Definition, Role of the Parser, Context Free Grammars, Writing a Grammar, Top down Parsing and its techniques, Bottom-up Parsing, Types of LR Parsers, Constructing LR Parsers, Using Ambiguous Grammars, Parser Generators. Variants of Syntax Trees, Three Address Code, Types and Declarations, Assignment Statements, Control Flow, Backpatching, Switch Statements, Procedure Calls, Type Checking, Run-Time Environments, Storage Organization, Static Allocation of Space, Access to Nonlocal Data on Stack, Heap Management.

**Code Generation and Code Optimization**

A Simple Code Generator, Register Allocation and Assignment, Generating Code from DAG, Principle Sources of Optimization, Peephole Optimization, Optimization of Basic Blocks, Loops in Flow Graphs, Introduction to Global Data Flow Analysis, Code Improving Transformations.

**List of Experiments**

1. Lexical Analyzer
2. Storage allocation strategies
3. DAG
4. Back end of the compiler

5. Simple Code Optimization Techniques

**References**


1. Alfred V Aho, Monica S Lam, Ravi Sethi and Jeffrey D Ullman, "Compilers - Principles, Techniques and Tools", 2nd Edition, Pearson Education South Asia, 2012. ISBN- 9788131789865
2. Henri E Bal, Ceriel J H Jacobs, Kees Van Reeuwijk, Dick Grune, Koen Langendoen, Grune, Van Reeuwijk, Langendoen, Bal, Jacobs,"Modern Compiler Design",1st Edition, Springer,2012. ISBN-9781461446989
3. Allen I. Holub," Compiler Design in C", 1st Edition, 2015.
4. Randy Allen, Ken Kennedy, "Optimizing Compilers for Modern Architectures: A Dependence-based Approach", Morgan Kaufmann Publishers, 2002.
5. Charles N. Fischer, Richard. J. LeBlanc, "Crafting a Compiler with C", Pearson Education, 2008.

| UITC201 | WEB PROGRAMMING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 1 | 4 |

**Course Objectives**

- Learn the Web Front-End Development by introducing various technologies that computer programmers use when creating web sites
- Learn about the framework in use today and how they apply to web development

**Course Content**

**HTML5**

Introduction, New Elements, Canvas, SVG, Drag/Drop, Geolocation, Video, Audio, Input Types, Form Elements, Attributes, Semantic, Web Storage, App Cache, Web Workers, SSE.

**Cascading Style Sheets**

Introduction, Syntax, Id & Class, Backgrounds, Text, Fonts, Links, Lists, Tables, Box Model, Border, Outline, Margin, Padding, Grouping/Nesting, Dimension, Display, Positioning, Floating, Align, Pseudo-class, Pseudo-element, Navigation Bar, Image Gallery, Image Opacity, Image Sprites, Media Types, Attribute Selectors, CSS3 Introduction, Gradients, Text Effects, Fonts, 2D Transforms, 3D Transforms, Transitions, Animations, Multiple Columns.

Introduction, Comment, Variable, Global Variable, Data Types, Operators, If Statement, Switch, Loop: for and while, Function, Objects, Array, Browser Object Model, Validation. JQuery: Introduction, Selectors, Events, CSS Classes, Dimensions.

**Lab Experiments**

1. Exercises on HTML
2. Exercises on CSS
3. Design a web site using HTML and DHTML. Use Basic text Formatting, Images.
4. Create a script that asks the user for a name, then greets the user with “Hello” and the user name on the page
5. Create a script that collects numbers from a page and then adds them up and prints them to a blank field on the page.

**References**


1. Harvey Deitel, Abbey Deitel, Internet and World Wide Web: How to Program 5th Edition. ISBN-13: 978-0132151009.
2. DJ Editorial Services, "HTML5 Black Book", 2nd Edition. ISBN-13:978-9351199076
3. Thomas A.Powell, HTML & CSS: The Complete Reference,5th Edition ISBN-13:978-0070701946.
4. Bear Bibeault,Yehuda Katz, jQuery in Action,3rd Edition. MANNING publications ISBN-9781933988351.
5. Jonathan Chaffer,Karl Swedberg, Learning jQuery ,4th Edition. Packt publications. ISBN- 978-1-78216-314-5.

# SEMESTER VI

| UITC202 | CLOUD COMPUTING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 1 | 4 |

**Course Objectives**

- Understand various basic concepts related to cloud platforms such as Amazon Web Services.
- Be familiar with web application development and deployment using cloud platforms.
- Learn to develop scalable applications using IOT and cloud of things.
- Learn about some of the newer techniques that are considering to protect cloud systems.

**Course Content**

**Introduction to Cloud Computing**

Defining Cloud Computing- History of Computing- Understanding Cloud Architecture – Characteristics – Services – Pros and Cons of Cloud Computing – Cloud Analytics – Testing under Cloud - Cloud Mobility – Cloud Management - Amazon Web Services - Google App Engine – Microsoft Azure – Cloud computing economics - Web services, AJAX and Mashups. Virtualization Structure – Implementation levels of Virtualization – Virtualization for data center automation - Understanding service oriented architecture.

**The Cloud of Things**

Grid/SOA and Cloud Computing - Cloud Middleware - NIST's SPI Architecture and Cloud Standards - Cloud Providers and Systems - The Internet of Things and Cloud Computing - Mobile Cloud Computing - MAI versus XaaS: The Long Tail and the Big Switch - The Cloud of Things Architecture : Four Deployment Models - Vertical Applications - Fifteen Essential Features - Four Technological Pillars - Three Layers of IoT Systems - Foundational Technological Enablers.

**Security in Cloud Computing**

Cloud Computing software security Fundamentals : Cloud Security Services, Cloud Security Design Principles - Security Challenges Concerns, Risk Issues, and Legal Aspects - Security Requirements for the Architecture - Security Patterns and Architectural Elements - Cloud Security Architecture - Planning Key Strategies for Secure Operation - Data Security – Key strategies and best practices – Building an internal cloud - Selecting an external cloud provider – Information security framework.

**List of Experiments**

1. Identify the Procedure to run the Virtual Machine of different Configurations and Examine how many Virtual Machine can be utilized at particular time using Eucalyptus or Open Nebula or Open Stack.
2. Write a program to perform the migration of Virtual Machine based on the load from one node to the another using Eucalyptus or Open Nebula or Open Stack.
3. Create an application using Hadoop Map/Reduce.
4. Find Procedure to set up the One Node Hadoop Cluster and mount the One Node Hadoop Cluster Using FUSE.
5. Create Simulation entities in run time using Cloudsim Tool kit.

**References**


1. Dr Gautam Shroff, "Enterprise Cloud Computing: Technology, Architecture, Applications", Cambridge University Press, USA, 2010.
2. Kai Hwang, Geoffrey C.Fox, Jack J.Dongarra, "Distributed and Cloud Computing from Parallel Processing to the Internet of Things", Morgan Kaufmann Publisher an imprint of Elsevier,2012.
3. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", Publisher: CRC Press, September 2013.
4. Graham Speake, Vic (J.R.) Winkler, "Securing the Cloud: Cloud Computer Security Techniques and Tactics", Elsevier, USA, 2011.
5. Ronald L.Krutz, Russell Dean Vines, "Cloud Security: A Comprehensive Guide to Secure Cloud Computing", Wiley Publications, 2014.

| UITC203 | CRYPTOGRAPHY AND NETWORK SECURITY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Understand the fundamental principles of access control models and techniques, authentication and secure system design.
- Have a strong understanding of different cryptographic protocols and techniques and be able to use them.
- Apply methods for authentication, access control, intrusion detection and prevention.

**Course Content**

**Introduction**

Introduction to Cryptography, Security Threats, Vulnerability, Active and Passive attacks, Security services and mechanism, Conventional Encryption Model, CIA model, Modular Arithmetic, Euclidean and Extended Euclidean algorithm, Prime numbers, Fermat and Euler's Theorem.

**Classical Cryptography**

Dimensions of Cryptography, Classical Cryptographic Techniques, Block Cipher (DES, AES): Feistal Cipher Structure, Simplifies DES, DES, Double and Triple DES, Block Cipher design Principles, AES, Modes of Operations.

**Public -Key Cryptography**

Principles of Public-Key Cryptography, RSA Algorithm, Key Management, Diffie - Hellman Key Exchange, Elgamal Algorithm, Elliptic Curve Cryptography.

**Hash and MAC Algorithms**

Authentication Requirement, Functions, Message Authentication Code, Hash Functions, Security of Hash Functions and Macs, MD5 Message Digest Algorithm, Secure Hash Algorithm, Digital Signatures, Key Management: Key Distribution Techniques, Kerberos.

**Security in Networks**

Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security, Firewalls – Design and Types of Firewalls, Personal Firewalls, IDS, Email Security – PGP, S/MIME.

**References**


1. Cryptography And Network Security Principles and Practice 4th Edition, William Stallings, Pearson Education
2. Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall PTR.
3. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall.
4. Cryptography: Theory and Practice by Douglas R. Stinson, CRC press.
5. Cryptography and Network Security by Behrouz Forouzan, Tata Mc Graw Hill.

| UITC014 | INDUSTRIAL DESIGN PROJECT (COURSE WORK) | L | T | P | C |
|---|---|---|---|---|---|
| | | 4 | 0 | 0 | 4 |

**Course Objectives**

Industrial design project offers a distinctive opportunity to play a key role as part of a team working on a realistic design project in an industry or organization. It's about creating and testing ideas to solve real-world problems. It will improve technical knowledge, communication, practical skills and employability at a stroke.

The students should undergo Industrial design project from third year (Sixth Semester) of study. Industrial design project is designed into three courses **UITC014 - Industrial Design Project (Course Work), UITC015 - Industrial Design Project (Practical) and UITC016 - Industrial Design Project (Phase – II)** it will be a platform for the students to gain full experience in the breadth and depth of Information Technology.

**Course Content**

Industrial design project offers a distinctive opportunity to play a key role as part of a team working on a realistic design project in an industry or organization. It's about creating and testing ideas to solve real-world problems. It will improve technical knowledge, communication, practical skills and employability at a stroke.

| UITC015 | INDUSTRIAL DESIGN PROJECT (PRACTICAL) | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 2 |

**Course Content**

A project based course in which students are required to undertake a course work on advanced design which involves different areas of the Information Technology discipline such as Grid and Cloud Computing, Internet of Things, Networks, Data Analytics, Image Processing and Machine Learning

# SEMESTER VII

| UITC204 | BIG DATA ANALYTICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To understand the field of data science.
- To understand the computational approaches with R.
- To analyze the different statistical and clustering data analytics algorithms.
- To understand the need and application of Map Reduce.
- To analyze and interpret streaming data.

**Course Content**

**Introduction to Big data Analytics**

Big Data Overview - State of the practice in Analytics - Data Analytics Lifecycle Overview- Discovery - Data Preparation - Model Planning - Model Building - Case Study.

**Basic Data Analytic Methods using R**

Introduction to R - Exploratory Data Analysis - Visualization before analysis, Dirty data, visualizing a single variable, Examining multiple variables, Data exploration versus presentation Statistical Methods for Evaluation – Hypothesis testing, Difference of means, Wilcoxon Rank-sum test, Type I and Type II Errors, Power and Sample size , ANOVA.

**Overview of Analytic Algorithms**

Introduction to analytic algorihms - K-means - Association Rules- Overview - Evaluation of Candidate Rules - Application of Association Rules - An Example - Apriori Algorithm - Validation and Testing.

**Advanced Data Analytic Methods**

Regression – Linear and Logistic - Classification – Decision Trees and Naïve Bayes - Diagnostics of Classifiers - Time Series Analysis - ARIMA Model - Text Analysis - A Text Analysis Example - Collecting Raw Data - Representing Text - Term Frequency - Categorizing Documents by Topics - Determining Sentiments.

**Technology and Tools in Analytics**

Analytics for Unstructured Data – Use Cases – MapReduce - Apache Hadoop – Pig – Hive – Hbase – Mahout – NoSQL. SQL Essentials - In-Database Text Analysis - Advanced SQL - Communicating and Operationalizing an Analytics Project.

**References**


1. David Dietrich, Barry Heller, and Beibei Yang, “Data Science And Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, John Wiley & Sons, Inc., 2015.
2. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2011.
3. Tom White, “Hadoop: The Definitive Guide”, Third Edtion, O’Reilly Media, 2012.
4. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, Wiley, 2012.
5. Nathan Marz, James Warren, “Big Data Principles and best practices of scalable real-time data systems”.

| UITC016 | INDUSTRIAL DESIGN PROJECT – PHASE II | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 6 | 6 |

**Course Content**

Industrial design project offers a distinctive opportunity to play a key role as part of a team working on a realistic design project in an industry or organization. It's about creating and testing ideas to solve real-world problems. It will improve technical knowledge, communication, practical skills and employability at a stroke.

A project based practical course in which students are required to complete advanced design software through an organization / institution. At the end of the course students have to submit a certificate of completion and appear for final practical examination.

| UITC017 | FINAL YEAR PROJECT - PHASE I | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 2 |

**Course Objectives**

- To allow students to complete a research and / or development project via an individual work or team work.
- To identify a specific problem for the current need of the society and collecting information related to the same through detailed review of literature.
- To develop the methodology to solve the identified problem.
- To enhance students skills pertaining to scientific and technical report writing and presentation.

**Course Content**

The student individually or in a group of 2 to 3 works on a specific topic approved by the project review committee constituted by the head of the department under the guidance of a faculty member who is familiar in this area of interest. The students can select any topic which is relevant to the area of Information Technology. At the end of the semester, a detailed report on the work done should be submitted which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work. The progress of the project is evaluated based on a minimum of three reviews by the project review committee. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

# SEMESTER VIII

| UITC205 | MACHINE LEARNING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Able to understand the concepts of machine learning.
- Able to analyze the differences between supervised and unsupervised learning techniques

**Course Content**

**Introduction**

Machine Learning - Machine Learning Foundations –Overview – Applications - Types of Machine Learning - Basic Concepts in Machine Learning - Examples of Machine Learning - Applications - Linear Models for Regression - Linear Basis Function Models - The Bias-Variance Decomposition - Bayesian Linear Regression - Bayesian Model Comparison.

**Supervised Learning**

Linear Models for Classification - Discriminant Functions - Probabilistic Generative Models - Probabilistic Discriminative Models - Bayesian Logistic Regression - Decision Trees - Classification Trees - Regression Trees – Pruning - Neural Networks - Feed-Forward Network Functions - Error Back-Propagation - Regularization - Mixture Density and Bayesian Neural Networks - Kernel Methods - Dual Representations - Radial Basis Function Networks – Ensemble methods - Bagging – Boosting.

**Unsupervised Learning**

Clustering- K-means - EM - Mixtures of Gaussians - The EM Algorithm in General –Model Selection for Latent Variable Models - High-Dimensional Spaces -- The Curse of Dimensionality - Dimensionality Reduction - Factor Analysis - Principal Component Analysis - Probabilistic PCA Independent Components Analysis.

**References**


1. Ethem Alpaydin, “Introduction to Machine Learning”, 2nd Edition, PHI, 2010.
2. S Christopher Bishop, “Pattern Recognition and Machine Learning” Springer, 2006.
3. Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
4. Stephen Marsland, “Machine Learning - An Algorithmic Perspective”, CRC Press, 2009.
5. R.O.Duda, P.E.Hart and D.G.Stork, “Pattern Classification”, John Wiley, 2001.

| UITC018 | FINAL YEAR PROJECT - PHASE – II | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 6 | 6 |

**Course Objectives**

- To solve the identified problem based on the formulated methodology.
- To further develop students' skills to analyze and discuss the test results, and make conclusions.
- To enhance students skills pertaining to scientific and technical report writing and presentation.

**Course Content**

The student should continue the Final Year Project Phase I work on the selected topic as per the formulated methodology under the same supervisor. The progress of the project be evaluated based on the report as well as by conducting a minimum of three reviews by the project review committee. At the end of the semester, after completing the work to the satisfaction of the supervisor and review committee, a detailed report should be prepared and submitted to the head of the department. The students will be evaluated through based on the report and the viva-voce examination by a panel of examiners including one external examiner.

# PROFESSIONAL ELECTIVE - I

| UITE201 | PYTHON PROGRAMMING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To provide an insight on the basic concepts of python programming
- To obtain exposure on the syntactical representation used in python.
- To gain exposure on the data structures used in python.

**Course Content**

**Introduction to Python**

Types and Operations - Introducing Python Statements - Assignments, Expressions - Print Operations - if Tests - while and for Loops

**Numeric and Strings**

Numeric Type Basics - Numbers in Action - Other Numeric Types - Numeric Extensions - String Fundamentals - String Literals - Basic Operations - Indexing and Slicing - String Conversion Tools - String Methods - String Formatting Expressions - String Formatting Method Calls.

**Lists and Dictionaries**

Lists - Basic List Operations - Indexing, Slicing, and Matrixes - Changing Lists in Place - Basic Dictionary Operations - Changing Dictionaries in Place - More Dictionary Methods, Tuples.

**File and Text Operations**

The I/O Module - In-Memory Files - Compressed Files - The OS Module - File system Operations - Text Input and Output - Richer-Text I/O - Internationalization.

**Exceptions**

The try Statement – With statement and context Managers – Exception propagation – raise statement – Exception objects – Custom exception classes.

**References**


1. Dusty Phillips, Python 3 - Object-oriented Programming, 2nd Edition, Packt Publishing Ltd. 2015.
2. Mark Alex Martelli, Anna Ravenscroft and Steve Holden, Python in a Nutshell, 3rd Edition , O'Reilly publishing
3. Lutz, Learning Python, 5th Edition, O'Reilly publishing, 2013.
4. Vernon L. Ceder ," The Quick Python Book ", 2nd Edition, Manning Publications, Jan 2010.
5. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016.

| UITE202 | MOBILE COMPUTING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Learn the basics of mobile telecommunication system
- Identify solution for each functionality at each layer
- To understand the issues and solutions of issues related to mobile ad-hoc networks

**Course Content**

**Introduction**

Mobile Computing – Mobile Computing Vs wireless Networking – Mobile Computing Applications – Characteristics of Mobile computing – Mobile Computing Application. MAC Protocols – Wireless MAC Issues – Mobile Telecommunication systems: Global System for Mobile Communication (GSM) – General Packet Radio Service (GPRS) – Universal Mobile Telecommunication System (UMTS).

**Mobile Internet Protocol and Transport Layer**

Mobile IP – Features of Mobile IP – Key Mechanism in Mobile IP – route Optimization. Overview of TCP/IP – Architecture of TCP/IP- Adaptation of TCP Window – Improvement in TCP Performance.

**Mobile Ad-hoc Networks**

Ad-Hoc Basic Concepts – Characteristics – Applications – Design Issues – Routing – Essential of Traditional Routing Protocols –Popular Routing Protocols – Vehicular Ad Hoc networks (VANET) – MANET Vs VANET – Security.

**References**


1. Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning Pvt. Ltd, New Delhi - 2012.
2. Jochen H. Schller, “Mobile Communications”, 2nd Edition, Pearson Education, New Delhi, 2007.
3. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.

4. Raj Kamal, “Mobile Computing”, Oxford University Press, 2007. ISBN: 0195686772.
5. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.

| UITE203 | DISTRIBUTED SYSTEMS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Understand foundations of Distributed Systems
- Introduce the idea of peer to peer services and file system
- Understand in detail the system level and support required for distributed system
- Understand the issues involved in studying process and resource management.

**Course Content**

**Introduction and Communication in distributed system**

Introduction – Examples of Distributed Systems–Trends in Distributed Systems – Focus on resource sharing – Challenges. Case study: World Wide Web. System Model – Inter process Communication - the API for internet protocols – External data representation and Multicast communication. Remote Method Invocation and Objects: Remote Invocation – Introduction - Request-reply protocols - Remote procedure call - Remote method invocation. Case study: Java RMI - Group communication - Publish-subscribe systems - Message queues - Shared memory approaches - Distributed objects.

**Peer To Peer Services and File System**

Peer-to-peer Systems – Introduction - Napster and its legacy - Peer-to-peer – Middleware - Distributed File Systems –Introduction - File service architecture – Andrew File system. File System: Features-File model -File accessing models - File sharing semantics Naming: Identifiers, Addresses, Name Resolution.

**Process & Resource Management**

Process Management: Process Migration: Features, Mechanism - Threads: Models, Issues, Implementation. Resource Management: Introduction- Features of Scheduling Algorithms –Task Assignment Approach – Load Balancing Approach – Load Sharing Approach.

**References**

1. George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design", 5th Edition, Pearson Education, 2012.

2. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.
3. Tanenbaum A.S., Van Steen M., “Distributed Systems: Principles and Paradigms”, Pearson Education, 2007.
4. Liu M.L., “Distributed Computing, Principles and Applications”, Pearson Education, 2004.
5. Nancy A Lynch, “Distributed Algorithms”, Morgan Kaufman Publishers, USA, 2003.

| UITE204 | DIGITAL SIGNAL PROCESSING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To learn discrete Fourier transform and its properties.
- To know the characteristics of IIR and FIR filters learn the design of infinite and finite impulse response filters for filtering undesired signals.
- To understand finite word length effects.
- To study about a programmable digital signal processor & quantization effects.

**Course Content**

**Discrete Fourier Transform**

DFT– Properties of DFT-Efficient computation of the DFT– FFT Algorithms-Radix 2 DIT–FFT and DIF–FFT, use of DFT in linear filtering–filtering of long data sequences.

**Design of Infinite Impulse Response Filters**

Analog filters–Butterworth and Chebyshev Type I–Transformation of analog filters into digital filters using approximation of derivatives, Impulse invariant method and Bilinear transform method–prewarping–Realization structures for IIR filters–direct, cascade and parallel forms.

**Design of Finite Impulse Response Filters**

Linear phase response of FIR–Windowing techniques for design of linear phase FIR filters: Hamming–Hanning–Rectangular–FIR filter design using Frequency sampling method–Realization of FIR filters, Comparison of FIR and IIR filters.

**Finite Word Length Effects**

Quantization noise–quantization noise power–Binary fixed point and floating–point number representations–Comparison–truncation and rounding error–input quantization error–coefficient quantization error–limit cycle oscillations–dead band–overflow error–signal scaling.

**Digital Signal Processors**

Introduction – Architecture – Features – Addressing Formats – Functional modes - Introduction to Commercial Processors.

**References**


1. John G Proakis and Manolakis, “Digital Signal Processing Principles, Algorithms and Applications”, Pearson Education, 4th Edition, 2011.
2. A.V.Oppenheim, R.W. Schafer and J.R. Buck, “Discrete-Time Signal Processing”, Prentice Hall India, 3rd Edition, 2010.
3. Mitra S.K. “Digital Signal Processing - A Computer based approach”, Tata McGraw Hill, 2011.
4. Johnny R Johnson, “Introduction to Digital Signal Processing”, Prentice Hall India, 3rd Edition, 2010.
5. B. Venkataramani and M. Bhaskar, “Digital Signal Processors”, Tata McGraw Hill, 2010.

| UITE205 | COMPUTER GRAPHICS AND MULTIMEDIA | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course objectives**

- Learn the computational development of graphics as a mathematical derivation.
- Provide in-depth knowledge of display systems, image synthesis and modelling of 3D application.
- Learn the basic concepts related to multimedia including data standards, algorithms and software.

**Course Content**

**Basic Concepts**

Line drawing and circle drawing algorithms - 2D Transformations – Clipping – Window – View Plot Mapping – Graphical User Interfaces and Interactive Input Methods – Picture Construction Techniques – Virtual Reality Environment.

**3D Graphics**

3D Transformation – 3D Viewing – Visible Surface Detection – Back Face Detection – Depth Buffer Method – Scan Line Method.

**Multimedia Basics**

Introduction to Multimedia – Components – Hypermedia – Authoring – Authoring tools – File formats – Color models – Digital Audio representation – Transmission – Audio signal processing – Digital music making – MIDI – Digital video – Video compression techniques – Video performance measurements – Multimedia Databases – Animation – Key frames and tweening techniques – Principles of animation – Virtual reality – Multimedia for portable devices.

**Multimedia Communication**

Stream characteristics for Continuous media – Temporal Relationship – Object Stream Interactions - Media Synchronization – Models for Temporal Specifications – Streaming of Audio and Video – Recovering from packet loss – RTSP – Multimedia Communication Standards –RTP/RTCP – SIP and H.263- Real time streaming and On-demand streaming.

**Multimedia Application Development**

Design, Development and evaluation of multimedia a system - The development of user interface design - Design Process - Multimedia & the Internet - Multimedia conferencing - Multimedia file sharing – Multimedia broadcasting - Multimedia Development Issues - Multimedia project – Structured Multimedia development - Multimedia project timing - Sample project.

**References**


1. Donald Hearn and M. Pauline Baker, "Computer Graphics in C Version", 2nd Edition, Pearson Education.
2. Tom McReynolds – David Blythe " Advanced Graphics Programming Using OpenGL" , Elsevier, 2010
3. Parag Havaldar and Gerard Medioni, "Multimedia Systems-Algorithms, Standards and Industry Practices",Course Technology, Cengage Learning, 2010.
4. John F. Koegel Bufend , "Multimedia systems", Pearson Education, Delhi, 2002
5. Ralf Steinmetz and Klara "Multimedia Computing, Communications and Applications", Pearson Education, 2004.
6. Kurose and Ross, "Computer Networks : A top down Approach", Pearson Education, 2002
7. Ralf Steinmetz and Klara Nahrstedt "Multimedia Applications", Springer, 2007.

# PROFESSIONAL ELECTIVE - II

| UITE206 | ADVANCED JAVA PROGRAMMING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Provide a complete foundation to the students on the concepts, precepts and practices.
- To study the concepts of server side programming in java.
- To study the concepts of java database programming in the application.

**Course Content**

**Java Applets and Beans**

Applets and HTML – Bean Concepts – Events in Bean Box – Bean Customization and Persistence – JavaScript –Combining Scripts and Applets – Applets over web - Animation techniques – Animating images.

**Advanced Networking**

Client- Server computing – Sockets – Content and Protocols handlers – Developing distributed applications –RMI – Remote objects – Object serialization.

**Server Side Programming**

Introduction to Java Servlets – Overview and Architecture – Handling HTTP get & post request – Session Tracking – Multi-tier application - Implicit objects – Scripting – Standard actions – Directives – Custom Tag libraries.

**Java Database Programming**

Connecting to Databases – JDBC principles – Databases access – Interacting – Database search – Accessing Multimedia databases – Database support in Web applications.

**Related Java Techniques**

Media Techniques - 3D graphics – JAR file format and creation – Internationalization – Swing Programming – Advanced Java Scripting Technique.

**References**

1. Deital and Deital, Goldberg, “Internet & World Wide Web, How to Program”, 3rd Edition, Pearson Education, 2004.

2. Deitel M. and Deitel P.J., “Java how to program”,Prentice Hall, 8th Edition, 2009.
3. Duane A.Bailey, “Java Structures”, McGraw-Hill Publications, 2007.
4. Herbert Schildt, “Java The Complete Reference”,McGraw-Hill Publications,2011.
5. Cay.S.Horstmann,Gary Cornell, “ Core Java Volume –II Advanced Features”, Prentice Hall, 8th Edition, 2008.

| UITE207 | AD HOC AND SENSOR NETWORKS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Learn the issues and challenges in the design of wireless ad hoc networks.
- Understand the routing protocols deployed in ad-hoc and sensor networks.
- Learn the MAC protocols and the measurement of QoS parameters for ad hoc and sensor networks.

**Course Content**

**Introduction**

Fundamentals of Wireless Communication Technology - Radio Propagation Mechanisms - Characteristics of the Wireless Channel - mobile ad hoc networks (MANETs) and wireless sensor networks (WSNs): concepts and architectures. Applications of Ad Hoc and Sensor networks - Design Challenges in Ad hoc and Sensor Networks.

**Routing protocols and MAC protocols in ad hoc wireless networks**

Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols- Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms - proactive routing, reactive routing (on-demand), hybrid routing.

**Wireless Sensor Networks (WSNs)**

Single Node Architecture: Hardware and Software Components of a Sensor Node - WSN Network architecture: Typical network architectures - Data Relaying and Aggregation Strategies - QOS in WSN - Localization - Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks.

**References**


1. C. Siva Ram Murthy and B. S. Manoj, Ad Hoc Wireless Networks Architectures and Protocols, Prentice Hall, 1st Edition., 2004.
2. Holger Karl, Andreas Willig, Protocol and Architecture for Wireless Sensor Networks, Wiley-Interscience, 1st Ed., 2007.
3. Feng Zhao, Leonidas Guibas, Wireless Sensor Networks: an information processing approach, Morgan Kauffmann, 2014.

4. Waltenegus Dargie, Christian Poellabauer, “Fundamentals of Wireless Sensor Networks Theory and Practice”, John Wiley and Sons, 2010
5. Xiang-Yang Li , “Wireless Ad Hoc and Sensor Networks: Theory and Applications”, 1227 th edition, Cambridge university Press,2008.

| UITE208 | PHP AND MYSQL | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Study the basics of PHP syntax and constructs.
- Study the handling of cookies and session with PHP.
- Exposure towards database connectivity with MySQL.

**Course Content**

**Introduction to PHP, Decisions and loop**

Evaluation of PHP, Basic Syntax, Defining variable and constant, PHP Data type,

Operator and Expression. Making Decisions, Doing Repetitive task with looping, Mixing Decisions and looping with Html.

**Function, Strings and Arrays**

Function: Call by value and Call by reference, Recursive function. Creating and accessing, String Searching & Replacing String, Formatting String, String Related Library function. Anatomy of an Array, Creating index based and Associative array Accessing array, Element Looping with Index based array, Looping with associative array using each () and for each(), Some useful Library function.

**Handling Html Form with Php**

Capturing Form, Data Dealing with Multi-value filed, and Generating File uploaded form, redirecting a form after submission.

**Working with file and Directories**

Understanding file& directory, Opening and closing, a file, Coping, renaming and deleting a file, working with directories, Creating and deleting folder, File Uploading & Downloading.

**Session and Cookie**

Introduction to Session Control, Session Functionality, Setting Cookies with PHP. Using Cookies with Sessions, Deleting Cookies, Registering Session variables, Destroying the variables and Session.

**Database Connectivity with MySQL and Exception Handling**

Introduction to RDBMS, Connection with MySQL Database, Performing basic database operation (DML), setting queries parameter, Executing query-Join. Understanding Exception and error, Try, catch, throw. Error tracking and debugging.

**References**


1. Luke Welling, Thomson, "PHP and MySQL Web Development", Pearson Education, 5th Edition, 2016.
2. Steven Holzner, "The Complete Reference - PHP", Tata McGraw Hill, 2008.
3. Mike Mcgrath, "PHP & MySQL in easy Steps", Tata McGraw Hill, 2012.
4. Harvey & Paul Deitel & Associates, Harvey Deitel and Abbey Deitel, "Internet and World Wide. Web - How To Program", 5th Edition, Pearson Education, 2011.
5. Thomas A Powell, Fritz Schneider, "JavaScript: The Complete Reference", 3rd Edition, Tata McGraw Hill, 2013.
6. David Flanagan, "JavaScript: The Definitive Guide, 6th Edition", O'Reilly Media, 2011.

| UITE209 | DIGITAL IMAGE PROCESSING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To provide an insight of the key aspects, concepts and techniques in image processing.
- To study the features of various image enhancement, segmentation, compression and recognition methods.
- To impart knowledge on the boundary descriptors, regional descriptors and various texture patterns.

**Course Content**

**Digital Image Fundamentals**

Elements of Visual Perception – A Simple image model, Sampling and Quantization – Neighborhood of Pixels, Pixel Connectivity, Labeling of Connected Components – Distance Measures– Arithmetic and Logic Operations of images – Image Transformations – DFT, DCT - Introduction to colour image processing.

**Image Enhancement, Image Restoration and Segmentation**

Spatial Domain Methods– Frequency Domain Methods– Point processing, Intensity Transformations, Histogram Processing– Spatial filtering, Smoothing Filters, Sharpening Filters– Enhancement in the Frequency Domain, Low Pass Filtering, High Pass Filtering. A model of Image degradation/Restoration process- Mean Filters – Order Statistics filters-Band reject Filters – Band pass Filters. Segmentation: Detection of Discontinuities–Edge Linking and Boundary detection - Morphological processing– erosion and dilation.

**Image Compression and Image Representation**

Fundamentals of Compression– Image Compression Model– Error free Compression– Lossy and Lossless Predictive Coding, JPEG image compression standard. Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments –Boundary description – Shape number – Fourier Descriptor, moments– Regional Descriptors –Topological feature, Texture.

**References**

1. Rafael C. Gonzales and Richard E. Woods, “Digital Image Processing”, 3rd Edition, Pearson Education, 2010.

2. Anil K Jain. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.
3. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, 3rd Edition Tata McGraw Hill Pvt. Ltd., 2011.
4. Willliam K Pratt, “Digital Image Processing”, John Willey, 2010.
5. Malay K. Pakhira, “Digital Image Processing and Pattern Recognition”, 1st Edition, PHI Learning Pvt. Ltd., 2011.

| UITE210 | USER EXPERIENCE DESIGN | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Improve individual and collaborative skills in design problem solving.
- Develop an appreciation for concepts and sensibilities of user experience design
- Develop skills in the use and application of specific methods in user experience design.

**Course Content**

Rectangular Representation – Intersecting Code and Design - Components and Patterns - Divide and Conquer – Dividing Page – Design Hierarchy - Page Chunks – Sketching to Code – Varying Components – Variation through Pictures and Words.

Assembling Pages - Common Combos – Implementation – Disadvantages of Embedded Art Work – Dynamic Design - Reuse in Design Software – Linked Files - Unifying Design and Documentation – Need for Documentation – Components of Documentation - Turning Projects into Standards - Need for Library – Discovery Approaches – Scope of Library – Value - Component Catalog – Categories – Variations – Codes – Names – Keywords.

Tools – Templates – Styles – Conventions – Roles – Build Files - Pages and Elements – Packaging – Role of Librarian – Life of a Component - Updating the Library – Publishing - Inputs and Feedback - Documenting a Library - Standardizing Components – Planning – Pacing – Pilots - Live Training - Post-Launch Training Activities – Planning – Preparation - Design and Document – Development – Standardization.

**References**


1. Nathan Curtis, “Modular Web Design - Creating Reusable Components for User Experience Design”, Pearson Education, 2010, ISBN: 978-0321601353.
2. Richard Banfield, “Design Leadership”, O'Reilly, 2016, ISBN: 978-9352132935.
3. Buxton, B. Sketching “User Experiences: Getting the Design Right and the Right Design”. Morgan Kaufmann, (2007).

# PROFESSIONAL ELECTIVE - III

| UITE211 | ADVANCED WEB PROGRAMMING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Understand the design of single-page applications and how AngularJS facilitates their development
- Distinguish model, view, and controller layers of your application and implement them using AngularJS
- Gain exposure on application development using the Node.js Express framework

**Course Content**

**Introduction**

Node and node core API basics-Loading Modules, Using Buffers to Manipulate, Encode and Decode Binary Data.

**Working with Directives**

Introduction - Core Directives - Conditional Directives - Styles Directives - Mouse and Keyboard Events Directives.

**Controllers**

Understanding Controllers - Programming Controllers & scope object - Adding Behavior to a Scope Object - Passing Parameters to the Methods - Having Array as members in Controller Scope. Nested Controllers and Scope Inheritance. Multiple Controllers and their scopes.

**Filters**

Purpose of Filters - Built-In Filters - Uppercase and Lowercase Filters - Currency and Number Formatting Filters - Order By Filter - Creating Custom Filter.

**Forms**

Using Simple Form - Working with Select and Options - Input Validations - Using CSS classes - Form Events - Custom Model update triggers - Custom Validations.

**Services**

Understanding Services - Developing Creating Services - Using a Service - Injecting Dependencies in a Service.

**Ajax in Angular JS**

$http Service - $q Service - Ajax implementation using $http and $q Service. Routing: Introduction to SPA - Creating HTML Templates - Configuring Route Provider.

**References**


1. Mike Cantelon, Alex R. Young, Marc Harter, Nathan Rajlich, T. J. Holowaychuk, “Node.js in Action”, Manning Publications, 2017.
2. Pedro Teixeria, “Professional Node.js: Building Javascript Based Scalable Software”, John Wiley & Sons, 2016.
3. Fabian Cook, “Node.js Essentials”, Packet Publishing Ltd, 2015.
4. Basarat Ali Syed, “Beginning Node.js”, Apress publishing limited, 2015.
5. Caio Ribeiro Pereira, “Building APIs with Node.js”, Apress publishing limited, 2015.

| UITE212 | COMMUNICATION SWITCHING TECHNIQUES | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Learn switching, signalling and traffic in the context of telecommunication network.
- Exposure towards the evolution of switching systems from manual and electro mechanical systems to stored-program-controlled digital systems.
- Study signalling, packet switching and networks.

**Course Content**

**Multiplexing**

Transmission Systems - FDM - TDM - Line Coding - SONET/SDH: SONET Multiplexing Overview- SONET Frame Formats - SONET Operations - Administration and Maintenance - Payload Framing and Frequency Justification - Virtual Tributaries - DS3 Payload Mapping - E4 Payload Mapping - SONET Optical Standards - SONET Networks - SONET Rings: Unidirectional Path-Switched Ring - Bidirectional Line -Switched Ring.

**Digital Switching**

Switching Functions - Space Division Switching - Time Division Switching - Two - Dimensional Switching: STS Switching - TST Switching - No-4 ESS Toll Switch- Digital Cross - Connect Systems - Digital Switching in an Analog Environment- Elements of SSN07 signaling. Signal Exchanges-State Transition Diagrams- Stored Program Control.

**Network Synchronization Control and Management**

Timing: Timing Recovery: Phase - Locked Loop- Clock Instability - Jitter Measurements - Systematic Jitter -Timing Inaccuracies: Slips - Asynchronous Multiplexing - Network Synchronization - Network Control-Network Management.

**Digital Subscriber Access**

ISDN: ISDN Basic Rate Access Architecture - ISDN U Interface - ISDN D Channel Protocol - High - Data -Rate Digital Subscriber Loops: Asymmetric Digital Subscriber Line - VDSL - Digital Loop Carrier Systems: Universal Digital Loop Carrier Systems - Integrated Digital Loop Carrier Systems – Next Generation Digital Loop Carrier - Fiber in the Loop - Hybrid Fiber Coax Systems -

Voice band Modems: PCM Modems – Local Microwave Distribution Service - Digital Satellite Services.

**Networks**

Introduction-Analog Networks-Integrated Digital Networks-Integrated Services Digital Networks-Cellular Radio Networks-Intelligent Networks-Private Networks-Charging-Routing General-Automatic Alternative Routing.

**References**


1. Viswanathan.T., 'Telecommunication Switching System and Networks', Prentice Hall of India Ltd., 2015.
2. Flood J.E., Telecommunications switching traffic and networks', Pearson education Ltd, 2011.
3. John.C. Bellamy, 'Digital Telephony',John Wiley & Sons, 3rd edition, 2009.
4. Behrouz A. Forouzan, "Data Communications and Networking," TMH, 5th Edition, 2012.
5. William Stallings, "Data and Computer Communications", 10th Edition 2014.

| UITE213 | WEB ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Understand the requirements to develop web applications
- Exposed to Model web applications
- Be aware of Systematic methods
- Be familiar with the testing techniques for web applications

**Course Content**

**Introduction to Web Engineering and Requirements Engineering**

Motivation, Categories of Web Applications, Characteristics of Web Applications, Product-related Characteristics, Usage related Characteristics, Development-related Characteristic, Evolution of web engineering - Requirements Engineering Activities RE Specifics in Web Engineering, Principles for RE of Web Applications, Adapting RE Methods to Web Application Development, Requirement Types, Notations, Tools.

**Web Application Architectures & Modelling Web Applications**

Introduction- Categorizing Architectures, Specifics of Web Application Architectures, Components of a Generic Web Application Architecture, Layered Architectures, 2-Layer Architectures, N-Layer Architectures Data-aspect Architectures, Database-centric Architectures, Architectures for Web Document Management, Architectures for Multimedia Data Modeling Specifics in Web Engineering, Levels, Aspects, Phases Customization, Modeling Requirements, Hypertext Modeling, Hypertext Structure Modeling Concepts, Access Modeling Concepts, Relation to Content Modeling, Presentation Modeling, Relation to Hypertext Modeling, Customization Modeling, Relation to Content, Hypertext, and Presentation Modeling.

**Web Application Design**

Introduction, Web Design from an Evolutionary Perspective, Information Design, Software Design: A Programming Activity, Merging Information Design and Software Design, Problems and Restrictions in Integrated Web Design, A Proposed Structural Approach, Presentation Design, Presentation of Nodes and Meshes, Device-independent Development, Approaches, Inter action Design, User Interaction User Interface Organization, Navigation Design, Designing a Link

Representation, Designing Link Internals, Navigation and Orientation, Structured Dialog for Complex Activities, Interplay with Technology and Architecture, Functional Design.

**Testing Web Applications**

Introduction, Fundamentals, Terminology, Quality Characteristics, Test Objectives, Test Levels, Role of the Tester, Test Specifics in Web Engineering, Test Approaches, Conventional Approaches, Agile Approaches, Test Scheme, Three Test Dimensions, Applying the Scheme to Web Applications, Test Methods and Techniques, Link Testing, Browser Testing, Usability Testing, Load, Stress, and Continuous Testing, Testing Security, Test-driven Development, Test Automation, Benefits and Drawbacks of Automated Test, Test Tools.

**References**


1. Gerti Kappel, Birgit Proll, "Web Engineering", John Wiley and Sons Ltd, 2006.
2. Roger S. Pressman, David Lowe, "Web Engineering", Tata McGraw Hill Publication, 2007.
3. Guy W. Lecky-Thompson, "Web Programming", Cengage Learning, 2008.
4. Chris Bates, "Web Programming: Building Internet Applications", Third Edition, Wiley India Edition, 2007
5. John Paul Mueller, "Web Development with Microsoft Visual Studio 2005", Wiley Dream tech, 2006.

| UITE214 | PATTERN RECOGNITION | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Exposure to the concepts of supervised and unsupervised learning.
- Learn the essentials of feature extraction and structural pattern recognition
- Explore various classification models and learn about fuzzy pattern classifiers and perception.

**Course Content**

**Introduction**

Pattern Classifier: Overview of Pattern recognition – Discriminant functions – Supervised learning – Parametric estimation – Maximum Likelihood Estimation – Bayesian parameter Estimation – Problems with Bayes approach– Pattern classification by distance functions – Minimum distance pattern classifier.

**Clustering, Feature Extraction and Structural Pattern Recognition**

Clustering for unsupervised learning and classification – Clustering concept – C Means algorithm –Hierarchical clustering – Graph theoretic approach to pattern Clustering – Validity of Clusters. KL Transforms – Feature selection through functional approximation – Binary selection - Elements of formal grammars - Syntactic description - Stochastic grammars - Structural representation.

**Hidden Markov Models, Support Vector Machine and Fuzzy Logic**

State Machines – Hidden Markov Models – Training – Classification – Support vector Machine – Feature Selection. Fuzzy logic – Fuzzy Pattern Classifiers – Pattern Classification using Genetic Algorithms – Case Study Using Fuzzy Pattern Classifiers and Perception.

**References**


1. M. Narasimha Murthy and V.Susheela Devi, Pattern Recognition‖, Springer 2011.
2. S.Theodoridis and K.Koutroumbas, Pattern Recognition‖, 4th Edition., Academic Press,2009.
3. Robert J.Schalkoff, Pattern Recognition Statistical, Structural and Neural Approaches‖, John Wiley & Sons Inc., New York, 1992.

4. C.M.Bishop, Pattern Recognition and Machine Learning‖, Springer, 2006.
5. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification‖, John Wiley, 2001.

| UITE215 | MANAGEMENT INFORMATION SYSTEMS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To learn the various strategic views deployed in an enterprise.
- To learn how MIS could have an impact over a business sector.
- To design customised MIS for a specific business Sector.

**Course Content**

**Strategic View and Basics of MIS**

Management Information System in a Digital Firm - E-Business Enterprise: A Digital Firm-Strategic Management of Business Performance: Creating a Model of Organization Excellence-Threats and Management - Information Technology: Impact on Society. Decision-Making-Information, Knowledge, Business Intelligence - Systems Engineering: Analysis and Design, Development Process, Strategic Design of MIS - Business Intelligence for MIS.

**Applications of MIS**

Applications in Manufacturing Sector - Applications in Service Sector - Decision Support Systems and Knowledge Management - Management of Global Enterprise. Technology of Information Systems - Unified Communications and Networks –DBMS- Client Server and Service Oriented Architecture - Data Warehouse: Architecture to Implementation, E-Business Technology.

**Comprehensive Cases of MIS**

Management Information Systems in a Digital Firm - Techno-Cases in E-Enterprise Management - Case Digest of SCM , FS Square Infotech Ltd. (FSIT) - Home Land Groceries and Stores (HLGS).

**References**


1. W.S. Jawadekar, “Management Information Systems Text and Cases A Global Digital Enterprise Perspective”, 5th Edition, McGraw Hill Education (India) Pvt. Limited, 2013.
2. James A. O’ Brien, “Introduction to Information System”, 16th Edition, Tata McGraw Hill, 2012.
3. Gordon B Davis & Margrethe H Olson, “Management Information Systems Conceptual Foundations, Structure and Development”, 2nd Edition, Tata McGrawHill,2008.
4. Ken J. Sousa, Effy Oz,Management Information Systems ,Cengage Learning, 2015.

5. C. Laudon Kenneth, P. Laudon Jane , Management Information systems: Managing the Digital firm, Pearson Education , 2008.

# PROFESSIONAL ELECTIVE – IV

| UITE216 | PROGRAMMING WITH OPEN SOURCE SOFTWARE | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Be exposed to the context and operation of free and open source software (FOSS) communities and associated software projects.
- Learn scripting language like Python
- Learn some important FOSS tools

**Course Content**

**System Administration**

Linux,GNU and Freedom, Brief history of GNU, Licensing free software – GPL and copy Left, trends and potential – global and Indian, overview and usage of various Linux Distributions – userfriendliness perspective – scientific perspective- GNU and linux installation – Boot process, Commands Using bash features, The man pages, files and file systems, File security, Partitions, Processes, Managing processes, I/O redirection, Graphical environment, Installing software, Backup techniques.

**Foss Programming Practices**

GNU debugging tools, using source code versioning and managing tools, Review of common programming practices and guidelines for GNU/Linux and FOSS, Documentation.

**Programming Practices**

Application programming – Basics of X Windows server architecture – QT programming– GTK + Programming- Python programming – Open source equivalent of existing Commercial software- Linux for portable Devices, Creation of Bootable CD and USB from command line, Case Studies – Samba, Libre office, Assistive technology.

**References**


1. Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, Linux in a nutshell, Sixth edition, OReilly media, September 2009.
2. Philosophy of GNU URL: http://www.gnu.org/philosophy/
3. Introduction to Linux – A Hands on Guide, URL: http://tldp.org/guides.html

4. Fabrizio Romano, Learning Python: Learn to code like a professional with Python - an open source, versatile, and powerful programming language, Packt Publishing.

5. Mark Lutz, Learning Python, O'REILLY' 5th Edition.

| UITE217 | INTERNET OF THINGS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

## Course Objectives

- Understand the vision and introduction of Internet of Things.
- Gain exposure towards the IoT market perspective.
- Understand the IoT architecture reference model.

## Course Content

### M2M to IoT

The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics. M2M to IoT – A Market Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies.

### M2M to IoT

An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management.

### IoT Architecture

State of the Art – Introduction, State of the art, Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model. IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

**References**


1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1stEdition, VPT, 2014.
3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.
4. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015
5. Michael Margolis, "Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects", 2nd Edition, O'Reilly Media, 2011.

| UITE218 | ADVANCED DATABASE TECHNOLOGY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To learn the data models and to conceptualize a database system using ER diagrams.
- To know the concepts of parallel and distributed databases.
- To gain knowledge about the emerging database technologies.

**Course Content**

System Concepts File systems - Database systems - Database systems architecture - Data Database models - Relational model –Hierarchical model - Network model - Entity-Relationship model-Normalization and database design (1NF, 2NF, 3NF, BCNF. Parallel and Distributed Databases Parallel Databases: I/O parallelism – Inter and Intra query parallelism – Inter and Intra operation parallelism – Distributed database concepts - Distributed data storage – Distributed transactions – Commit protocols – Concurrency control – Distributed query processing-Three tier client-server architecture.

Object and Object Relational Databases Concepts for object databases: Object identity – Object structure – Type constructors – Encapsulation of operations – Methods – Persistence – Type and class hierarchies – Inheritance – Complex objects – Object database standards, languages and design: ODMG model – ODL – OQL – Object relational and extended – Relational systems, Object relational features in SQL / Oracle.

Enhanced Data Models Active database concepts and triggers – Temporal databases – Spatial databases – Multimedia databases – Deductive databases – XML databases: XML data model – DTD - XML schema - XML querying - Geographic information systems-Genome data management. Emerging Technologies Mobile Databases: Location and handoff management - Effect of mobility on data management – Location dependent data distribution - Mobile transaction models - Concurrency control - Transaction commit protocols – Information retrieval-Web databases.

**References**

1. R. Elmasri, and S. B. Navathe, Fundamentals of Database Systems. New Delhi: Pearson Education/Addison Wesley, 2011.

2. Henry F. Korth, Abraham Silberschatz, and S. Sudharshan, Database System Concepts. New Delhi: McGraw Hill, 2006.
3. Thomas Cannolly and Carolyn Begg, “Database Systems, A Practical Approach to Design, Implementation and Management”. New Delhi: Pearson Education, 2009.
4. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems. New Delhi: McGraw Hill, 2004.
5. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, 8th Edition, Pearson Education, 2006.

| UITE219 | SOFT COMPUTING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To understand the application of different neural network algorithms in real-time applications.
- To gain exposure on various soft computing techniques such as fuzzy logic and genetic algorithms.

**Course Content**

**Introduction**

Artificial neural network: Introduction, characteristics- learning methods – taxonomy – Evolution of neural networks- basic models – important technologies – applications. Fuzzy logic: Introduction – crisp sets- fuzzy sets – crisp relations and fuzzy relations: Cartesian product of relation – classical relation, fuzzy relations, tolerance and equivalence relations, non-iterative fuzzy sets. Genetic algorithm: Introduction – biological background – traditional optimization and search techniques – Genetic basic concepts.

**Neural Networks**

McCulloch-Pitts neuron – linear separability – hebb network – supervised learning network: perceptron networks – adaptive linear neuron, multiple adaptive linear neuron, BPN, RBF, TDNN-associative memory network: auto-associative memory network, hetero-associative memory network, BAM, hopfield networks, iterative autoassociative memory network & iterative associative memory network – unsupervised learning networks: Kohonenself organizing feature maps, LVQ – CP networks, ART network.

**Fuzzy Logic**

Membership functions: features, fuzzification, methods of membership value assignments-Defuzzification: lambda cuts – methods – fuzzy arithmetic and fuzzy measures: fuzzy arithmetic – extension principle – fuzzy measures – measures of fuzziness -fuzzy integrals – fuzzy rule base and approximate reasoning : truth values and tables, fuzzy propositions, formation of rules-decomposition of rules, aggregation of fuzzy rules, fuzzy reasoning-fuzzy inference systems-overview of fuzzy expert system-fuzzy decision making.

**Genetic Algorithm**

Genetic algorithm and search space – general genetic algorithm – operators – Generational cycle – stopping condition – constraints – classification genetic programming – multilevel optimization – real life problem- advances in GA.

**References**


1. S. Rajasekaran and G. A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications", Prentice-Hall of India Pvt. Ltd., 2006.
2. S. N. Sivanandam and S. N. Deepa, "Principles of Soft Computing", Wiley India Pvt. Ltd, 2011.
3. David E. Goldberg, "Genetic Algorithm in Search Optimization and Machine Learning" Pearson Education India, 2013.
4. George J. Klir, Ute St. Clair, Bo Yuan, "Fuzzy Set Theory: Foundations and Applications" Prentice Hall, 1997.
5. N.P.Padhy, S.P.Simon, "Soft Computing with MATLAB Programming", Oxford University Press, 2015.

| UITE220 | EMBEDDED SYSTEM DESIGN | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To understand the architecture of embedded systems
- Be familiar with the embedded computing platform design and analysis.
- Be exposed to the basic concepts of real time operating system.

**Course Content**

**Architecture of Embedded Systems**

Categories of Embedded Systems – Specifications of Embedded systems – Recent trends in Embedded Systems – Detailed Hardware and Software Design – ARM Processor – CPU: programming input and output - supervisor mode, exceptions and traps – Co-processors – Memory system mechanisms – CPU performance – CPU power consumption.

**Embedded Computing Platform Design**

The CPU Bus-Memory devices and systems – Designing with computing platforms – Host and target machines – consumer electronics architecture – platform-level performance analysis - Components for embedded programs – Models of programs – Assembly, linking and loading – compilation techniques – Program level performance analysis.

**Processes and Operating Systems**

Introduction – Multiple tasks and multiple processes – Multi rate systems – Preemptive real-time operating systems – Priority based scheduling – Inter process communication mechanisms – Semaphores and Shared Data – Message Queues – Mailboxes and Pipes – Interrupt Routines in RTOS Environment – Evaluating operating system performance – power optimization strategies for processes.

**Hardware/Software Integration & Programming**

Cross-Compilers – Cross-Assemblers – Linker/Locator – Debugger – Emulator – Simulators – Introduction to Integrated Development Environment (IDE) – Getting Embedded Software into Target System: In-Circuit Emulators – Debug Kernels: BDM and JTAG - Simple Programs using

IDE: I/O Port Programming, EEPROM Programming, Timer Programming, Programming ADC, Programming PWM Module, Serial Port Programming and Interrupts Programming.

**Embedded System Applications & IOT**

Applications of Embedded systems – Recent trends in embedded systems – Case study of Embedded systems like automatic chocolate vending machine, Adaptive Cruise Control Systems in a Car, Digital camera, Smart card and ATM – Embedded Sensors and Internet of Things (IoT) Systems: Integration of off-the-shelf sensors and embedded intelligence components to form data acquisition, monitoring and control of remote equipment and systems through wired and wireless networks.

**References**


1. Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design", 3rd Edition, Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.
2. Jonathan W.Valvano, "Embedded Microcomputer Systems Real Time Interfacing", 3rd Edition Cengage Learning, 2012.
3. Raj Kamal, "Embedded Systems Architecture Programming and Design", Pearson, 2011.
4. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", John Wiley and Sons, 2014.
5. Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands-on Approach", published by Arshdeep Bahga, Vijay Madisetti, 2014.

# PROFESSIONAL ELECTIVE – V

| UITE221 | SOFTWARE TESTING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To understand about test case design techniques
- To understand detail about various testing techniques and test management process.
- To understand test effort estimation and test documentation

**Course Content**

**Introduction**

Necessity of Testing – Objectives of Testing – Testing Principles – Fundamental Test Process – The Psychology of Testing - Software Development Models – Test Levels - Computer System Strategic Risks – Software Development Life Cycle Testing – Establishing a Testing Policy – Structured Approach to Testing- Test Factors – Developing Risk Matrix – Eleven Step Software Testing Process.

**Test Case Design**

Test Case Design – White Box Testing – Basis Path Testing – Control Structure Testing - Black Box Testing– Testing for Specialized Environments – Architectures and Applications – Testing Strategies – Verification and Validation – Unit Testing – Integration Testing – Validation Testing – System Testing – The Art of Debugging - Test Tools – Selecting and using the Test Tools.

**Test Management**

Test Management – Requirements Management – Planning Tests – Executing Tests - Managing Issues – Test Organization – Addressing Perception – Taking the Team Together – Focus on Technology, Process and Management Estimation Methods – Estimating Size and Effort – Function Point Analysis Technique – Test Point Analysis – Validating the Estimation Model – Documentation Uses – Types – Responsibility – Test Plan Documentation– Test Analysis Report Documentation.

**References**


1. Renu Rajani and Pradeep Oak, “Software Testing – Effective Methods, Tools and Techniques”, Tata McGraw Hill Publishing Company Limited, New Delhi, Reprint 2008.
2. Roger S Pressman, “Software Engineering – A Practitioner’s Approach”, Tata McGraw Hill International Edition, Singapore, 6th Edition, 2007.
3. Dorothy Graham, Erik Van Veenendaal, Isabel Evans and Rex Black, “Foundations of Software Testing – ISTQB Certification”, Thomson Learning, USA, 2007.
4. William Perry,”Effective Methods for Software Testing”, John Wiley & Sons, USA, 2nd Edition, 2000.
5. Aditya P. Mathur, ―Foundations of Software Testing _ Fundamental Algorithms and Techniques, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

| UITE222 | C# .NET FRAMEWORKS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Learn the basic programming concepts in C#.
- Study the advanced concepts in data connectivity, WPF, WCF and WWF with C# and .NET 4.5.
- Obtain knowledge on development of mobile applications using .Net compact framework

**Course Content**

**C# Language Basics**

.Net Architecture - Core C# - Variables - Data Types - Flow control - Objects and Types Classes and Structs - Inheritance- Generics - Arrays and Tuples - Operators and Casts - Indexers - Delegates - Lambdas - Lambda Expressions - Events - Event Publisher - Event Listener - Strings and Regular Expressions.

**Base Class Libraries and Data Manipulation**

Diagnostics -Tasks, Threads and Synchronization - .Net Security - Localization - Manipulating XML- SAX and DOM - Manipulating files and the Registry- Transactions - ADO.NET- Peer-to-Peer Networking - PNRP - Building P2P Applications - Windows Presentation Foundation (WPF).

**. Net Framework and Compact Framework**

Assemblies - Shared assemblies - Custom Hosting with CLR Objects - Appdomains - Core XAML - Bubbling and Tunneling Events- Reading and Writing XAML - .Net Compact Framework - Compact Edition Data Stores – Errors, Testing and Debugging – Optimizing performance – Packaging and Deployment – Networking and Mobile Devices.

**References**


1. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner .Professional C# 2012 and .NET 4.5‖, Wiley, 2012
2. Harsh Bhasin, Programming in C#‖, Oxford University Press, 2014.

3. Ian Gariffiths, Mathew Adams, Jesse Liberty, Programming C# 4.0‖, OReilly, Fourth Edition, 2010.
4. Andrew Troelsen, Pro C# 5.0 and the .NET 4.5 Framework, Apress publication, 2012.
5. Andy Wigley, Daniel Moth, Peter Foot, Mobile Development Handbook‖, Microsoft Press, 2011.

| UITE223 | NATURAL LANGUAGE PROCESSING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Learn the basics of language modelling.
- To obtain exposure towards analysis at various levels of a natural language.
- To understand the process involved in translation of natural languages.

**Course Content**

**Overview and Language Modeling**

Overview: Origins and challenges of NLP – Language and Grammar – Processing Indian Languages – NLP Applications – Information Retrieval. Language Modeling: Introduction – Various Grammar– based Language Models – Statistical Language Model.

**Word Level and Syntactic Analysis**

Word Level Analysis: Introduction – Regular Expressions – Finite State Automata – Morphological Parsing – Spelling Error Detection and correction – Words and Word classes – Part of Speech Tagging. Syntactic Analysis: Introduction – Context free Grammar – Constituency Parsing – Probabilistic Parsing.

**Semantic Analysis and Discourse Processing**

Semantic Analysis: Introduction – Meaning Representation – Lexical Semantics Ambiguity – Word Sense Disambiguation. Discourse Processing: Introduction – cohesion – Reference Resolution – Discourse Coherence and Structure.

**Natural Language Generation and Machine Translation**

Natural Language Generation: Introduction – Architecture of NLG Systems Generation Tasks and Representations – Application of NLG. Machine Translation: Introduction – Problems in Machine Translation – Characteristics of Indian Languages – Machine Translation Approaches – Translation involving Indian Languages.

**References**

1. Tanveer Siddiqui, U.S. Tiwary, “Natural Language Processing and Information Retrieval”, Oxford University Press, 2008.

2. James Allen, “Natural Language Understanding”, Pearson Education, New Delhi, 2003.
3. Daniel Jurafsky and James H Martin, “Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, Prentice Hall, 2nd Edition, 2008.
4. Ela Kumar, “Natural Language Processing”, I.K. International Publishing House Pvt. Ltd., New Delhi, 2011.
5. Akshar Bharati, Vineet Chaitanya and Rajeev Sangal, “Natural Laguage Processing A Paninian Perspective”, PHI Learning, 1996.

| UITE224 | UNIX INTERNALS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To understand UNIX architecture and familiarise with UNIX environment.
- Be able to know the basic internal structure, operations of UNIX OS and develop system programs using system calls.

**Course Content**

**Introduction to UNIX OS**

History - System structure – Introduction to the Kernel - Architecture System Concepts - Kernel Data Structures -Internal Representation of Files - System Calls.

**Buffers**

Buffers – Buffer header-Structure of buffer pool- Scenarios for retrieval of a buffer, reading and writing disk blocks- System representation – inodes – directories - super block. Implementation of Systems Calls- Open, read, write. File and record locking- Mounting and un mounting of files- Link, unlink, file abstractions, maintenance.

**UNIX Process Management**

The System Representation of Processes – States – Transitions - System Memory - Context of a Process - Saving the Context - Manipulation of a Process Address Space - Sleep Process Control – signals - Process Termination – Awaiting - Invoking other Programs - INIT Process - Process Scheduling - System Calls For Time – Clock.

**Drivers and IPC**

I/O Subsystem - Driver Interfaces - Disk Drivers - Terminal Drivers – Streams – Inter process Communication - Process Tracing - System V IPC - Network Communications – Sockets.

**References**


1. Maurice J. Bach, “Design of the Unix Operating System”, Pearson India, 2015.
2. Uresh Vahalia, “UNIX Internals: The New Frontiers”, Prentice Hall, 2010.

3. Steve D. Pate, “UNIX File systems: Evolution, Design, and Implementation”, John Wiley & Sons, 2013.
4. John Lion, “Lion’s Commentary on UNIX”, 6th edition, Peer-to-Peer Communications, 2004.
5. Daniel P. Bovet & Marco Cesati, “Understanding the Linux Kernel”, O’REILLY, Shroff Publishers &Distributors Pvt. Ltd, 2000.

| UITE225 | SOFTWARE DEFINED NETWORKS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To understand the background, development and challenges in SDN
- To understand the techniques to enable applications to control the underlying network using SDN

**Course Content**

**History and Evolution of Software Defined Networking**

The Evolution of Networking Technology - Forerunners of SDN - Software Defined Networking is Born- Sustaining SDN Interoperability - Open Source Contributions – evolution of SDN- Network Virtualization - SDN Working Principle: Overview - Fundamental Characteristics of SDN - SDN Operation - SDN Devices - SDN Controller - SDN Applications - Alternate SDN Methods.

**SDN in the Data Center**

SDN in the Data Center – Abstract - Data Center Definition – Demands - Tunneling Technologies - Path Technologies - Ethernet Fabrics - SDN Use Cases - Open SDN versus Overlays – Real World Data Center Implementations. **SDN in other Environments:** Consistent Policy Configuration - Global Network View - 8.1 Wide Area Networks - Service Provider and Carrier Networks - Campus Networks - Hospitality Networks- Mobile Networks - In-Line Network Functions - Optical Networks - SDN vs. P2P/Overlay Networks.

**Network Functions Virtualization**

Existing Network Virtualization Framework (VMWare and others) - Virtualization and Data Plane I/O- Services Engineered Path - Service Locations and Chaining - NFV at ETSI - Non-ETSI NFV Work - SDN Framework: Introduction - The Juniper SDN Framework -IETF SDN Framework(s) - Open Daylight Controller/Framework – Policy.

**References**

1. “SDN: Software Defined Networks, An Authoritative Review of Network Programmability Technologies”, By Thomas D. Nadeau, Ken Gray Publisher: O'Reilly Media, August 2013, ISBN: 978-1-4493-4230-2, ISBN 10: 1-4493-4230-2.

2. Paul Goransson and Chuck Black, - Software Defined Networks: A Comprehensive Approach, 1st Edition, Morgan Kaufmann, 2014.
3. "SDN and Open Flow for Beginners" by Vivek Tiwari, Sold by: Amazon Digital Services, Inc., ASIN: 2013.
4. "Network Innovation through Open Flow and SDN: Principles and Design", Edited by Fei Hu, CRC Press, ISBN-10: 1466572094, 2014.
5. Thomas D. Nadeau, Ken Gray, ―SDN: Software Defined Networks, O'Reilly Media, 2013.

# PROFESSIONAL ELECTIVE - VI

| UITE226 | GRAPH THEORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To understand fundamentals of graph theory.
- To study proof techniques related to various concepts in graphs.
- To explore modern applications of graph theory.

**Course Content**

**Introduction**

Introduction - Graph Terminologies - Types of Graphs - Sub Graph- Multi Graph - Regular Graph - Isomorphism - Isomorphic Graphs - Sub-graph - Euler graph - Hamiltonian Graph - Related Theorems.

**Trees**

Trees -Properties- Distance and Centres - Types - Rooted Tree - Tree Enumeration Labeled Tree - Unlabeled Tree - Spanning Tree - Fundamental Circuits- Cut Sets - Properties - Fundamental Circuit and Cut-set- Connectivity - Separability - Related Theorems.

**Graphs**

Graph Algorithms- Connectedness and Components- Spanning Tree- Fundamental Circuits- Cut Vertices- Directed Circuits- Shortest Path - Applications overview - Matrix Representation - Adjacency matrix- Incidence matrix- Circuit matrix - Cut-set matrix - Path Matrix- Properties - Related Theorems - Correlations. Graph Coloring - Chromatic Polynomial - Chromatic Partitioning - Matching - Covering - Related Theorems.

**References**


1. Narsingh Deo, "Graph Theory with Application to Engineering and Computer Science", Prentice-Hall of India Pvt.Ltd, 2003.
2. L.R.Foulds , "Graph Theory Applications", Springer ,2016.
3. Bondy, J. A. and Murty, U.S.R., "Graph Theory with Applications", North Holland Publication,2008.
4. West, D. B., Introduction to Graph Theory‖, Pearson Education,2011.
5. John Clark , Derek Allan Holton, A First Look at Graph Theory‖, World Scientific Publishing Company, 1991.

| UITE227 | INFORMATION TECHNOLOGY ESSENTIALS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Learn the concept of Internet, Networks and its working principles.
- Introduce scripting languages.
- Discuss various applications related to Information Technology

**Course Content**

**Web and Scripting Essentials**

Creating a Website - Working principle of a Website - Browser fundamentals - Authoring tools - Types of servers: Application Server - Web Server - Database Server. Need for Scripting languages - Types of scripting languages - Client side scripting - Server side scripting - PHP - Working principle of PHP - PHP Variables - Constants - Operators – Flow Control and Looping - Arrays - Strings - Functions - File Handling - PHP and MySQL - PHP and HTML - Cookies - Simple PHP scripts.

**Networking Essentials**

Fundamental computer network concepts - Types of computer networks - Network layers - TCP/IP model - Wireless Local Area Network - Ethernet - WiFi - Network Routing - Switching - Network components.

**Mobile Communication Essentials**

Cell phone working fundamentals - Cell phone frequencies & channels - Digital cell phone components - Generations of cellular networks - Cell phone network technologies / architecture - Voice calls & SMS.

**References**


1. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" 3rd Edition, O'REILLY, 2014.
2. James F. Kurose, “Computer Networking: A Top-Down Approach”, 6th Edition, Pearson, 2012.

3. Gottapu Sasibhushana Rao, "Mobile Cellular Communication", Pearson, 2012.
4. R. Kelly Rainer, Casey G. Cegielski , Brad Prince, “Introduction to Information Systems”, 5th Edition, Wiley Publication, 2014.
5. J.D.Gauchat,”HTML5 For Masterminds”, Revised 3rd Edition 2017.

| UITE228 | OPERATIONS RESEARCH | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Students will be well grounded in the mathematical, engineering, and modelling skills that are the basis for operations research, and they will be prepared to apply those skills to the efficient design, analysis, operation and control of complex systems.
- Solve problems in different environments that needs optimal decisions.

**Course Content**

Introduction to optimization-Linear Programming: Mathematical formulation- Graphic solution-Simplex method-Method of Penalties-Two Phase Method- Duality-Dual simplex method.

Transportation algorithm-Hungarian Assignment model-Travelling Salesmen Problem. Integer Programming: Cutting plan algorithm – Branch and bound Techniques-Inventory Models.

Network Model: Shortest route algorithm -Fulkerson's Rule- Critical path method – Program Evaluation and Review Techniques-Simulation-Applications of simulation to inventory.

**References**


1. H.A. Taha, "Operations Research", Pearson, 10th Edition, 2016.
2. Frederick S.Hiller, Gerald J Liberman "Operations Research", Mc graw hill education, 9th Edition, 2012
3. Ronald L.Rardin, "Optimization in Operations Research", Pearson Education, Asia, 2nd Edition 2016.
4. Wayne L.Winston "Operations Research", Thomson Learning, 4th Edition, 2003.
5. Kanti swarup, P.K Gupta and Manmohan, "Operations Research", S.Chand Delhi, 14th Edition, 2008.

| UITE229 | SOFTWARE PROJECT MANAGEMENT | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To gain exposure on the project planning for a software development process.
- To learn the cost estimation techniques during the analysis of the project.
- To understand the concepts of measuring the quality of a software

**Course Content**

**Software Project Management Concepts**

Introduction to Software Project Management: An Overview of Project Planning: Select Project, Identifying Project scope and objectives, infrastructure, project products and Characteristics. Estimate efforts, Identify activity risks, and Allocate resources.

**Software Evaluation and Costing**

Project Evaluation: Strategic Assessment, Technical Assessment, cost-benefit analysis, Cash flow forecasting, cost-benefit evaluation techniques, Risk Evaluation. Selection of Appropriate Project approach: Choosing technologies, choice of process models, structured methods.

**Software Estimation Techniques**

Software Effort Estimation: Problems with over and under estimations, Basis of software Estimation, Software estimation techniques, expert Judgment, Estimating by analogy. Activity Planning: Project schedules, projects and activities, sequencing and scheduling Activities, networks planning models, formulating a network model.

**Risk Management**

Risk Management: Nature of Risk, Managing Risk, Risk Identification and Analysis, Reducing the Risk. Resource Allocation: Scheduling resources, Critical Paths, Cost scheduling, Monitoring and Control: Creating Framework, cost monitoring, prioritizing monitoring.

**Software Quality Management**

TQM, Six Sigma, Software Quality: defining software quality, ISO9126, External Standards, Comparison of project management software's: dot Project, Launch pad, openProj.

**References**


1. Bob Hughes & Mike Cotterell, "Software Project Management", Tata McGraw- Hill Publications,5th Edition 2012.
2. S. A. Kelkar," Software Project Management" PHI, New Delhi, 3rd Edition ,2013.
3. Richard H.Thayer "Software Engineering Project Management,": IEEE Computer Society
4. Futrell , "Quality Software Project Management", Pearson Education India, 2008.
5. Gopalaswamy Ramesh, Managing Global Software Projects – McGraw Hill Education (India), 14th Reprint 2013.

| UITE230 | GAME PROGRAMMING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Able to understand the concepts of Game design and development.
- Able to explain the Core architectures of Game Programming.
- Able to gain knowledge about creating interactive Games using the Game programming platforms, frame works and engines.

**Course Content**

**3D Graphics for Game Programming**

3D Transformations, Quaternions, 3D Modeling and Rendering, Ray Tracing, Shader Models, Lighting, Color, Texturing, Camera and Projections, Culling and Clipping, Character Animation, Physics-based Simulation, Scene Graphs.

**Game Engine Design & Programming**

Game engine architecture, Engine support systems, Resources and File systems, Game loop and real-time simulation, Human Interface devices, Collision and rigid body dynamics, Game profiling. Application layer, Game logic, Game views, managing memory, controlling the main loop, loading and caching game data, User Interface management, Game event management.

**Gaming Platforms and Frameworks**

2D and 3D Game development using Flash, DirectX, Java, Python, Game engines – DX Studio, Unity- Game Development - Developing 2D and 3D interactive games using DirectX or Python – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi-Player games.

**References**


1. Mike Mc Shaffrfy and David Graham, “Game Coding Complete”, Fourth Edition, Cengage Learning, PTR, 2012.
2. Jason Gregory, “Game Engine Architecture”, CRC Press / A K Peters, 2009.

3. David H. Eberly, “3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics” 2nd Edition, Morgan Kaufmann, 2006.
4. Eric Lengyel, “Mathematics for 3D Game Programming and Computer Graphics”, 3rd Edition, Course Technology PTR, 2011.
5. Ernest Adams and Andrew Rollings, “Fundamentals of Game Design”, 2nd Edition Prentice Hall New Riders, 2009.

# GENERIC ELECTIVES OFFERED BY CIVIL ENGINEERING

| UCEG001 | ENVIRONMENTAL IMPACT ASSESSMENT | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To provides an overview of the concepts, methods, issues and various forms and stages of the EIA process.
- To learn and understand principles, process and necessary techniques for EIA, mitigation and monitoring.
- To expose the students to the methods of qualitative and quantitative assessment of environmental impacts due to developmental activities.

**Course Content**

Impact of Development projects on Environment and Environmental Impact Assessment (EIA) and Environmental Impact Statement (EIS) – Objectives – EIA Types – EIA in project cycle – capacity and limitations – Legal provisions on EIA – Environmental Impact Assessment Notifications – Environmental Impact Assessment Consultants – Legal provisions on EIA. Methods of Categorization of industries for EIA - Elements of EIA – Process screening, baseline studies, mitigation, matrices, checklist - Methods of EIA – Strengths, weaknesses and applicability – appropriate methodology solution. Prediction and Assessment of Impact on land, water, air, noise and energy, flora and fauna, Socio Economic Impact, Mathematical models for Impact prediction, Rapid EIA, Public participation – Post Environmental Audit.

Plan for mitigation of adverse impact on environment – options for mitigation of impact on water, air and land, water, energy, flora and fauna; Addressing the issues related to the Project Affected People – Environment management Plan – ISO 14000. EIA case studies for new and expansion projects - wastewater treatment plants, water supply and drainage, Highways and bridges, Railways, Dams, Irrigation projects, Power plants.

## References

1. Bram F. Noble, “Introduction to Environmental Impact Assessment: A Guide to Principles and Practice”, Oxford University Press; 3rd Edition, 2014

2. Canter, R.L., “Environmental Impact Assessment”, 2nd Edition, McGraw Hill Inc., New Delhi.
3. Anjaneyulu, Y, “Environmental Impact Assessment Methodologies”, B.S. Publications, Hyderabad, 2nd Edition, 2012.
4. S.K. Shukla and P.R. Srivastava, “Concepts in Environmental Impact Analysis”, Common Wealth Publishers, New Delhi, 1992.
5. John G. Rao and David C. Hooten (Ed.), “Environmental Impact Analysis Handbook”, McGraw Hill Book Company, 2010.

| UCEG002 | DISASTER MITIGATION AND MANAGEMENT | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To provide students an exposure to disasters, their significance and types.
- To distinguish between disaster management and risk management.
- To develop skills in various stages of disaster preparedness, mitigation and management.
- To explain selected models of disaster management and strategies for risk mitigation.
- To learn about organizational and administrative strategies for managing disasters.

**Course Content**

Natural Disasters around the world; Principles, Elements, and Systems; Natural disasters- Cyclones, Floods, Drought and Desertification - Earthquake, Tsunami, Landslides and Avalanche. Man -made disasters- Chemical industrial hazards, major power breakdowns, traffic accidents, Fire, War, Atom bombs, nuclear disaster, and Forest Fire-Oil fire –accident in Mines; disaster risk analysis - prevention and mitigation.

Applications of Space Technology (Satellite Communications, GPS, GIS and Remote Sensing and Information / Communication Technologies ( ICT ) in Early warning Systems ; Disaster Monitoring and Support Centre– Information Dissemination, mobile communication – etc. post disaster recovery & rehabilitation, Relief & Logistics Management; disaster related infrastructure development- Post Disaster, Emergency Support Functions and their coordination mechanism; Education and Training, Establishment of capacity building among various stake holders; Government - Educational institutions; Use of Multi-media knowledge products for self-education.

**References**


1. Mukesh Kapoor, “Disaster Management”, Dhanpat Rai, 2012.
2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012
3. Gupta Anil K, Sreeja S. Nair. “Environmental Knowledge for Disaster Risk Management”, NIDM, New Delhi, 2011
4. Claudia G. Flores Gonzáles , “Risk Management of Natural Disasters”, KIT Scientific Publishing, 2010.
5. Rajdeep Dasgupta, “Disaster Management and Rehabilitation”, Mittal Publishers, New Delhi, 2010.

| UCEG003 | GLOBAL WARMING AND CLIMATE CHANGES | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To understanding of the complex interrelationship of the physical, chemical and biological systems found in nature and the impact upon them of human activity.
- To provide an overview of contemporary changes to our global environment, current responses to environmental and social problems.
- To develop knowledge on the possibilities and challenges associated with transformative change processes.
- To understand the role of citizens, public land management agencies, and non-governmental organizations in protecting and conserving natural resources.

**Course Content**

Introduction –Sources and impact of resource degradation, social insecurity, industrialization and Globalization on environment, Global Environmental Problems. Changes in Lithosphere – Soil and agriculture, erosion, mining and pollution, urban pollution. Atmosphere - Global warming, Ozone layer depletion, Acid rains, desertification. Hydrosphere – Water use and pollution. Water abuse and control. Biosphere -Loss of Biodiversity, urbanization. Introduction to historical global climate change, Attribution of change, Perceptions of climate change. Projections of future climate - Introduction to climate models, Scenarios, Climate projections, Uncertainty. Impact of climate change - Observed impacts, Future climate impacts.

Adaptation to climate change - Terminology and history, Types of adaptation, Adaptation approaches, Adaptive capacity, Selecting and evaluating adaptation options, Opportunities limits, and constraints to adaptation, Indigenous knowledge and gender issues in adaptation, International and national adaptation strategies. Sustainable progress, Concept of sustainable development, Components of sustainability, carrying capacity, public participation, Energy generation and efficiency, conserving ecosystems and their services. Sector specific mitigation opportunities, Types of policy instruments, International climate change agreements.

**References**

1. Edmond Mathez, “Climate Change: The Science of Global Warming and Our Energy Future”, Columbia University Press, 1st Edition, 2009.

2. K. Jain, “A Practical Guide to Disaster Management”, 2013.
3. Henderson-Sellers, A. & K. McGuffie, “The future of the world’s climate”, Elsevier, 2012.
4. Intergovernmental Panel on Climate Change: The Third Assessment Report, Cambridge University Press, 2007.
5. Russell D. Thomson, “Atmospheric processes and systems”, Taylor and Francis, 2002.

| UCEG004 | GIS FOR NATURAL RESOURCES MANAGEMENT | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- The students will be introduced to the components of GIS, Data models and analysis.
- To comprehend the raster and vector data processing and eliminate errors of sources in GIS.
- To apply the GIS techniques for natural resources management, planning and mitigation.

**Course Content**

GIS - History of Development - Components of GIS – Hardware, Software and Organizational Context – Data – Spatial and Non-Spatial – Data Input Sources— DBMS – Data Output - Data models - Raster and Vector data structures – Data compression – Raster vs. vector comparison. Analysis using Raster and Vector data – Operations – Overlaying - Buffering – Modeling in GIS - Digital Terrain Modeling, Analysis and application – Products of DEMs and their uses – Sources of errors in GIS and their elimination.

Advanced applications of GIS in natural resource management; ecosystem inventory and monitoring - forests, wetlands; Water resource, Land use – Land cover – land use planning; urban planning, snow and glaciers, potential ground water mapping; coastal zone management, protected area management- Disaster management.

## References


1. Jenson, John R., "Remote Sensing of the environment: An earth resource perspective", 2nd Edition. Pearson Education, 2013.
2. Jones, Hamlyn G., and Robin A. Vaughan, "Remote Sensing of Vegetation: Principles, Techniques, and Applications" Oxford University Press, 2010.
3. Lo, Chor Pang, and Albert K. W. Yeung. "Concepts and Techniques of Geographic Information Systems", 2nd Edition. Pearson Education, 2016.
4. Awange, Joseph L., and John B. Kyalo Kiema, "Environmental Geoinformatics: Monitoring and Management", Springer, 2013.
5. Gomarasca, Mario A. "Basics of Geomatics", Springer, 2009.

| UCEG005 | PRINCIPLES OF REMOTE SENSING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To introduce to the students about the basic principles of remote sensing as a tool for mapping.
- To learn about the electromagnetic interactions with earth surface materials and their spectral signatures.
- To comprehend the satellite and sensor parameters.
- To employ digital image interpretation and analysis.

**Course Content**

Remote Sensing – History - Principle - Electro-magnetic energy, spectrum - EMR interaction with atmosphere – Atmospheric Windows and its Significance – EMR interaction with Earth Surface Materials – Spectral Signature. Aerial photography / aerial cameras / photographic process – Satellites - Classification – Satellite Sensors – satellite and sensor parameters - Resolution – Types of Remote Sensing - Elements of visual interpretation – Image data interpretation and Analysis – Photogrammetric process / softcopy photogrammetry – Digital Image processing. Characteristics of different platforms: Landsat, SPOT, IRS series, IKONOS, QUICKBIRD – Radar, LIDAR, SAR, MODIS, AMSRE, Sonar remote sensing systems. Applications - Remote sensing of vegetation – Remote sensing of Water resources – Remote sensing of urban landscapes – Remote sensing of soils and geomorphology.

**References**


1. Lillesand, Kiefer, and Chipman., Remote Sensing and Image Interpretation. 7th (Student) Edition. Wiley, 2014.
2. Jenson, John R., "Remote Sensing of the environment: An earth resource perspective" 2nd Edition, Pearson Education, 2013.
3. Jones, Hamlyn G., and Robin A., Vaughan, "Remote Sensing of Vegetation: Principles, Techniques, and Applications", Oxford University Press, 2010.
4. Richards, John A., "Remote Sensing Digital Image Analysis: An Introduction", 5th Edition. Springer, 2012.
5. Anji Reddy M, "Remote Sensing and Geographical Information System", 4th Edition, B S Publications, 2012.

# GENERIC ELECTIVES OFFERED BY COMPUTER SCIENCE AND ENGINEERING

| UCSG001 | FUNDAMENTALS OF INFORMATION SECURITY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To understand the basics of Information Security
- To know the legal, ethical and professional issues in Information Security
- To analyse the aspects of risk management
- To become aware of various standards in this area
- To know the technological aspects of Information Security

**Course Content**

History, What is Information Security?, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC

**Security Investigation**

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues

**Security Analysis**

Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk

**Logical Design**

Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture

**Physical Design**

Security Technology, IDS, Scanning and Analysis Tools, Cryptography – Protocols for secure communications, Physical Security, Security and Personnel.

**References**

1. Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, Vikas Publishing House, New Delhi, 2003.
2. Micki Krause, Harold F. Tipton, “ Handbook of Information Security Management”,

Vol 1-3 CRC Press LLC, 2004.

3. Stuart Mc Clure, Joel Scrambray, George Kurtz, “Hacking Exposed”, Tata McGraw-Hill, 2003.
4. Matt Bishop, “Computer Security Art and Science”, Pearson/PHI, 2002.
5. Mark Stamp, “Information Security: Principles and Practice”, Wiley-Blackwell, 2nd edition, 2011.

| UCSG002 | INTRODUCTION TO COMPUTER NETWORKS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Understand the division of network functionalities into layers
- Be familiar with the components required to build different types of networks
- Be exposed to the required functionality at each layer
- Learn the flow control and congestion control algorithms.

**Course Content**

**Fundamentals & Link Layer**

Building a network – Requirements - Layering and protocols - Internet Architecture – Network software – Performance ; Link layer Services - Framing - Error Detection - Flow control.

**Media Access & Internetworking**

Media access control - Ethernet (802.3) - Wireless LANs – 802.11 – Basic Internetworking (IP, CIDR, ARP, DHCP, ICMP).

**Routing**

Routing (RIP, OSPF, metrics) – Switch basics – Global Internet (Areas, BGP, IPv6), Multicast – addresses – multicast routing (DVMRP, PIM).

**Transport Layer**

Overview of Transport layer - UDP - Reliable byte stream (TCP) - Connection management - Flow control - Retransmission – TCP Congestion control - Congestion avoidance (DECbit, RED).

**Application Layer**

Traditional applications -Electronic Mail (SMTP, POP3, IMAP, MIME) – Web Services – DNS – SNMP.

**References**

1. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, 5th Edition, Morgan Kaufmann Publishers, 2011.

2. James F. Kurose, Keith W. Ross, “Computer Networking - A Top-Down Approach Featuring the Internet”, 5th Edition, Pearson Education, 2009.
3. Nader. F. Mir, “Computer and Communication Networks”, Pearson Prentice Hall Publishers, 2010.
4. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, “Computer Networks: An Open Source Approach”, Mc Graw Hill Publisher, 2011.
5. Behrouz A. Forouzan, “Data communication and Networking”, Fourth Edition, Tata McGraw – Hill, 2011.

| UCSG003 | INTRODUCTION TO SOFTWARE ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To be successful professionals in the field with solid fundamental knowledge of software engineering
- To utilize and exhibit strong communication and interpersonal skills, as well as professional and ethical principles when functioning as members and leaders of multi-disciplinary teams
- To apply the foundations in software engineering to adapt to readily changing environments using the appropriate theory, principles and processes

**Course Content**

**Requirements Analysis and Specification**

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.

**Software Design**

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.

**Testing and Maintenance**

Software testing fundamentals-Internal and external views of Testing–Types of testing - System testing and debugging –Software Implementation Techniques: Coding practices-Refactoring-Maintenance and Re-engineering-BPR model.

**References**


1. Roger S Pressman, "Software Engineering – A Practitioner's approach", 7th Edition, McGraw-Hill International edition, 2010.
2. Ian Somerville, "Software Engineering", 9th Edition, Pearson Education Asia, 2011.
3. Rajib Mall, "Fundamentals of Software Engineering", 3rd Edition, PHI Learning Private

Limited, 2009.

4. Pankaj Jalote, “Software Engineering”, A Precise Approach, Wiley India, 2010.
5. James F Peters, Witold Pedrycz, “Software Engineering an Engineering Approach”, John Wiley, Dec 1999.

| UCSG004 | PYTHON PROGRAMMING FOR ENGINEERS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To know the basics of algorithmic problem solving, read and write simple Python programs.
- To develop Python programs with Python data structures –- lists, tuples, dictionaries.

**Course Content**

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments.

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays.

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing – list comprehension.

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages.

**References**

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist'', 2nd Edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016.

2. Guido van Rossum and Fred L. Drake Jr, “An Introduction to Python – Revised and updated for Python 3.2”, Network Theory Ltd., 2011.
3. Charles Dierbach, “Introduction to Computer Science using Python: A Computational Problem-Solving Focus”, Wiley India Edition, 2013.
4. John V Guttag, “Introduction to Computation and Programming Using Python’’, Revised and expanded Edition, MIT Press , 2013
5. Kenneth A. Lambert, “Fundamentals of Python: First Programs”, CENGAGE Learning, 2012.

| UCSG005 | SOFT COMPUTING AND ITS APPLICATIONS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- Introduce a relatively new computing paradigm for creating intelligent machines useful for solving complex real world problems.
- Insight into the tools that make up the soft computing technique: fuzzy logic, artificial neural networks and hybrid systems Techniques.

**Course Content**

Introduction to Soft Computing, Introduction to Fuzzy logic, Fuzzy membership functions, Operations on Fuzzy sets Fuzzy relations, Fuzzy propositions, Fuzzy implications Fuzzy inferences Defuzzyfication Techniques-I, Defuzzyfication Techniques-II, Fuzzy logic controller-I, Fuzzy logic controller-II Solving optimization problems, Concept of GA, GA Operators: Encoding, GA Operators: Selection-I

GA Operators: Selection-II, GA Operators: Crossover-I, GA Operators: Crossover-II, GA Operators: Mutation Introduction to EC-I, Introduction to EC-II. MOEA Approaches: Non - Pareto, MOEA Approaches: Pareto – I MOEA Approaches: Pareto - II, Introduction to ANN, ANN Architecture and ANN Training-I, ANN Training-II, ANN Training-III, Applications of ANN.

**References**


1. S.Rajasekaran and G.A.Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications”, Prentice-Hall of India Pvt. Ltd., 2006.
2. George J. Klir, Ute St. Clair, Bo Yuan, “Fuzzy Set Theory: Foundations and Applications” Prentice Hall, 1997.
3. David E. Goldberg, “Genetic Algorithm in Search Optimization and Machine Learning” Pearson Education India, 2013.
4. James A. Freeman, David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques, Pearson Education India, 1991.
5. Simon Haykin, “Neural Networks Comprehensive Foundation” 2nd Edition, Pearson Education, 2005.

# GENERIC ELECTIVES OFFERED BY ELECTRICAL AND ELECTRONICS ENGINEERING

| UEEG001 | ENERGY MANAGEMENT SYSTEMS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To train the students for energy auditing and managing the energy demand by analyzing the energy issues and concern.

**Course Content**

Introduction to Energy Management, Buildings assessment, Electrical Systems-Supply Demand Side-Economic operation.

Electric motors-Energy efficient controls and Load Analysis, Efficient Control strategies-Optimal operation, Transformer Loading- Efficiency analysis, Feeder and cable loss evaluation, Optimal Load scheduling, Energy conservation in Lighting Schemes, Power quality issues. Cogeneration-Types and Schemes, Electric loads of Air conditioning & Refrigeration, case studies.

Electricity tariff types; Computer Controls- software-EMS- Energy conservation opportunities in electrical power supply sector.

**References**


1. Leon K. Kirchmayer, “Economic Operation of power system”, Wiley India Pvt Ltd, July 2010.
2. Jean-Claude SabonnadiAre, “Low emission power generation technologies and energy management”, John Wiley & Sons, August 2010
3. Rik DeGunther, “Alternative energy for dummies”, John Wiley & Sons, May 2010.
4. Donald R Wulfinghoff, “Energy Efficiency Manual”, Energy Institute Press, USA, 1999.
5. Tripathy S C, “Electrical Energy Utilization and Conservation”, Tata McGraw-Hill, New Delhi, 1991.

| UEEG002 | MEDICAL INSTRUMENTATION | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To impart knowledge on operation of instruments used for various physiological measurements and the blood flow measurement techniques.

**Course Content**

Components of Medical Instrumentation; System Origin of Bio potential; Bio amplifiers: Isolation Amplifier, Differential amplifier, Chopper Amplifier, Instrumentation Amplifier, Bioelectric signals:ECG, EMG,EEG, EOG & ERG and their characteristics; Electrodes for ECG, EEG and EMG; Einthoven triangle; Standard 12-lead configurations; ECG Machine; EMG machine; 10-20 electrodes placement system for EEG; Heart sound and characteristics; PCG.

Measurement of Blood pressure: Direct Methods and Indirect Methods; Temperature; Respiration rate; Heart rate measurement; Oximetry: Pulse-oximeter; Computerized patient monitoring system; Biotelemetry: Basics components, and its different types; Cardiac output Measuring techniques: Dye Dilution method, Thermo dilution Method.

Blood flow measuring techniques: Electromagnetic Type; Ultrasound Blood Flow meter; Cardiac Arrhythmias; Plethysmography; Cardiac Pacemakers; Defibrillator: AC and DC-types; Heart-Lung Machine; Optical method: Colorimeter, Spectro photometer, Flame photometer; Safety in medical field: Electrical hazard, Micro and Macro shock; Patient safety procedures.

**References**


1. Joseph J.Carr and John M. Brown, “Introduction to Biomedical Equipment Technology”, John Wileyand sons, New York, 4th Edition, 2012.
2. Khandpur.R.S, “Hand book of Bio-Medical Instrumentation”, Tate McGraw –Hill 2015.
3. Duane Knudson, “Fundamentals of Biomechanics”, Springer, 2013.
4. Robert B. Northrop, “Introduction to Instrumentation and Measurements”, Taylor and Francis group, New York, 3rd Edition, 2014.
5. John G. Webster, “Medical Instrumentation Application and Design”, John Wiley and sons, New York, 2010.

| UEEG003 | PLC PROGRAMMING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To understand Programmable Logic Controller and its functions.
- To impart knowledge in various PLC programming methods.

**Course Content**

Programmable Logic controller-Brief history, difference between PC & PLC, architecture, benefits, PLC cycle Application.

Overview of PLC programming methods, ladder diagram, various examples of PLC application, a basic relay type instruction, timer and counter instructions, logical and arithmetic instructions, data handling instructions. Comparison and manipulation instructions, PID instructions, PTO / PWM generation.

Applications of PLC- Case studies of Machine automation, Process automation, Selection parameters for PLC. Introduction to Programmable Automation Controller.

**References**


1. John W Webb, Ronald A Reis, “Programmable logic controllers: Principles and Applications”, Prentice Hall India, 2003.
2. Frank D Petruzella, “Programmable Logic Controllers ", McGraw Hill Inc, 2005.
3. Kelvin T Erikson, “Programmable Logic Controllers”, Dogwood Valley Press, 2005.
4. Garry Duning, “Introduction to Programmable Logic Controller”, Cengage Learning, 3rd Edition, 2006.
5. W. Bolten, “Programmable Logic Controller”, Elsevier Newnes Publication, 5th Edition, 2009.

| UEEG004 | RENEWABLE ENERGY SYSTEMS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To provide knowledge about various renewable energy technologies.
- To gain knowledge about application of various renewable energy technologies.

**Course Content**

Primary energy sources, renewable vs. non-renewable primary energy sources, renewable energy resources in India, Current usage of renewable energy sources in India, future potential of renewable energy in power production and development of renewable energy technologies.

Solar and wind Power Generation, Energy from Biomass Bio gas generation, types of biogas plants, Application of biomass and biogas plants and their economics.

Energy conversion from Hydrogen and Fuel cells, Geo thermal energy Resources, types of wells, methods of harnessing the energy, potential in India. OTEC, Principles utilization, setting of OTEC plants. Tidal and wave energy: Potential and conversion techniques, mini hydal power plants and their economics.

**References**


1. John Twidell and Tony Weir, "Renewable Energy Resources" Tyalor and Francis Publications, 2005.
2. Clark W Gellings, "The Smart Grid, Enabling Energy Efficiency and Demand Side Response", CRC Press, 2009.
3. Krzysztof Iniewski, "Smart Grid & Infrastructure networking", TATA Mc Graw Hill, 2012 2nd Edition.
4. Bin Wu, Yongqiang Lang, Navid Zargari, Power Conversion and Control of Wind Energy Systems. WILEY 2011.
5. J. W. Tester, E. M. Drake, M. W. Golay, M. J. Driscoll, and W. A. Peters, Sustainable Energy: Choosing Among Options. The MIT Press, ISBN 978-0-262-20153-7.

| UEEG005 | VIRTUAL INSTRUMENTATION & DATA ACQUISITION | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To impart the knowledge about software and the programming structure of LabView.
- To introduce various techniques of interfacing of external instruments of PC.

**Course Content**

Virtual Instrumentation: Historical perspective, advantages, block diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, and comparison with conventional programming; VI programming techniques: VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Instrument Drivers.

Data acquisition basics: Introduction to data acquisition, Sampling fundamentals andInput/Output techniques: ADC, DAC, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements, VI Chassis requirements;Common Instrument Interfaces: Current loop, RS 232C/ RS485, GPIB; Bus Interfaces: USB, PCMCIA, VXI, SCSI, PCI, PXI, PXI system controllers, Ethernet control of PXI.

Analysis tools & Applications of VI: Fourier transforms, Power spectrum, Correlation methods, Windowing and flittering; Industrial applications: Instrument Control, Simulation of systems using VI, Development of Control system, Image acquisition and processing, Motion control.

**References**


1. Jane W. S. Liu," Real-time Systems", Pearson Education, 2001.
2. Jovitha Jerome, "Virtual Instrumentation using LabVIEW", Prentice Hall of India, New Delhi, 2011.
3. Gary Johnson, "LabVIEW Graphical Programming", McGraw Hill, 1997.
4. Kevin James, "PC Interfacing and Data Acquisition: Techniques for Measurement", Instrumentation and Control, Newnes, 2000.
5. Gupta S and Gupta J P, "PC Interfacing for data acquisition and Process control", Instrument Society of America.

# GENERIC ELECTIVES OFFERED BY ELECTRONICS AND COMMUNICATION ENGINEERING

| UECG001 | ELECTRONIC MEASUREMENTS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To impart knowledge on the functional elements of instrumentation.
- To learn the fundamentals of electrical and electronic instruments.
- To understand the operation of transducers, data acquisition systems, storage and display devices.

**Course Content**

**Electronics Instruments**

Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement — Standards and calibration – Principle and types of analog and digital voltmeters, ammeters, multimeters – Single and three phase wattmeters and energy meters – Magnetic measurements – Determination of B-H curve and measurements of iron loss.

**Measuring Instruments**

D.C & A.C potentiometers, D.C & A.C bridges, transformer ratio bridges, self-balancing bridges. Interference & screening – Multiple earth and earth loops - Electrostatic and electromagnetic interference – Grounding techniques.

**Storage and display Devices**

Magnetic disk and tape – Recorders, digital plotters and printers, CRT display, digital CRO, LED, LCD & dot matrix display – Data Loggers.

**Transducers and Data Acquisition Systems**

Classification of transducers – Selection of transducers – Resistive, capacitive & inductive transducers – Piezoelectric, Hall effect, optical and digital transducers – Elements of data acquisition system – A/D, D/A converters – Smart sensors.

**References**


1. A.K. Sawhney, “A Course in Electrical & Electronic Measurements & Instrumentation”, Dhanpat Rai and Co, 2004.
2. J. B. Gupta, “A Course in Electronic and Electrical Measurements”, S. K. Kataria & Sons, Delhi, 2003.

3. J Doebelin E.O. and Manik D.N., “Measurement Systems – Applications and Design”, Special Indian Edition, Tata McGraw Hill Education Pvt. Ltd., 2007.
4. H.S. Kalsi, “Electronic Instrumentation”, Tata McGraw Hill, 2nd Edition 2004.
5. D.V.S. Moorthy, “Transducers and Instrumentation”, Prentice Hall of India Pvt Ltd, 2007.

| UECG002 | INTRODUCTION TO EMBEDDED SYSTEMS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To understand the architecture and programming concepts of embedded systems.
- To impart the knowledge on embedded computing platform design and analysis.
- To learn the basic concepts of real time operating systems and embedded system applications.

**Course Content**

**Architecture of Embedded Systems**

Categories of Embedded Systems – Specifications of Embedded systems – Recent trends in Embedded Systems – Detailed Hardware and Software Design – ARM Processor – CPU: programming input and output - supervisor mode, exceptions and traps – Co-processors – Memory system mechanisms – CPU performance – CPU power consumption.

**Embedded Computing Platform Design**

The CPU Bus-Memory devices and systems – Designing with computing platforms – Host and target machines – consumer electronics architecture – platform-level performance analysis - Components for embedded programs – Models of programs – Assembly, linking and loading – compilation techniques – Program level performance analysis

**Processes and Operating Systems**

Introduction – Multiple tasks and multiple processes – Multi rate systems – Preemptive real-time operating systems – Priority based scheduling – Inter process communication mechanisms – Semaphores and Shared Data – Message Queues – Mailboxes and Pipes – Interrupt Routines in RTOS Environment – Evaluating operating system performance – power optimization strategies for processes.

**Hardware/Software Integration & Programming**

Cross-Compilers – Cross-Assemblers – Linker/Locator – Debugger – Emulator – Simulators – Introduction to Integrated Development Environment (IDE) – Getting Embedded Software into Target System: In-Circuit Emulators –Serial Port Programming and Interrupts Programming.

**Embedded System Applications**

Applications of Embedded systems – Case study of Embedded systems like automatic chocolate vending machine, Adaptive Cruise Control Systems in a Car, Digital camera, Smart card and ATM.

**References**


1. Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design", 3rd Edition, Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.
2. Jonathan W. Valvano, "Embedded Microcomputer Systems Real Time Interfacing", 3rd Edition Cengage Learning, 2012.
3. Raj Kamal, "Embedded Systems Architecture Programming and Design", Pearson, 2011.
4. K.V.K.K.Prasad "Embedded /Real-Time Systems: Concepts, Design and Programming" Dream tech, Wiley 2012.
5. Daniel 5.W Lewis, "Fundamentals of Embedded Software" Pearson Education, 2013.

| UECG003 | MICROCONTROLLERS AND ITS APPLICATIONS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To understand the architecture and programming of 8051 and PIC microcontrollers.
- To familiarize with the concept of interfacing the microcontrollers for various applications.

**Course Content**

**8051 Microcontroller**

Architecture of 8051 – Register set - I/O Pins, Ports and Circuits - Instruction set - Addressing modes - Assembly language programs for arithmetic and Logical operations.

**Interfacing 8051 Microcontroller**

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - Stepper Motor Interfacing – Application of 8051 in power optimization- Power and real-world constraints.

**PIC Microcontroller**

CPU Architecture – Register – I/O pins, Ports -Instruction set – addressing modes - Interrupts

**Interfacing PIC Microcontroller**

PIC: Timers- I2C Interfacing –UART- A/D Converter –Pulse Width Modulation.

**References**


1. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", 2nd Edition, Pearson Education, 2011
2. Subrata Ghoshal, "8051 Microcontrollers: Internals, Instructions, Programming &Interfacing", 2nd Edition, Pearson education, 2014.
3. John. B. Peatman, "Design with PIC Microcontroller", Prentice Hall, 2011.
4. Gene .H.Miller, "Micro Computer Engineering", Pearson Education, 2013.
5. Subrata Ghoshal, "8051 Microcontrollers: Internals, Instructions, Programming &Interfacing", 2nd Edition, Pearson education, 2014.

| UECG004 | NANO ELECTRONICS AND SENSORS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To learn the basics of Nano electronics.
- To learn characteristics and operation of the basic components of Nano electronic systems.
- To familiarize with characteristics of Sensors, Actuators and Memory Devices.

**Course Content**

**Overview of Nano-Electronics**

Nano-scale electronics; Foundation of nano-electronics – low dimension transport, quantum confinement, Coulomb blockade and quantum dot; Ballistic transport and Quantum interferences; Landauer formula, quantization of conductance, example of Quantum point contact.

**Two-Terminal Junction Transistors**

Basic CMOS process flow; MOS scaling theory; Issues in scaling MOS transistors; Requirements for non-classical MOS transistor; PMOS versus NMOS; Design and construction of MOS capacitor; Integration issues of high-k MOS – interface states, bulk charge, band offset, stability, reliability; MOS transistor and capacitor characteristics.

**Gate Transistors**

Metal gate transistors – motivation, basics and requirements; quantum transport in nano MOSFET; Ultrathin body silicon on insulator (SOI) – double gate transistors; Vertical transistors – FinFET and surround gate FET; compound semiconductor MOSFET – Hetero-structures MOSFET.

**Sensors and Actuator Characteristics**

Basics: types and working principles of sensors and actuators; Characteristic features: Range, Resolution, Sensitivity, Error, Repeatability, Linearity and Accuracy, Impedance, Nonlinearities, Static and Coulomb Friction, Eccentricity, Backlash, Saturation, Dead-band, System Response, First Order System Response, Under-damped Second Order System Response, Frequency Response.

**Memory Devices and Sensors**

Nano ferroelectrics – Ferroelectric random access memory –Fe-RAM circuit design – ferroelectric thin film properties and integration – calorimetric -sensors – electrochemical cells – surface and bulk acoustic devices – gas sensitive FETs – resistive semiconductor gas sensors – electronic noses – identification of hazardous solvents and gases – semiconductor sensor array.

**References**


1. W. Ranier, “Nano Electronics and Information Technology”, Wiley, 2003.
2. K.E. Drexler, “Nano systems”, Wiley, 1992.
3. M.C. Petty, “Introduction to Molecular Electronics”, Oxford University Press, New York, 1995.
4. Handbook of Nanoscience, Engineering and Technology”, Kluwer publishers, 2002.
5. G. Cao, “Nanostructures & Nanomaterials: Synthesis, Properties &Applications” Imperial College Press, 2014.

| UECG005 | PRINCIPLES OF VLSI SYSTEMS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To learn the principles of operation of MOS transistors
- To impart knowledge on the design of digital VLSI circuits using MOS transistors.
- To learn the basics of FPGA implementation.

**Course Content**

**MOS Transistor Principle**

NMOS and PMOS transistor operations, MOS DC Equations, Electrical properties of CMOS circuits and device modeling, Scaling principles CMOS inverter, Second Order Effects, Stick diagram.

**Combinational Logic Circuits**

MOSFETs as switches, Basic Logic Gates in CMOS, Examples of Combinational Logic Design, RC Delay Model, Linear Delay Model, Elmore's constant, Pass transistor Logic, Transmission gates, static and dynamic CMOS design.

**Sequential Logic Circuits**

Static and Dynamic Latches and Registers, Timing issues, Memory architecture and memory control circuits.

**Arithmetic Building Blocks**

Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, Multipliers, speed and area tradeoff.

**Implementation Strategies**

Full custom and Semi-custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures, Xilinx FPGA.

**References**


1. Jan Rabaey, Anantha Chandrakasan, B.Nikolic, "Digital Integrated Circuits: A Design Perspective", 2nd Edition, Prentice Hall of India, 2013.
2. M.J. Smith, "Application Specific Integrated Circuits", Addisson Wesley, 2001.

3. A.Pucknell, Kamran Eshraghian, “BASIC VLSI Design”, Third Edition, Prentice Hall of India, 2009.
4. Weste and Harris, “CMOS VLSI DESIGN: A Circuits and Systems Perspective”, 4th edition, Pearson Education, 2010.
5. N.Weste, K.Eshraghian, “Principles of CMOS VLSI Design”, 2nd Edition, Addison Wesley, 2009.

# GENERIC ELECTIVES OFFERED BY MECHANICAL ENGINEERING

| UMEG001 | AUTOMOTIVE FUNDAMENTALS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To provide knowledge on IC Engines, braking, transmission, suspension, starting systems.
- To import knowledge in new combustion techniques used for various fuels and alternative sources.

**Course Content**

**Vehicle structure, Engine**

Types of automobiles, vehicle construction and different layouts, chassis, frame and body, Vehicle aerodynamics, IC engines –components function and materials.

**Engine auxiliary systems**

Electronically controlled gasoline injection system for SI engines and diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system (Transistorized coil ignition system, capacitive discharge ignition system), Turbo chargers (WGT, VGT), Variable valve timing (VVT), Firing order.

**Transmission Systems**

Types of transmission, Clutch: Types diaphragm clutch, single and multi-plate clutch, centrifugal clutch and construction, Gear box: Types - gear selector and shifting mechanism, over drive, transfer box, fluid flywheel, torque converter, propeller shaft, slip joints, universal joints, Differential and rear axle.

**Brakes and Suspension Systems**

Suspension system: Types of Suspension Systems-front and rear suspension, Braking system: Types of brakes, Mechanical, Hydraulic, and Air brakes, Disc & Drum brakes, Engine brakes, anti-lock braking system (ABS).

**Alternative Energy Sources and Emission Control**

Use of Natural Gas, Liquefied Petroleum Gas, Bio-diesel, Bio-ethanol, Gasohol and Hydrogen in Automobiles. Electric and Hybrid Vehicles, Fuel Cell. Engine emission: Automotive air pollution, emission control, Engine emission control by three-way catalytic converter system, Emission norms (Euro and BS).

**References**


1. Kirpal Singh, "Automobile Engineering", Standard Publishers, Vol-I & II. 13th Edition. New Delhi, 2014.
2. R. K. Rajput, "A Text book of Automobile Engineering", Lakshmi publication, 2nd Edition. 2014
3. Heniz Heisler, "Vehicle and Engine Technology", SAE, 2nd Edition. 2009.
4. Julian Happian Smith, "An Introduction to Modern Vehicle Design", Butterworth-Heinemann, New Delhi, 2002.
5. Gupta R B, "Automobile Engineering", Satya Prakashan, 2015.

| UMEG002 | COMPUTER AIDED DESIGN | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective**

- To provide an overview of how computers are being used in engineering component design
- To provide knowledge on different CAD standards

**Course Content**

**Fundamentals of Computer Graphics**

Product cycle- Design process- sequential and concurrent engineering- Computer aided design – CAD system architecture- Computer graphics – co-ordinate systems- 2D and 3D transformations homogeneous coordinates - Line drawing -Clipping- viewing transformation

**Geometric Modeling**

Representation of curves- Hermite curve- Bezier curve- B-spline curves-rational curves- Techniques for surface modeling – surface patch- Coons and bicubic patches. Solid modeling techniques- CSG

**Visual Realism**

Hidden – Line-Surface-Solid removal algorithms – shading – colouring – computer animation.

**Assembly of Parts**

Assembly modelling – interferences of positions and orientation – tolerance analysis-mass property calculations – mechanism simulation and interference checking.

**CAD Standards**

Standards for computer graphics- Graphical Kernel System (GKS) - standards for exchange images- Open Graphics Library (OpenGL) - Data exchange standards - IGES, STEP, CAL Setc. Communication standards.

**References**


1. Ibrahim Zeid, “Mastering CAD CAM”, Tata McGraw-Hill Publishing Co.2007
2. Chris McMahon and Jimmie Browne, “CAD/CAM Principles", "Practice and Manufacturing management”, 2nd Edition, Pearson Education, 1999.
3. William M Neumann and Robert F.Sproul, “Principles of Computer Graphics”, McGraw Hill Book Co. Singapore, 1989.
4. Donald Hearn and M. Pauline Baker, “Computer Graphics”, Prentice Hall, Inc, 1992.
5. Foley, Wan Dam, Feiner and Hughes,"Computer graphics principles & practice", Pearson Education - 2003.

| UMEG003 | INTRODUCTION TO POWER PLANT ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective**

- To providing an overview of power plants and detailing the role of Engineers in their operation and maintenance.
- To impart knowledge on renewable power sources and operating cost.

**Course Content**

**Layout of power plants**

Layout of Steam, Hydel, Diesel, Nuclear and Gas Turbine Power Plants - Combined Power Cycles – Comparison and Selection

**Nuclear and Hydro power plants**

Nuclear Energy – Fission, Fusion Reaction, Types of Reactors, Waste Disposal and safety. Hydroelectric power plants – runoff storage and pumped storage type, Selection of Turbines

**Diesel and Gas Power plants**

Types of Diesel Plants, Components, Selection of Engine Type, Applications, environmental hazards – Gas Turbine Power Plant – Fuels – Gas Turbine Material – Regeneration and Intercooling.

**Solar, tidal, wind power plants and economic issues of power plants**

Geo thermal –Fuel cells – Tidal - Solar thermal central receiver system – wind power plants -Cost of Electric Energy – Fixed and operating Costs – Energy Rates – Types of Tariffs.

**References**


1. EI- Wakil M. M, “Power Plant Technology”, McGraw-Hill, 2nd edition, 2014.
2. Arora S. C and Domkundwar S, “A course in Power Plant Engineering”, Dhanpatrai, Third Edition, 2012.
3. Nag P.K, “Power Plant Engineering”, Tata McGraw-Hill, 2014.
4. G. D. Rai, “Introduction to Power Plant Technology”, Khanna Publishers, 3rd Edition, 2014.
5. T. Morse Frederick, “Power Plant Engineering”, Prentice Hall of India, 3rd Edition, 2014.
6. Culp A. W., “Principles of Energy Conversion”, McGraw Hill, 2nd Edition, 2014.

| UMEG004 | INTRODUCTION TO ROBOTICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To impart knowledge about automation, various sensors and their applications in robots.
- To learn about Robot Programming methods & Languages of robot.

**Course Content**

**Introduction**

Automation and robotics –History of robotics - Definition of a Robot - Basic concepts - Robot configurations - Types of Robot drives - Basic robot motions - Point to point control - Continuous path control.

**Components and Operations**

Basic control system concepts - control system analysis - robot actuation and fed back, Manipulators - direct and inverse kinematics, Coordinate transformation - Brief Robot dynamics. Types of Robot and effectors - Grippers - Tools as end effectors - Robot/End - effort interface.

**Sensing and Machine Vision**

Range sensing - Proximity sensing - Touch sensing - Force and Torque sensing. Introduction to Machine vision - Sensing and digitizing - Image processing and analysis.

**Robot Programming**

Methods - languages - Capabilities and limitation - Artificial intelligence - Knowledge representation - Search techniques - A1 and Robotics.

**Industrial Applications**

Application of robots in machining - Welding - Assembly - Material handling - Loading and unloading - CIM - Hostile and remote environments.

**References**


1. S.R. Deb, “Robotics Technology and flexible automation”, Tata McGraw-Hill Education., 2010
2. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, “Industrial Robotics, Technology programming and Applications”, McGraw Hill, 2012.
3. Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, “Robotics Engineering an Integrated Approach”, PHI Learning, 2011.
4. K.S. Fu., R.C.Gonalez, C.S.G.Lee, “Robotics Control Sensing ", Vision and Intelligence, McGraw Hill International Edition, 2000.
5. Craig J.J., “Introduction to Robotics Mechanics and Control”, Pearson Education, 2008.

| UMEG005 | 3D PRINTING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To understand the various RPT processes adopted to produce parts.
- To impart knowledge on three dimensional printing, reverse engineering, new technologies and their influence in manufacturing.

**Course Content**

**Fundamentals of RPT**

RPT History, Development of RP systems, Applications in Product Development, Rapid Tooling, Rapid Manufacturing- Principle –Fundamental – File format – Other translators – medical applications of RP- Materials for Rapid Prototyping Systems

**Liquid Based and Solid based Rapid Prototyping Systems**

Liquid based system - Stereolithography Apparatus (SLA), details of SL process, products, Advantages, Limitations, Applications and Uses. Solid based system - Fused Deposition Modeling, principle, process, products, advantages, applications and uses - Laminated Object Manufacturing

**Powder Based Rapid Prototyping Systems**

Selective Laser Sintering – principles of SLS process, principle of sinter bonding process, Laser sintering materials, products, advantages, limitations, applications and uses.

**Three Dimensional Printing**

Process, major applications, research and development. Direct shell production casting – key strengths, process, applications and uses, case studies, research and development

**Reverse Engineering and New Technologies**

Reverse Engineering - Introduction, measuring device- contact type and non-contact type, CAD model creation from point clouds-preprocessing, point clouds to surface model creation, medical data processing - types of medical imaging, software for making medical models, medical materials, and other applications.

**References**


1. Douglas Bryden, “CAD and Rapid Prototyping for Product Design”, Laurence King, 2014.
2. Kalani Kirk Hausman, Richard Horne, “3D Printing For Dummies”, Wiley Publications, 2014.
3. Chee Kai Chua, Kah Fai Leong, Chu Sing Lim “Rapid Prototyping: Principles and Applications” World Scientific Publication Pvt Ltd, 2011.
4. Chua C. K, Leong K. F and Lim C. S, “Rapid Prototyping: Principles and Applications”, World Scientific, Second edition, 2010.
5. Ian Gibson, “Advanced Manufacturing Technology for Medical applications: Reverse Engineering, Software conversion and Rapid Prototyping”, Wiley, 2006.

# GENERIC ELECTIVES OFFERED BY SCIENCE AND HUMANITIES

| UHSG001 | INDIAN CONSTITUTION, DEMOCRACY AND WORLD AFFAIRS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To the study the Indian political system is a window to understanding politics in society.
- To learn the idea of political system and the account of the making and working of constitutional institutions
- To expose the students to the methods of qualitative and quantitative assessment of environmental impacts due to developmental activities.

**Course Content**

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review. State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

Indian Federal System – Center – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries – Assessment of working of the Parliamentary System in India.

Current World Political Leaders- World Geography Issue Analysis - international politics - international security issues, nuclear proliferation, arms control, environmental politics, foreign policy analysis – Migration - Global wealth and poverty – Globalization - an overview - Territorial Conflicts.

**References**


1. Durga Das Basu, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi.
2. Granville Austin, "Indian Constitution Cornerstone of a Nation", Oxford Publication.
3. Granville Austin (1999), "Working Democratic Constitution: The Indian Experience", Oxford Publication.
4. Sharma, Brij Kishore, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi.

5. Timothy Dunne and Steve Smith, eds., “International Relations Theories: Discipline and Diversity”, Oxford University Press, 2007.

| UPHG001 | FUNDAMENTALS OF ASTROPHYSICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To learn the fundamental concepts in astrophysics that will equip in better understanding of the stellar classification, spectroscopy, solar system and planetary motion.
- To provide students with a detailed overview of galactic and extragalactic astronomy as well as solar system studies.

**Course Content**

Historical Astronomy of Indian and western - astronomy - Aryabhatta, Tycho Brahe, Copernicus, Galileo - Olbers paradox - solar system satellites, planets, comets, meteorites, asteroids. Size and Time Scales - Stars – Spectra – Classification - Stellar Structure Equations and Survey of Stellar Evolution - Stellar Oscillations - Degenerate and Collapsed Stars - Radio Pulsars.

Interacting Binary Systems - Accretion Disks - X-ray Sources - Gravitational Lenses - Dark Matter - Interstellar Medium - HII Regions - Supernova Remnants - Molecular Clouds – Dust - Radiative Transfer - Jeans' Mass - Star Formation.

High-energy Astrophysics - Compton Scattering – Bremsstrahlung - Synchrotron Radiation - Cosmic Rays - Galactic Stellar Distributions and Populations - Oort Constants - Oort Limit. White Dwarfs - Neutron Stars - Black Holes - Hubble Expansion - Charting the Expansion - Astronomical Instrumentation -Telescopes & Observations.

**References**


1. Hansen, Carl J, Steven D. Kawaler, and Virginia Trimble, “Stellar Interiors: Physical Principles, Structure and Evolution”, New York, NY: Springer, 2004. ISBN: 9780387200897.
2. Carroll, Bradley W, and Dale A. Ostlie, “An Introduction to Modern Astrophysics. Reading”, MA: Addison-Wesley Pub., 1995. ISBN: 9780201547306.
3. Kippenhahn, Rudolf, and Alfred Weigert, “Stellar Structure and Evolution”, New York, NY: Springer-Verlag, 1990. ISBN: 9780387502113.
4. Shapiro, Stuart L, and Saul A. Teukolsky, “Black Holes, White Dwarfs, and Neutron Stars”, New York, NY: Wiley, 1983. ISBN: 9780471873167.

5. William Marshall Smart, and Robin Michael Green, “On Spherical Astronomy”, (Editor) Carroll, Bradley W Cambridge University Press, 1977.

| UCHG001 | FUNDAMENTALS OF BIOCHEMISTRY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To provide an integrated knowledge to understand the structure and functions of biomolecules.
- To interpret the biochemical process using analytical techniques.

**Course Content**

Proteins and Amino acids: Introduction to amino acid, structure, properties (physical, chemical) Titration of amino acid. Essential and non-essential amino acid. Protein Introduction to protein, classification of protein based on solubility, shape, composition, function and polarity. Peptide bond – Structure of peptide bond. Denaturation– renaturation of protein, properties of protein. Introduction to lipoprotein, glycoprotein and nucleoprotein. Biological function of protein. Protein structure-Primary, Secondary, tertiary and Quaternary type.

Carbohydrates: Monosaccharides, disaccharides, oligosaccharides- and polysaccharides- types, characteristics and properties, biological significance. Lipids-Classification, structure, properties, biological significance.

Separation techniques: Chromatography- Thin-layer, paper chromatography, Column chromatography, High Performance Liquid Chromatography (HPLC)- Analytical techniques - Basic principle, laws of absorption (Lambert - Beers law). Instrumentation for UV -Visible and IR Spectrophotometry and their applications.

**References**


1. Sadasivam S and Manickam A, “Biochemical methods”, New Age International Pvt Ltd, Revised Edition, 2018.
2. Albert Lehninger, Michael Cox and David L. Nelson, “Principles of Biochemistry”, W. H. Freeman & Company, 2017
3. Elsa Lundanes, Leon Reubsaet and Tyge Greibrokk, “Chromatography”, Wiley VCH Revised Edition 2013
4. Donald Voet, Judith G. Voet and Charlotte W. Pratt, “Principles of Biochemistry”, John Wiley & Sons,2012
5. Rastogi S C, “Biochemistry”, McGraw Hill Inc., New Delhi, 2nd edition,2003.

| UMHG001 | STATISTICAL INFERENCES AND APPLICATIONS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To provide students with theoretical foundations and methods of theory of statistics.
- Understand basic theory behind the development and assessment of statistical analysis techniques in the areas of point and interval estimation, as well as hypothesis testing
- To learn basic theoretical knowledge about fundamental principles for statistical inference.

**Course Content**

Data collection and treatment: Data Collection and organization, diagrammatic representation of data (bar, pie, 2-D and 3-D diagrams), standard deviation and standard error of means, co-efficient of variation, Correlation and regression analysis. Probability and Distributions: Bayer's theorem, probability theorem, elements of binomial and Poisson distribution, normal distribution curve and properties.

Point Estimation: : Estimator and methods of estimation, Properties of an estimator: Consistency, Unbiasedness, Efficiency and Sufficiency- Neyman Factorization, Cramer-Rao Bound Testing of Hypotheses: Tests of hypotheses, simple and composite hypotheses, types of error, Neyman-Pearson Lemma, families with monotone likelihood ratio, UMP, UMP unbiased and UMP invariant tests. Likelihood ratio tests - applications to one sample and two sample problems, Chi-square tests. Wald's sequential probability ratio test.

Interval estimation: methods for finding confidence intervals, shortest length confidence intervals. Classical inference: Frequentist and Bayesian inference, maximum likelihood estimation. Traditional computer-based methods: Empirical Bayes, ridge regression, generalized linear models, regression trees, survival analysis and the EM-algorithm. Computer-intensive methods as resampling, resampling based confidence intervals, cross validation, large-scale hypothesis testing, sparse regression models, random forests, and boosting. Bioinformatic application examples.

**References**


1. Roger E. Kirk, Statistics an introduction, Thomson Wadsworth, 2008.
2. V.K. Rohatgi & A.K. Md. E.Saleh, “An Introduction to Probability and Statistics”, 3rd Edition, Wiley, 2015
3. E.J. Dudewicz & S.N. Mishra, “Modern Mathematical Statsitics”, Wiley, 1988.
4. Introduction to the Theory of Statistics by A.M. Mood, F.A. Graybill and D.C. Boes, McGraw-Hill 1974.
5. Efron, Bradley; Hastie, Trevor, “Computer age statistical inference: algorithms, evidence, and data science”, New York, NY: Cambridge University Press, 2016.

# GENERIC ELECTIVES OFFERED BY DEPARTMENT OF MANAGEMENT

| UMGG001 | ENTREPRENEURSHIP DEVELOPMENT | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To develop necessary knowledge and skills for entrepreneurship
- Develop and strengthen entrepreneurial quality
- Understand the process and procedure involved in setting up enterprises

**Course Content**

Entrepreneurship concept, Characteristics of Successful Entrepreneur, Knowledge and Skills of Entrepreneur, Central and State Government Industrial Policies and Regulations.

Prefeasibility Study, Criteria for Selection of Product, Capital Budgeting, Feasibility Report Preparation and Evaluation Criteria

Finance and Human Resource Mobilization, Operations Planning, Market and Channel Selection, Growth Strategies, Product Launching, Incubation, Venture capital

**References**


1. S.S.Khanka, "Entrepreneurial Development"; S. Chand & Co. Ltd., 2011.
2. Hisrich R D and Peters M P, "Entrepreneurship"; Tata McGraw-Hill, 5th Edition, 2012.
3. Mathew Manimala, "Entrepreneurship Theory at the Crossroads", Paradigms & Praxis, Biztrantra 2nd Edition , 2009
4. Prasanna Chandra, "Projects – Planning, Analysis, Selection, Implementation and Reviews", Tata McGraw-Hill, 2015.
5. Rabindra N. Kanungo; "Entrepreneurship and Innovation"; Sage Publications, 2014.

| UMGG002 | INTELLECTUAL PROPERTY RIGHTS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To acquire knowledge about the intellectual property rights.
- To learn the procedure for registering Patents, Copy Rights, Trademarks and Geographical Indication
- To protect one's intellectual property rights

**Course Content**

Introduction to IPR, International cooperation on IPR, Major Treaties, International convention relating to Intellectual Property – Establishment of WIPO – Mission and Activities – History – General Agreement on Trade and Tariff (GATT).

Nature &Importance of Patents, Copy Rights, Trade Marks, Geographical Indication. Procedure to file Application for grant of Patents, Copy rights, Trade Marks and Geographic Indication.

Emerging trends in IPR, IPR litigation, Case Studies on Patents, Copyright and related rights, Trade Marks, geographic indications.

**References**


1. Bare Acts (Up-to-date)
2. Subbaram N. R., and Viswanathan S., "Handbook of Indian Patent Law and Practice", Printers and Publishers Pvt. Ltd., 2008.
3. Susan K. Sell, "Private Power, Public Law: The globalization of Intellectual Property Rights", Cambridge studies in International relations, Cambridge University Press, 2013.
4. Wadehra, B.L., "Law relating to Intellectual Property", University law publishing company Pvt Ltd, 4th Edition, 2010.
5. Bhandari, M.K., "Law Relating to Intellectual Property Rights", Central Law Publications, 4th Edition, 2015.

| UMGG003 | TOTAL QUALITY MANAGEMENT | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To determine the voice of the customer and the impact of quality on economic performance and long-term business success of an organization.
- To apply and evaluate best practices for the attainment of total quality.
- To expose the students to the quality management systems and standards.

**Course Content**

Quality, TQM framework, Customer Focus, Customer retention, Product and service quality, Quality Cost,, Taguchi techniques, Quality circle, Japanese 5S principles and 8D methodology.

Statistical process control, Control charts, Process capability, Six sigma, Reliability, and Business process re-engineering (BPR). Tools and Techniques for Quality Management - Quality Functions Deployment (QFD), Failure Mode Effect Analysis (FMEA), Total Productivity Maintenance (TPM).

Quality management systems, IS/ISO 9000, Performance improvements, Quality Audits, TQM culture, Leadership, Quality council, Employee involvement, Motivation, Empowerment, Recognition and Reward.

**References**


1. Dale H. Besterfield, et. al., "Total Quality Management", Pearson Education, Revised 3rd Edition, 2011.
2. Lal, H., "Total Quality Management: A Practical Approach", New Age International publication, 2015.
3. Douglas C. Montgomory, "Introduction to Statistical Quality Control", Wiley Student Edition, Wiley India Pvt Limited, 7th Edition, 2012.
4. James R. Evans and William M. Lindsay, "The Management and Control of Quality", Thomson, 8th Edition, 2010.

5. Indian standard – “Quality Management Systems – Guidelines for performance improvement”, Bureau of Indian standards, New Delhi.

| UMGG004 | HUMAN RIGHTS AND HUMAN VALUES | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To understand values and its importance
- To know human rights and duties.
- To understand the duty towards women and society.

**Course Content**

Values and Self-Development - Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non-moral valuation, Standards and principles, Value judgments. Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National unity, Patriotism, Love for nature, Discipline.

Human Rights and Duties: United Nations declaration, Role of various agencies in protection and promotion of human rights. Computer Ethics: Social Impact of Computer, Gender-Issues and Privacy, Cyber Crime, Ethical use of Software. Protection of women at work place.

The Constitution of India - Philosophy of Constitution, Fundamental Rights and Fundamental Duties, Organs of the State - Legislature, Executive, and Judiciary – their composition scope and activities, Judiciary as the guardian of fundamental rights – Writs as constitutional remedies –types of Writs.

**References**


1. Basu D. D, “Introduction to the Constitution of India”, Lexis Nexis, New Delhi, 2014.
2. “Value Education and Human Rights”, Isha books, New Delhi, 2012
3. Kapoor S.K, “International Law and Human Rights”, Central Law Agency, New Delhi, 2016.
4. Chakraborty S.K, “Values and Ethics for organizations: Theory and Practice”, Oxford University Press, New Delhi, 2001.

| UMGG005 | SUPPLY CHAIN MANAGEMENT AND LOGISTICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives**

- To understand the Logistics and SCM Role in the Organization
- To apply theory on logistics in Customer Service, Procurement and Outsourcing
- To enhance the knowledge about supply chain processes and its management.

**Course Content**

**Introduction**

Definition –Scope and Importance of logistics – Logistics-"A system concept"- Logistics functions – Customer value chain – The importance of supply chain flows –Logistics and Competitive advantage –Drivers of supply chain and performance –Integrating logistics within organization.

**Supply Chain Management**

Introduction- Objectives – Role of logistics in supply chain –Functions and contribution of supply chain management –Warehouse function –Purpose of warehouses – Modes of transport –Freight Management

**Logistics Outsourcing and Logistics Information System**

Role of sourcing in a supply chain – Supplier selection and contracts –The procurement process – Supplier selection –The role of IT in the supply chain –Supplier relationship management – Logistics information needs –The role of e-business in supply chain.

**References**


1. Vinod V. Sople, "Logistics Management-The Supply Chain Imperative", Pearson, 2012.
2. Sunil Chopra, Peter Meindl and Kalra, "Supply Chain Management Strategy, Planning and Operations", Pearsons Education, 2016.
3. Martin Christopher, "Logistics and Supply Chain Management", Pearsons Education, 2016.
4. Richard B.Chase, Ravi Shankar, Robert Jacobs," Operations and Supply Chain Management", SIE, 2014.
5. Leenders, Johnson, Flyn, Fearon, "Purchasing and Supply Management", Tata McGraw Hill, 2010.