**Prof. Ram Meghe Institute of Technology and Research, Badnera - Amravati**

**(An Autonomous Institute)**

**Affiliated to Sant Gadge Baba Amravati University, Amravati, Maharashtra (India)**

# PROGRAMME SCHEME & SYLLABI
# 2023-2024

# B.Tech

## Department of
## Electronics and Telecommunication Engineering

**Prof. Ram Meghe Institute of Technology and Research,**
**Badnera - Amravati.**

**Published By**
**Principal**
Prof. Ram Meghe Institute of Technology and Research, Badnera - Amravati.

## Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati

## (An Autonomous Institute)

## Four Year Under Graduate Degree Program in Bachelor of Technology

## Choice Based Credit System (Semester Pattern)

## Branch: Electronics & Telecommunication Engineering

**SEMESTER: I (GROUP-A/GROUP-B)**

| Sr No | Course Code | Course Name | Teaching Scheme | | | | | | Examination Scheme | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Hours / Week | | | Group | Total Hrs/Week | Credits | Theory | | | | | | Practical | | | |
| | | | | | | | | | | | Internal | | | | Max Marks | | | |
| | | | Lecture | Tutorial | P/D | | | | Duration of paper (Hr) | Max Marks Paper ESE/ ESSE | Max Marks MSE/ MSIE | Max. Marks TA/ IA | Total | Overall Min Passing Marks | Int. | Ext. | Total | Min Passing Marks |
| **Theory** | | | | | | | | | | | | | | | | | | |
| 1 | 1SF01 | Applied Mathematics - I | 3 | -- | -- | BSC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 2 | 1SF02 | Applied Physics | 3 | -- | -- | BSC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 3 | 1SF03 | Engineering Graphics | 2 | -- | -- | ESC | 2 | 2 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 4 | 1SF04 | Programming for Problem Solving | 2 | -- | -- | ESC | 2 | 2 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 5 | 1SF05 | Professional Communication Skills | 1 | 1 | -- | AEC/HSSM | 2 | 2 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 6 | 1SET01 | Electrical Measurements & Measuring Instruments | 3 | -- | -- | PCC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 7 | 1SF06 | Design Thinking * | 1 | -- | -- | LLC | 1 | 1 | -- | -- | -- | 50 | 50 | 25 | -- | -- | -- | -- |
| **Practical's** | | | | | | | | | | | | | | | | | | |
| 8 | 1SF07 | Applied Physics Lab | -- | -- | 2 | BSC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| 9 | 1SF08 | Engineering Graphics Lab | -- | -- | 2 | ESC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| 10 | 1SF09 | Programming for Problem Solving Lab | -- | -- | 2 | ESC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| 11 | 1SET02 | Electrical Measurements & Measuring Instruments Lab | -- | -- | 2 | PCC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| 12 | 1SF10 | NSS/Sports/Yoga/Cultural/ Community Service ** | -- | -- | 2 | VSEC | 2 | 1 | -- | -- | -- | -- | -- | -- | 50 | | 50 | 25 |
| | | | **15** | **1** | **10** | | **26** | **21** | | | | | **650** | | | | **250** | |
| | | | | | | | | | | | | | | | **Total** | | **900** | |

* Assessment will be based on Case study and Assignments

**Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati**

**(An Autonomous Institute)**

**Four Year Under Graduate Degree Program in Bachelor of Technology**

**Choice Based Credit System (Semester Pattern)**

**Branch: Electronics & Telecommunication Engineering**

**SEMESTER: II (GROUP-A/GROUP-B)**

| Sr No | Course Code | Course Name | Teaching Scheme | | | | | | Examination Scheme | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Hours / Week | | | Group | Total Hrs/Week | Credits | Theory | | | | | | Practical | | | |
| | | | Lecture | Tutorial | P/D | | | | Duration of paper (Hr) | Max Marks Paper ESE/ ESSE | Internal | | Total | Overall Min Passing Marks | Max Marks | | Total | Min Passing Marks |
| | | | | | | | | | | | Max Marks MSE/ MSIE | Max. Marks TA/ IA | | | Int. | Ext. | | |
| **Theory** | | | | | | | | | | | | | | | | | | |
| 1 | 2SF01 | Applied Mathematics - II | 3 | -- | -- | BSC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 2 | 2SF02 | Applied Chemistry | 3 | -- | -- | BSC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 3 | 2SF03 | Basics of Electrical Engineering | 2 | -- | -- | ESC | 2 | 2 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 4 | 2SF04 | Biology for Engineers | 2 | -- | -- | BSC | 2 | 2 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 5 | 2SF05 | Universal Human Values | 2 | -- | -- | VEC/HSSM | 2 | 2 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 6 | 2SAEKNT01 | Introduction to Python | 3 | -- | -- | ESC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 7 | 2SF06 | Indian Knowledge Systems * | 2 | -- | -- | IKS/HSSM | 2 | 2 | -- | -- | -- | 50 | 50 | 25 | -- | -- | -- | -- |
| **Practicals** | | | | | | | | | | | | | | | | | | |
| 8 | 2SF07 | Applied Chemistry Lab | -- | -- | 2 | BSC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| 9 | 2SF08 | Basic of Electrical Engineering Lab | -- | -- | 2 | ESC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| 10 | 2SAEKNT02 | Introduction to Python Lab | -- | -- | 2 | ESC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| 11 | 2SF09 | Workshop/Digital Fabrication Lab | -- | -- | 2 | VSEC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| | | **Total** | **17** | | **8** | | **25** | **21** | | | | | **650** | | | | **200** | |
| | | | | | | | | | | | | | | | **Total** | | **850** | |

* Assessment will be based on Unit Tests and Assignments

**Exit Option: Two relevant skill-based courses (excluding from list of courses undertaken in First to Fourth semesters) to qualify for UG Certificate**

| Title | Credit |
|---|---|
| Two relevant MOOC/NPTEL courses as decided by BOS | 8 |
| **OR** | |
| Internship (Min 120 hrs) | 8 |

# Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati

## (An Autonomous Institute)

## Four Year Under Graduate Degree Program in Bachelor of Technology

## Choice Based Credit System (Semester Pattern)

## Branch: Electronics & Telecommunication Engineering

### SEMESTER: III

| Sr No | Course Code | Course Name | Teaching Scheme | | | | | | Examination Scheme | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Hours / Week | | | Group | Total Hrs/Week | Credits | Theory | | | | | | Practical | | | |
| | | | Lecture | Tutorial | P/D | | | | Duration of paper (Hr) | Max Marks Paper ESE/ ESSE | Internal | | Total | Overall Min Passing Marks | Max Marks | | Total | Min Passing Marks |
| | | | | | | | | | | | Max Marks MSE/ MSIE | Max. Marks TA/ IA | | | Int. | Ext. | | |
| **Theory** | | | | | | | | | | | | | | | | | | |
| 1 | 3SE01 | Applied Mathematics - III | 2 | -- | -- | BSC | 2 | 2 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 2 | 3SE02 | Electronic Devices & Circuits | 3 | -- | -- | PCC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 3 | 3SE03 | Digital System Design | 2 | -- | -- | PCC | 2 | 2 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 4 | 3SE04 | Electromagnetic Waves | 3 | -- | -- | PCC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 5 | 3SEOE1 | OE-1 | 3 | -- | -- | OE-I | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 6 | 3SE05 | Fundamentals of Entrepreneurship# | 2 | -- | -- | EEMC | 2 | 2 | -- | -- | -- | 50 | 50 | 25 | -- | -- | -- | -- |
| 7 | 3SE06 | Environmental Science* | 2 | -- | -- | VEC-01 | 2 | 2 | -- | -- | -- | 50 | 50 | 25 | -- | -- | -- | -- |
| **Practicals** | | | | | | | | | | | | | | | | | | |
| 8 | 3SE07 | Electronic Devices & Circuits Lab | -- | -- | 2 | PCC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| 9 | 3SE08 | Digital System Design Lab | -- | -- | 2 | PCC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| 10 | 3SE09 | Object Oriented Programing Lab | -- | -- | 2 | PCC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| 11 | 3SE10 | Community Engagement Project / Field Project | | | 4 | ELC | 4 | 2 | -- | -- | -- | -- | -- | -- | 50 | 0 | 50 | 25 |
| | | **Total** | **17** | | **10** | | **27** | **22** | | | | | **600** | | | | **200** | |
| | | | | | | | | | | | | | | | **Total** | | **800** | |

**OE-1 :** 3SEOE1A Operation Management 3SEOE1B Marketing Management 3SEOE1D Introduction to Cyber Laws

# Evaluation will be based on subject related activities,

* Evaluation will be based on Field Visit, Environment based project or other relavant activities

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## Four Year Under Graduate Degree Program in Bachelor of Technology

## Choice Based Credit System (Semester Pattern)

## Branch: Electronics & Telecommunication Engineering

### SEMESTER: IV

| Sr No | Course Code | Course Name | Teaching Scheme | | | | | | Examination Scheme | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Hours / Week | | | Group | Total Hrs/Week | Credits | Theory | | | | | | Practical | | | |
| | | | Lecture | Tutorial | P/D | | | | Duration of paper (Hr) | Max Marks Paper ESE/ ESSE | Internal | | Total | Overall Min Passing Marks | Max Marks | | Total | Min Passing Marks |
| | | | | | | | | | | | Max Marks MSE/ MSIE | Max. Marks TA/IA | | | Int. | Ext. | | |
| **Theory** | | | | | | | | | | | | | | | | | | |
| 1 | 4SE01 | Analog Circuits | 3 | -- | -- | PCC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 2 | 4SE02 | Analog and Digital Communication | 3 | -- | -- | PCC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 3 | 4SE03 | Network Theory | 3 | -- | -- | PCC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 4 | MDM1 | MDM-01 | 3 | -- | -- | MDM | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 5 | 4SEOE2 | OE-II | 3 | -- | -- | OE | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 6 | 4SE04 | Signals and systems | 2 | -- | -- | AEC/VSEC | 2 | 2 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 7 | 4SE05 | Engineering Economics* | 2 | -- | -- | EEMC | 2 | 2 | -- | -- | -- | 50 | 50 | 25 | -- | -- | -- | -- |
| **Practicals** | | | | | | | | | | | | | | | | | | |
| 8 | 4SE06 | Analog Circuits Lab | -- | -- | 2 | PCC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| 9 | 4SE07 | Analog and Digital Communication Lab | -- | -- | 2 | PCC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| 11 | 4SE08 | Network Theory Lab | -- | -- | 2 | PCC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| 12 | 4SE09 | Signals and systems Lab | -- | -- | 2 | AEC/VSEC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| | | **Total** | **19** | | **8** | | **27** | **23** | | | | | **650** | | | | **200** | |
| *Evaluation will be based on subject related activities | | | | | | | | | | | | | | | **Total** | | **850** | |

**OE-2 :-** 4SEOE2A Aptitude for Engineers 4SEOE2B Financial Planning 4SEOE2C Accounting & Costing

**Exit Option: Two relevant skill-based courses (excluding from list of courses undertaken in First to Fourth semesters) to qualify for Diploma**

| Title | Credit |
|---|---|
| Two relevant MOOC/NPTEL courses as decided by BOS | 8 |
| **OR** | |
| Internship (Min 120 hrs) | 8 |

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**Choice Based Credit System (Semester Pattern)**

**Branch: Electronics & Telecommunication Engineering**

**SEMESTER: V**

| Sr No | Course Code | Course Name | Teaching Scheme | | | | | | Examination Scheme | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Hours / Week | | | Group | Total Hrs/Week | Credits | Theory | | | | | | Practical | | | |
| | | | | | | | | | Duration of paper (Hr) | Max Marks Paper ESE/ ESSE | Internal | | Total | Overall Min Passing Marks | Max Marks | | Total | Min Passing Marks |
| | | | Lecture | Tutorial | P/D | | | | | | Max Marks MSE/ MSIE | Max. Marks TA | | | Int. | Ext. | | |
| **Theory** | | | | | | | | | | | | | | | | | | |
| 1 | 5SE01 | Microcontroller and Applications | 3 | -- | -- | PCC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 2 | 5SE02 | Power Electronics | 3 | -- | -- | PCC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 3 | 5SE03 | Digital Signal Processing | 3 | -- | -- | PCC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 4 | 5SE04 | PEC-01 | 2 | -- | -- | PEC | 2 | 2 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 5 | 5SE05 | PEC-02 | 2 | -- | -- | PEC | 2 | 2 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 6 | MDM2 | MDM-02 | 3 | -- | -- | MDM | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 7 | 5SEOE3 | OE-III | 3 | -- | -- | OE | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| **Practicals** | | | | | | | | | | | | | | | | | | |
| 8 | 5SE06 | Microcontroller and Applications Lab | -- | -- | 2 | PCC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| 9 | 5SE07 | Power Electronics Lab | -- | -- | 2 | ELC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| 10 | 5SE08 | Digital Signal Processing Lab | -- | -- | 2 | PCC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| | | **Total** | **19** | | **6** | | **25** | **22** | | | | | **700** | | | | **150** | |
| | | | | | | | | | | | | | | | **Total** | | **850** | |

**PEC- 1:-** 5SE04PE1A Control Systems , 5SE04PE1B Speech and Audio Processing , 5SE04PE1C Fiber Optic Communication

**PEC- 2:-** 5SE05PE2A Sensors and Transducers , 5SE05PE2B Introduction to JAVA , 5SE05PE2C Cryptography & Network Security

**OE-III :-** 5SEOE3A Waste to Energy , 5SEOE3B Intellectual Property Rights(IPR), 5SEOE3C Human Resource Management

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**Choice Based Credit System (Semester Pattern)**

**Branch: Electronics & Telecommunication Engineering**

**SEMESTER: VI**

| Sr No | Course Code | Course Name | Teaching Scheme | | | | | | Examination Scheme | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Hours / Week | | | Group | Total Hrs/Week | Credits | Theory | | | | | | Practical | | | |
| | | | | | | | | | Duration of paper (Hr) | Max Marks Paper ESE/ ESSE | Internal | | Total | Overall Min Passing Marks | Max | | Total | Min Passing Marks |
| | | | Lecture | Tutorial | P/D | | | | | | Max Marks MSE/ MSIE | Max. Marks TA | | | Int. | Ext. | | |
| **Theory** | | | | | | | | | | | | | | | | | | |
| 1 | 6SE01 | Microwave Theory & Techniques | 3 | -- | -- | PCC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 2 | 6SE02 | Digital Image Processing | 3 | -- | -- | PCC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 3 | 6SE03 | Embedded systems | 3 | -- | -- | PCC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 4 | 6SE04 | PEC-03 | 3 | -- | -- | PEC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 5 | 6SE05 | PEC-04 | 3 | -- | -- | PEC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 6 | MDM3 | MDM-03 | 3 | -- | -- | MDM | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 7 | 6SDMP | Disaster Management and Prepardeness | 2 | | | | 2 | 0 | | | | | | | | | | |
| **Practicals** | | | | | | | | | | | | | | | | | | |
| 7 | 6SE06 | Microwave Theory & Techniques Lab | -- | -- | 2 | PCC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| 8 | 6SE07 | Digital Image Processing Lab | -- | -- | 2 | PCC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| 9 | 6SE08 | Embedded System Lab | -- | -- | 2 | PCC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| 10 | 6SE09 | Mini Project | -- | -- | 2 | ELC | 2 | 1 | -- | -- | -- | -- | -- | -- | 50 | | 50 | 25 |
| | | **Total** | **20** | | **8** | | **28** | **22** | | | | | **600** | | | | **200** | |
| | | | | | | | | | | | | | | | **Total** | | **800** | |

**PEC- 3** :- 6SE04PE3A IOT, 6SE04PE3B Biomedical Electronics, 6SE04PE3C Data Base Management System

**PEC- 4 :-** 6SE05PE4A Adaptive Signal Processing, 6SE05PE4B Renewable Energy Sources , 6SE05PE4C Antenna & Wave Propagation

**Exit Option: Two relevant skill-based courses (excluding from list of courses undertaken in First to Sixth semesters) to qualify for B.Voc.**

| Title | Credit |
|---|---|
| Two relevant MOOC/NPTEL courses as decided by BOS | 8 |
| **OR** | |
| 1. Internship (Min 120 hrs) | 8 |

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**Four Year Under Graduate Degree Program in Bachelor of Technology**

**Choice Based Credit System (Semester Pattern)**

**Branch: Electronics & Telecommunication Engineering**

| SEMESTER: VII | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sr No | Course Code | Course Name | Teaching Scheme | | | | | | Examination Scheme | | | | | | | | | | |
| | | | Hours / Week | | | Group | Total Hrs/Week | Credits | Theory | | | | | | Practical | | | |
| | | | Lecture | Tutorial | P/D | | | | Duration of paper (Hr) | Max Marks Paper ESE/ ESSE | Internal | | Total | Overall Min Passing Marks | Max | | Total | Min Passing Marks |
| | | | | | | | | | | | Max Marks MSE/ MSIE | Max. Marks TA | | | Int. | Ext. | | |
| **Theory** | | | | | | | | | | | | | | | | | | | |
| 1 | 7SE01 | Communication Networks | 3 | -- | -- | PCC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 2 | 7SE02 | VLSI Design | 3 | -- | -- | PCC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 3 | 7SE03 | PEC-05 | 2 | -- | -- | PEC | 2 | 2 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 4 | 7SE04 | PEC-06 | 2 | -- | -- | PEC | 2 | 2 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| 5 | MDM4 | MDM-04 | 3 | -- | -- | MDM | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| **Practical's** | | | | | | | | | | | | | | | | | | | |
| 6 | 7SE05 | PROJECT | -- | -- | 8 | ELC | 12 | 6 | -- | -- | -- | -- | -- | -- | 100 | 100 | 200 | 100 |
| 7 | 7SE06 | Cryptography and Network Security Lab | -- | -- | 2 | PCC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| 8 | 7SE07 | VLSI Design Lab | -- | -- | 2 | PCC | 2 | 1 | -- | -- | -- | -- | -- | -- | 25 | 25 | 50 | 25 |
| 9 | 7SE08 | Research Methodology | | | | ELC | 4 | 2 | | | | | | | 50 | 0 | 50 | 25 |
| | | **Total** | **13** | | **12** | | **27** | **23** | | | | | **500** | | | | **350** | |
| | | | | | | | | | | | | | | | **Total** | | **850** | |

* Evaluation will be based on subject related activities

| |
|---|
| **PEC- 5 :-** 7SE03PE5A High Speed Electronics , 7SE03PE5B Computer Architecture , 7SE03PE5C Error Correcting Codes |
| **PEC- 6** :- 7SE04PE6A Introduction to MEMS , 7SE04PE6B Introduction to Artificial Intelligence & Machine Learning, 7SE04PE6C Printed Electronics |

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**Choice Based Credit System (Semester Pattern)**

**Branch: Electronics & Telecommunication Engineering**

**SEMESTER: VIII**

| Sr No | Course Code | Course Name | Teaching Scheme | | | | | | Examination Scheme | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Hours / Week | | | Group | Total Hrs/Week | Credits | Theory | | | | | | Practical | | | |
| | | | | | | | | | Duration of paper (Hr) | Max Marks Paper ESE/ ESSE | Internal | | Total | Overall Min Passing Marks | Max Marks | | Total | Min Passing Marks |
| | | | Lecture | Tutorial | P/D | | | | | | Max Marks MSE/ MSIE | Max. Marks TA | | | Int. | Ext. | | |
| **Theory** | | | | | | | | | | | | | | | | | | |
| 1 | 8SE01 | Satellite Communication | 3 | -- | -- | PCC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | | | | |
| 2 | 8SE02 | Mobile Communication Networks | 3 | -- | -- | PCC | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | | | | |
| | | **Total** | **6** | | **0** | | **6** | **6** | | | | | **200** | | | | **200** | |
| | | | | | | | | | | | | | | | | **Total** | **200** | |
| | | **AND** | | | | | | | | | | | | | | | | |
| 3 | 8SE03 | Internship / Apprenticeship / On the Job Training | -- | -- | | ELC | 24 | 12 | -- | -- | -- | -- | | -- | 150 | 150 | **300** | 150 |
| | | | | | | | | | | | | | | | | | | |
| | | **Total** | | | | | **30** | **18** | | | | | | | **Total** | | **500** | |
| | | **OR** | | | | | | | | | | | | | | | | |
| 3 | 8SE03 | Research Internship | -- | -- | | ELC | 24 | 12 | -- | -- | -- | -- | | -- | 150 | 150 | **300** | 150 |
| | | | | | | | | | | | | | | | | | | |
| | | **Total** | | | | | **30** | **18** | | | | | | | **Total** | | **500** | |

* Theory Subjects will be based on self-learning or online learning without MSE/MSIE.

* The internal assessment for theory subjects will be as follows.

1. There will be online objective type examination of 15 Marks based on Unit I and Unit II.
2. There will be online assignment of 15 Marks based on Unit III to Unit VI.
3. The 10 Marks of Teachers Assessment will be based on overall performance of the student.

| Name of Degree Offered | Semesters | | | | | | | | Total Credits |
|---|---|---|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI | VII | VIII | |
| **B. Tech. EXTC with Multidisciplinary Minor** | 21 | 21 | 22 | 23 | 22 | 22 | 23 | 18 | **172** |

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**Choice Based Credit System (Semester Pattern)**

**Branch: Electronics & Telecommunication Engineering**

## B.Tech with Honors

| Sr No | Semester | Course Code | Course Name | Teaching Scheme | | | | | | Examination Scheme | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Hours / Week | | | Group | Total Hrs/Week | Credits | Theory | | | | | | Practical | | | |
| | | | | | | | | | | | | Internal | | | | Max Marks | | | |
| | | | | Lecture | Tutorial | P/D | | | | Duration of paper (Hr) | Max Marks Paper ESE/ ESSE | Max Marks MSE/ MSIE | Max. Marks TA | Total | Overall Min Passing Marks | Int. | Ext. | Total | Min Passing Marks |
| **Theory** | | | | | | | | | | | | | | | | | | | |
| 1 | IV | 4SEH | PLC & Scada | 3 | | | Honor | | 3 | 3 | 60 | 30 | 10 | 100 | 40 | | | | |
| 2 | V | 5SEH | Electronics Circuit Design | 3 | | | Honor | | 3 | 3 | 60 | 30 | 10 | 100 | 40 | | | | |
| 3 | VI | 6SEH | Cognitive Radio | 3 | | | Honor | | 3 | 3 | 60 | 30 | 10 | 100 | 40 | | | | |
| 4 | VII | 7SEH1 | Biomedical Signal Processing | 3 | | | Honor | | 3 | 3 | 60 | 30 | 10 | 100 | 40 | | | | |
| 6 | VII | 7SEH2 | Mini Project | 3 | | | Honor | | 3 | | | | | | | 50 | 50 | 100 | 50 |
| 5 | VIII | 8SEH | VLSI Design Verification and Testing | 3 | | | Honor | | 3 | 3 | 60 | 30 | 10 | 100 | 40 | | | | |
| | | | **Total** | **18** | | **0** | | | **18** | | | | | **500** | | | | **100** | |
| | | | | | | | | | | | | | | | | **Total** | | **600** | |

* The internal assessment for theory subjects for Semester VIII (8SEH) will be as follows.

1. There will be online objective type examination of 15 Marks based on Unit I and Unit II.
2. There will be online assignment of 15 Marks based on Unit III to Unit VI.
3. The 10 Marks of Teachers Assessment will be based on overall performance of the student.

## *MDM BASKETS OF COURSES FOR ALL Departments

| MDM Basket/ Track Name | Sr. No. | Course Code | Course Name | Semester | Students from following Departments can Register | Offered by Department of |
|---|---|---|---|---|---|---|
| Artificial Intelligence | 1 | 4SAMDM1 | Artificial Intelligence and Expert Systems | IV | CE, CSE, EXTC, IT, IIoT, ME | Artificial Intelligence and Data Science |
| | 2 | 5SAMDM2 | Applied Artificial Intelligence | V | | |
| | 3 | 6SAMDM3 | Generative Artificial Intelligence | VI | | |
| | 4 | 7SAMDM4 | Safe and Responsible Artificial Intelligence Systems | VII | | |
| Data Science | 1 | 4SAMDM5 | Programming for Data Science | IV | CE, CSE, EXTC, IT, IIoT, ME | |
| | 2 | 5SAMDM6 | Business Intelligence and Analytics | V | | |
| | 3 | 6SAMDM7 | Data Engineering | VI | | |
| | 4 | 7SAMDM8 | Ethics in Data Science | VII | | |
| Civil Engineering | 1 | 4SCMDM1 | Introduction to Environmental Engineering | IV | AI&DS, CSE, EXTC, IT, IIoT, ME | Civil Engineering |
| | 2 | 5SCMDM2 | Introduction to Water Resource Engineering | V | | |
| | 3 | 6SCMDM3 | Introduction to Transportation Engineering | VI | | |
| | 4 | 7SCMDM4 | Basics of Structural Analysis | VII | | |
| Construction Technology | 1 | 4SCMDM5 | Building Planning | IV | AI&DS, CSE, EXTC, IT, IIoT, ME | |
| | 2 | 5SCMDM6 | Construction Materials | V | | |
| | 3 | 6SCMDM7 | Basics of Surveying | VI | | |
| | 4 | 7SCMDM8 | Basics of Geotechnical Engineering | VII | | |
| Computer Science and Engineering | 1 | 4SKMDM1 | Fundamentals of Data Structures | IV | CE, EXTC, IIoT, ME | Computer Science and Engineering |
| | 2 | 5SKMDM2 | Introduction to Algorithms | V | | |
| | 3 | 6SKMDM3 | Database Management System | VI | | |
| | 4 | 7SKMDM4 | Basics of Enterprise Resource Planning | VII | | |

*** indicates that the Track for MDM will be decided by respective Board of Studies (BoS)**

# *MDM BASKETS OF COURSES FOR ALL Departments

| MDM Basket/ Track Name | Sr. No. | Course Code | Course Name | Semester | Students from following Departments can Register | Offered by Department of |
|---|---|---|---|---|---|---|
| Software Engineering | 1 | 4SKMDM5 | Software Requirements Engineering | IV | AI&DS, CE, EXTC, IT, IIoT, ME | Computer Science and Engineering |
| | 2 | 5SKMDM6 | Software Architecture | V | | |
| | 3 | 6SKMDM7 | Software Project Management | VI | | |
| | 4 | 7SKMDM8 | Software Testing and Quality Assurance | VII | | |
| Electronics and Communication Engineering | 1 | 4SEMDM1 | Electronic Instrumentation | IV | AI&DS, CE, CSE, IT, IIoT, ME | Electronics and Telecommunication Engineering |
| | 2 | 5SEMDM2 | Electronic Devices and Circuits | V | | |
| | 3 | 6SEMDM3 | Analog and Digital Communication | VI | | |
| | 4 | 7SEMDM4 | Electronic Circuit Design | VII | | |
| Telecommunication Engineering | 1 | 4SEMDM5 | Basic Electronic Communication Systems | IV | AI&DS, CE, CSE, IT, ME | |
| | 2 | 5SEMDM6 | Introduction to Wireless Communication | V | | |
| | 3 | 6SEMDM7 | Introduction to Mobile Computing | VI | | |
| | 4 | 7SEMDM8 | Satellite and Optic Fiber Communication | VII | | |
| Information Technology | 1 | 4SNMDM1 | Data Transmission and Information Technology | IV | AI&DS, CE, CSE, EXTC, IIoT, ME | Information Technology |
| | 2 | 5SNMDM2 | Data Communication Networks | V | | |
| | 3 | 6SNMDM3 | E-Commerce | VI | | |
| | 4 | 7SNMDM4 | Management Information Systems | VII | | |
| Cyber Security | 1 | 4SNMDM5 | Introduction to Cyber Security | IV | CE, EXTC, IIoT, ME | |
| | 2 | 5SNMDM6 | Fundamentals of Cryptography | V | | |
| | 3 | 6SNMDM7 | Basics of Ethical Hacking | VI | | |
| | 4 | 7SNMDM8 | Blockchain Technology | VII | | |

*** indicates that the Track for MDM will be decided by respective Board of Studies (BoS)**

# *MDM BASKETS OF COURSES FOR ALL Departments

| MDM Basket/ Track Name | Sr. No. | Course Code | Course Name | Semester | Students from following Departments can Register | Offered by Department of |
|---|---|---|---|---|---|---|
| IoT | 1 | 4STMDM1 | Fundamentals of IoT | IV | AI&DS, CE, CSE, EXTC, IT, ME | Industrial IoT |
| | 2 | 5STMDM2 | Sensors and Actuators | V | | |
| | 3 | 6STMDM3 | Single Board Computers | VI | | |
| | 4 | 7STMDM4 | Industrial Internet of Things | VII | | |
| Mechanical Engineering | 1 | 4SMMDM1 | Energy Engineering | IV | AI&DS, CE, CSE, EXTC, IT, IIoT | Mechanical Engineering |
| | 2 | 5SMMDM2 | Automobile Engineering and Electric Vehicles | V | | |
| | 3 | 6SMMDM3 | Industrial Engineering | VI | | |
| | 4 | 7SMMDM4 | Industrial Automation | VII | | |
| Robotics and Automation Engineering | 1 | 4SMMDM5 | Mechatronics | IV | AI&DS, CE, CSE, EXTC, IT, IIoT | |
| | 2 | 5SMMDM6 | Rapid Prototyping | V | | |
| | 3 | 6SMMDM7 | Automation Engineering | VI | | |
| | 4 | 7SMMDM8 | Robotics and industrial Application | VII | | |

*** indicates that the Track for MDM will be decided by respective Board of Studies (BoS)**

# DOUBLE MINOR (SPECIALIZATION) BASKETS OF COURSES FOR ALL DEPARTMENTS

| Double Minor / Specialization Minor Basket Track Name | Sr. No. | Course Code | Course Name | Semester | Students from following Departments can Register | Offered by Department of |
|---|---|---|---|---|---|---|
| Advanced Programming | 1 | 3SASM | Programming Language for Data Science | IV | CSE, CE, EXTC, IT, IIoT, ME | Artificial Intelligence and Data Science |
| | 2 | 4SASM | Advanced Java Programming | V | | |
| | 3 | 5SASM | Mobile Application Development | VI | | |
| | 4 | 6SASM | Introduction to Gaming | VII | | |
| | 5 | 7SASM | Introduction to Software Development Platform (GitHub) | VII | | |
| | 6 | 8SASM | Databases and SQL for Data Science | VIII | | |
| Construction Management and Environmental Engineering | 1 | 3SCSM | Environmental Pollution and Control | III | AI&DS, CSE, EXTC, IT, IIoT, ME | Civil Engineering |
| | 2 | 4SCSM | Water Treatment Engineering | IV | | |
| | 3 | 5SCSM | Waste Water Treatment Engineering | V | | |
| | 4 | 6SCSM | Project Management and Planning | VI | | |
| | 5 | 7SCSM | Construction Material Management | VII | | |
| | 6 | 8SCSM | Construction Quality Management | VIII | | |
| Web Technology | 1 | 3SKSM | Introduction of HTML | III | AI&DS, CE, EXTC, IT, IIoT, ME | Computer Science and Engineering |
| | 2 | 4SKSM | Javascript | IV | | |
| | 3 | 5SKSM | Web Engineering | V | | |
| | 4 | 6SKSM | Cloud Technology | VI | | |
| | 5 | 7SKSM | Distributed Database | VII | | |
| | 6 | 8SKSM | User Experience Design | VIII | | |
| Embedded System | 1 | 3SESM | Fundamentals of Digital Electronics | III | AI&DS, CE, CSE, IT, ME | Electronics and Telecommunication Engineering |
| | 2 | 4SESM | Digital System Design | IV | | |
| | 3 | 5SESM | Introduction to Microprocessors | V | | |
| | 4 | 6SESM | Microcontroller and Applications | VI | | |
| | 5 | 7SESM | Advanced Microcontrollers | VII | | |
| | 6 | 8SESM | Embedded System and RTOS | VIII | | |

# DOUBLE MINOR (SPECIALIZATION) BASKETS OF COURSES FOR ALL DEPARTMENTS

| Double Minor / Specialization Minor Basket Track Name | Sr. No. | Course Code | Course Name | Semester | Students from following Departments can Register | Offered by Department of |
|---|---|---|---|---|---|---|
| Information Processing | 1 | 3SNSM | Fundamentals of Information Technology | III | CE, CSE, EXTC, IIoT, ME | Information Technology |
| | 2 | 4SNSM | Database Processing | IV | | |
| | 3 | 5SNSM | Network Processing | V | | |
| | 4 | 6SNSM | Data Mining and Warehousing | VI | | |
| | 5 | 7SNSM | Data Visualaization | VII | | |
| | 6 | 8SNSM | Big Data Processing | VIII | | |
| Industrial IoT | 1 | 3STSM | Introduction to Internet of Things | III | AI&DS, CE, CSE, EXTC, IT, ME | Industrial IoT |
| | 2 | 4STSM | Industrial Sensors and Actuators | IV | | |
| | 3 | 5STSM | Industrial Networks | V | | |
| | 4 | 6STSM | Embedded System for Internet of Things | VI | | |
| | 5 | 7STSM | Edge and Fog Computing | VII | | |
| | 6 | 8STSM | Internet of Things Security | VIII | | |
| Manufacturing Techniques | 1 | 3SMSM | Manufacturing Processes-I | III | AI&DS, CE, CSE, EXTC, IT, IIoT, | Mechanical Engineering |
| | 2 | 4SMSM | Manufacturing Processes -II | IV | | |
| | 3 | 5SMSM | Modern Manufacturing Techniques | V | | |
| | 4 | 6SMSM | Production Management | VI | | |
| | 5 | 7SMSM | Productivity Techniques | VII | | |
| | 6 | 8SMSM | Computer Integrated Manufacturing | VIII | | |

# Honors Baskets of Courses for all Departments

| Name of Department | Sr. No. | Course Code | Course Name | Semester |
|---|---|---|---|---|
| Artificial Intelligence and Data Science | 1 | 4SAH | Advanced Programming for Data Science | IV |
| | 2 | 5SAH | Advanced Data Science and Analytics | V |
| | 3 | 6SAH | Business and Web Analytics | VI |
| | 4 | 7SAH | Data Engineering | VII |
| | 5 | 8SAH1 | Deep Learning and its Applications | VIII |
| | 6 | 8SAH2 | Minor Project | VIII |
| Civil Engineering | 1 | 4SCH | Air Pollution and Control | IV |
| | 2 | 5SCH | Structural Dynamics | V |
| | 3 | 6SCH | Geographic Information Systems | VI |
| | 4 | 7SCH | Advanced Foundation Engineering | VII |
| | 5 | 8SCH1 | Finite Element Method | VIII |
| | 6 | 8SCH2 | Minor Project | VIII |
| Computer Science and Engineering | 1 | 4SKH | Data Science and Analytics | IV |
| | 2 | 5SKH | Natural Language Processing and Text Analytics | V |
| | 3 | 6SKH | Artificial Neural Network | VI |
| | 4 | 7SKH | Optimization Techniques for Data Analytics | VII |
| | 5 | 8SKH1 | Computer Vision | VIII |
| | 6 | 8SKH2 | Minor Project | VIII |
| Electronics and Telecommunication Engineering | 1 | 4SEH | PLC & SCADA | IV |
| | 2 | 5SEH | Electronics Circuit Design | V |
| | 3 | 6SEH | Cognitive Radio | VI |
| | 4 | 7SEH1 | Biomedical Signal Processing | VII |
| | 5 | 7SEH2 | Minor Project | VII |
| | 6 | 8SEH | VLSI Design Verification and Testing | VIII |

# Honors Baskets of Courses for all Departments

| Name of Department | Sr. No. | Course Code | Course Name | Semester |
|---|---|---|---|---|
| Information Technology | 1 | 4SNH | Advanced Data Science | IV |
| | 2 | 5SNH | Advanced Machine Learning | V |
| | 3 | 6SNH | Advanced Artificial Intelligence | VI |
| | 4 | 7SNH | Advanced Deep Learning | VII |
| | 5 | 8SNH1 | Advanced Speech and Natural Language Processing | VIII |
| | 6 | 8SNH2 | Minor Project | VIII |
| Industrial IoT | 1 | 4STH | IoT Architectures and Protocols | IV |
| | 2 | 5STH | Internet of Things Security | V |
| | 3 | 6STH | Embedded Systems and IoT | VI |
| | 4 | 7STH | Machine Learning For IoT | VII |
| | 5 | 8STH1 | Data Science in IoT | VIII |
| | 6 | 8STH2 | Minor Project | VIII |
| Mechanical Engineering | 1 | 4SMH | Energy Audit | IV |
| | 2 | 5SMH | Computer Aided Design | V |
| | 3 | 6SMH | Advance Heat Transfer | VI |
| | 4 | 7SMH | 3D Printing and Application | VII |
| | 5 | 8SMH1 | Design of Transmission System | VIII |
| | 6 | 8SMH2 | Minor Project | VIII |

**Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati**
**(An Autonomous Institute)**
**Four Year Under Graduate Degree Program in Bachelor of Technology**
**Choice Based Credit System (Semester Pattern)**
**Branch: All Branches**

# SPECIALIZATION MINOR (SM) BASKET OF COURSES (DOUBLE MINOR) for 3rd Semester

| Semester | Course Code | Course Name | Teaching Scheme | | | | | | Examination Scheme | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Hours / Week | | | SM Applicable to | Total Hours /Week | Credits | THEORY | | | | | | PRACTICAL | | | |
| | | | | | | | | | | | Internal | | | | Max. | | | |
| | | | Lecture | Tutorial | P/D | | | | Duration of paper (Hrs) | Max. Marks ESE/ ESSE | Max. Marks MSE/ MSIE | Max. Marks TA | Total | Overall Min Passing Marks | Int. | Ext. | Total | Min. Passing Marks |
| **Theory** | | | | | | | | | | | | | | | | | | |
| III | 3SASM | Advanced Programming for Data Science | 3 | -- | -- | CE, CSE, EXTC, IT, IIoT, ME | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| III | 3SCSM | Environmental Pollution and Control | 3 | -- | -- | AI&DS, CSE, EXTC, IT, IIoT, ME | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| III | 3SKSM | Introduction of HTML | 3 | -- | -- | AI&DS, CE, EXTC, IT, IIoT, ME | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| III | 3SESM | Fundamentals of Digital Electronics | 3 | -- | -- | AI&DS, CE, CSE, IT, ME | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| III | 3SNSM | Fundamentals of Information Technology | 3 | -- | -- | CE, CSE, EXTC, IIoT, ME | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| III | 3STSM | Introduction to Internet of Things | 3 | -- | -- | AI&DS, CE, CSE, EXTC, IT, ME | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| III | 3SMSM | Manufacturing Processes-I | 3 | -- | -- | AI&DS, CE, CSE, EXTC, IT, IIoT | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| | | **Total** | **3** | -- | -- | | 3 | **3** | | | | | **100** | | | | | |

**Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati**
**(An Autonomous Institute)**
**Four Year Under Graduate Degree Program in Bachelor of Technology**

**Choice Based Credit System (Semester Pattern) Branch: All Branches**

# SPECIALIZATION MINOR (SM) BASKET OF COURSES (DOUBLE MINOR) for 4th Semester

| Semester | Course Code | Course Name | Teaching Scheme | | | | | | Examination Scheme | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Hours / Week | | | SM Applicable to | Total Hours /Week | Credits | THEORY | | | | | | PRACTICAL | | | |
| | | | | | | | | | | | Internal | | Total | Overall Min Passing Marks | Max. | | Total | Min. Passing Marks |
| | | | Lecture | Tutorial | P/D | | | | Duration of paper (Hrs) | Max. Marks ESE/ ESSE | Max. Marks MSE/ MSIE | Max. Marks TA | | | Int. | Ext. | | |
| **Theory** | | | | | | | | | | | | | | | | | | |
| IV | 4SASM | Advanced Java Programming | 3 | -- | -- | CE, CSE, EXTC, IT, IIoT, ME | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| IV | 4SCSM | Water Treatment Engineering | 3 | -- | -- | AI&DS, CSE, EXTC, IT, IIoT, ME | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| IV | 4SKSM | Javascript | 3 | -- | -- | AI&DS, CE, EXTC, IT, IIoT, ME. | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| IV | 4SESM | Digital System Design | 3 | -- | -- | AI&DS, CE, CSE, IT, ME | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| IV | 4SNSM | Database Processing | 3 | -- | -- | CE, CSE, EXTC, IIoT, ME | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| IV | 4STSM | Industrial Sensors and Actuators | 3 | -- | -- | AI&DS, CE, CSE, EXTC, IT, ME | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| IV | 4SMSM | Manufacturing Processes - II | 3 | -- | -- | AI&DS, CE, CSE, EXTC, IT, IIoT | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| | | **Total** | **3** | | | | 3 | 3 | | | | | **100** | | | | | |

**Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati**

**(An Autonomous Institute)**

**Four Year Under Graduate Degree Program in Bachelor of Technology**

**Choice Based Credit System (Semester Pattern)**

**Branch: All Branches**

# HONOURS BASKET OF COURSES for 4th Semester

| Semester | Course Code | Course Name | Teaching Scheme | | | | | | Examination Scheme | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Hours / Week | | | Honors Course Applicable to Students of | Total Hours /Week | Credits | THEORY | | | | | | PRACTICAL | | | |
| | | | | | | | | | | | Internal | | | | Max. Marks | | | |
| | | | Lecture | Tutorial | P/D | | | | Duration of paper (Hrs) | Max. Marks ESE/ ESSE | Max. Marks MSE/ | Max. Marks TA | Total | Overall Min Passing Marks | Int. | Ext. | Total | Min. Passing Marks |
| IV | 4SAH | Advanced Programming for Data Science | 3 | -- | -- | Artificial Intelligence & Data Science | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| IV | 4SCH | Air Pollution and Control | 3 | -- | -- | Civil Engineering | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| IV | 4SKH | Data Science and Analytics | 3 | -- | -- | Computer Science and Engineering | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| IV | 4SEH | PLC & SCADA | 3 | -- | -- | Electronics and Telecomm. Engineering | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| IV | 4SNH | Advanced Data Science | 3 | -- | -- | Information Technology | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| IV | 4STH | IoT Architectures and Protocols | 3 | -- | -- | Industrial Internet of Things | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| IV | 4SMH | Energy Audit | 3 | -- | -- | Mechanical Engineering | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | -- | -- | -- | -- |
| | | **Total** | **3** | | | | **3** | **3** | | | | | **100** | | | | | |

**Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati**
**(An Autonomous Institute)**
**Four Year Under Graduate Degree Program in Bachelor of Technology**
**Choice Based Credit System (Semester Pattern)**
**Branch: ELECTRONICS & TELECOMMUNICATION ENGINEERING**

**Specialization Minor: Embedded System**

| Sr No | Semester | Course Code | Course Name | Teaching Scheme | | | | | | Examination Scheme | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Hours / Week | | | Group | Total Hrs/Week | Credits | Theory | | | | | | Practical | | | |
| | | | | Lecture | Tutorial | P/D | | | | Duration of paper (Hr) | Max Marks Paper ESE/ ESSE | Internal | | Total | Overall Min Passing Marks | Max Marks | | Total | Min Passing Marks |
| | | | | | | | | | | | | Max Marks MSE/ MSIE | Max. Marks TA | | | Int. | Ext. | | |
| **Theory** | | | | | | | | | | | | | | | | | | | |
| 1 | III | 3SESM | Fundamentals of Digital Electronics | 3 | | | SM | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | | | | |
| 2 | IV | 4SESM | Digital System Design | 3 | | | SM | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | | | | |
| 3 | V | 5SESM | Introduction to Microprocessors | 3 | | | SM | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | | | | |
| 4 | VI | 6SESM | Microcontroller and Applications | 3 | | | SM | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | | | | |
| 5 | VII | 7SESM | Advanced Microcontrollers | 3 | | | SM | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | | | | |
| 6 | VIII | 8SESM | Embedded System and RTOS | 3 | | | SM | 3 | 3 | 3 | 60 | 30 | 10 | 100 | 40 | | | | |
| | | | **Total** | **18** | | **0** | | **18** | **18** | | | | | **600** | | | | | |
| | | | | | | | | | | | | | | | | **Total** | | **600** | |

* The internal assessment for theory subjects for Semester VIII (8SESM) will be as follows.

1. There will be online objective type examination of 15 Marks based on Unit I and Unit II.
2. There will be online assignment of 15 Marks based on Unit III to Unit VI.
3. The 10 Marks of Teachers Assessment will be based on overall performance of the student.

# B.Tech. First Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 2SF01 | Applied Mathematics II | 03 | 00 | 00 | 03 |

**Pre-requisites**:

1. Basic Knowledge of Matrix and Complex number.
2. Elementary Integral Calculus.

**Course Learning Objectives:**

1. To deal with system of equations and solutions of Eigen value problem.
2. To express real valued periodic function in terms of sines and cosines.
3. To Use Complex number theory in engineering application such as signal processing.
4. To familiarize with techniques in double and triple integrals and its applications.

**Course Outcomes:**

Students will be able to:

1. Make use of system of equations in matrix forms.
2. Find the periodic functions as an infinite series.
3. Apply De Moivre's theorem in various concepts of complex number.
4. Use new technique DUIS and to evaluate Beta and Gamma function.
5. Evaluate double integrals over bounded regions.
6. Evaluate triple integral and its applications.

| UNIT | Subject: Applied Mathematics II | No. of Lectures Required |
|---|---|---|
| **Unit I** | **Matrices:** Rank of a matrix, Consistency of linear system of equations by matrix method, Eigen values and Eigen vectors, Cayley-Hamilton theorem (without proof). | **7** |
| **Unit II** | **Fourier series:** Fourier expansion of function in (C, C+2L), half range Fourier series. | **6** |
| **Unit III** | **Complex Numbers:** Roots of complex number by deMoivre's theorem, Hyperbolic and inverse hyperbolic functions, Separation of real and imaginary parts, Logarithm of complex numbers. | **7** |
| **Unit IV** | **Integral Calculus I:** Differentiation under integral sign, Beta Function and Gamma Function. | **7** |
| **Unit V** | **Integral Calculus II:** Double integration, change of order of integration, transformation to polar coordinates, Evaluation of area by double integration. | **6** |
| **Unit VI** | **Integral Calculus III:** Triple integration, Transformation to spherical polar coordinates, Volume of solid by triple integration. | **7** |
| | **Total** | **40** |

**Text Books:**


1. Wartikar P.N. & Wartikar J.N.- A Text Book of Applied Mathematics Vol.-I & II, Pune V.G. Prakashan, Pune.
2. Grewal B.S. - Higher Engineering Mathematics, 40/e, Khanna Publishers.


**Reference Books:**


1. Kreyszig E.K. - Advanced Engineering Mathematics, John Wiley.
2. Ramana B.V. - Higher Engineering Mathematics, (TMH).
3. Singh R.R. & Bhatt M. - Engineering Mathematics, (TMH).
4. Dass H. K. – Advance Engineering Mathematics, S. Chand.

# B.Tech. First Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 2SF02 | Applied Chemistry (AC) | 03 | 00 | 00 | 03 |

**Pre-requisite**:

1. Fundamentals of redox reactions and electrochemistry.
2. Knowledge of chemical reaction.
3. Basic knowledge of qualitative and quantitative analysis.

**Course Learning Objectives:**

1. To enable students to manufacture functional materials on the basis of chemical forces.
2. To provide the knowledge of characteristics and application of cement, fuels and lubricants.
3. To impart knowledge of characteristics of water and methods for the removal of impurities from water.
4. To summarize students with operating principles, working processes and applications of energy conversion, storage devices and also with corrosion and corrosion control methods.

**Course Outcomes:**

Students will be able to

1. Apply the knowledge of chemical forces to design functional materials.
2. Apply the knowledge of useful engineering materials such as cement and lubricant.
3. Describe properties of hard water, its disadvantages and various processes for removal of water impurities.
4. Describe properties of chemical fuels, analysis methods and its applications.
5. Identify various types of corrosion, mechanism and control methods to protect metals.
6. Describe operating principles working processes and applications of energy conversion and storage devices.

| UNIT | Subject: Applied Chemistry (AC) | No. of Lectures Required |
|---|---|---|
| UNIT I | **Engineering Materials and Their Properties:** Introduction, Classification of Engineering materials, Chemical Forces in materials- Primary forces and Secondary forces, Properties of materials, Role of chemical forces in alteration of magnitude of the properties such as Density, Melting Point, Solubility, Strength, Stiffness, Elasticity and Plasticity. Real life examples where these interactions played major role to enhanced their properties: - vulcanized rubber and plasticized PVC. | 6 |

| | | |
|---|---|---|
| **UNIT II** | **Cement Engineering:** Introduction, Types of cement, Raw materials used for the manufacturing of Portland cement, Manufacturing of Portland cement by wet process. Functions of chemical constituents of cement: Tri-calcium aluminate, Tri-calcium silicate, Di-calcium silicate, Tetra-calcium alumino ferrite, magnesia, sulphur trioxide, iron oxide, alkalis, free lime, alumina. Physical Properties of Portland cement: Heat of hydration, Fitness, Soundness, Strength, Setting and hardening. | **6** |
| **UNIT III** | **Water Characteristics & Their Effects on Boiler:** Introduction. Characteristics of water: - Hardness, pH, alkalinity, DO, TDS and Chloride ion concentration. Disadvantages of characteristics of water in Boiler: - Scale & sludge, Priming & Foaming, Caustic embrittlement and Boiler corrosion. Methods of analysis: - EDTA method, Iodometric method and conductometric titration. Methods for removal of impurities: Sedimentation, Neutralization, Zeolite process, De-Ionization process and Reverse osmosis. Calculation of hardness by data obtained from EDTA and zeolite processes. | **8** |
| **UNIT IV** | **Fuel and Lubricant:** Introduction, Types of Fuels, Properties of Fuels: Ignition Temperature, Calorific value. Types of calorific value.<br>Solid Fuel: Coal, classification of coal, analysis of coal: ultimate analysis. **Liquid Fuel:** Crude oil, Fractional distillation of crude oil, Properties of liquid fuel: Octane number and Cetane number. **Gaseous Fuel:** Hydrogen gas, economy of hydrogen gas as fuel. **Lubricants:** Introduction, classification of lubricants, properties of lubricants, uses of lubricants. | **7** |
| **UNIT V** | **Energy Sources & Storage Devices:** Introduction, Principle of batteries, Types of Batteries: Primary Batteries-Dry Cell, Mercury cell, Secondary Batteries- NICAD (Ni-Cd) battery, Lithium-ion battery. Green energy sources: Photo voltaic cell (Solar Cell), Fuel Cell. | **6** |
| **UNIT VI** | **Corrosion & Its Control:** Introduction, Types of corrosion: Dry and Wet corrosion, Mechanism of dry and wet corrosion, Factor affecting corrosion: Nature of metal and nature of environment, Types of wet corrosion- Pitting corrosion, waterline corrosion, stress and galvanic corrosion, Methods of corrosion control- Cathodic protection: Sacrificial anode and impressed current method, Protective coating: Galvanizing and Tinning process. | **7** |
| | **Total** | **40** |

**Text Books:**


1. Textbook of Engineering Chemistry by Dara S S and Umare S S.
2. Engineering Chemistry by Jain & Jain (Dhanpat Rai & Sons)
3. Engineering chemistry by S. S. Dara, S. Chand Publication
4. Engineering & Technology by Shashi Chawala, Dhanpat Rai & Sons.
5. Engineering Chemistry by K. Sesha Maheswaramma, Mridula Chugh, Pearson.


**Reference Books:**


1. Engineering Chemistry: Fundamentals and Applications by Shikha Agarwal.
2. Chemistry for Engineers by B K Ambasta
3. Engineering Chemistry by N Krishnamurthy and P Vallinayagam.
4. Engineering & Technology Vol-I & II-by Rajaram& Kuriocose.
5. Engineering Chemistry by Prasanta Rath (Cengage learning).

## B.Tech. First Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 2SF03 | Basics of Electrical Engineering | 02 | 00 | 00 | 02 |

**Pre-requisites:**

1. Concepts of Electrostatics and Current Electricity.
2. Fundamentals of Magnetic effect of electric current, magnetism and Electromagnetic Induction.

**Course Learning Objectives:**

1. To introduce students with different terminologies in electrical engineering and network simplification methods of resistances.
2. To understand DC and AC Circuit analysis.
3. To understand magnetic circuits and Electromagnetic induction.
4. To understand single phase Transformer and Safety in electrical installation.

**Course Outcomes:** After completion of this course the student shall be able to:

1. Understand fundamentals of Electrical Engineering and be adequately trained to solve Network of resistances by using transformation techniques.
2. Demonstrate DC circuits by finding different parameters like voltage, currents, resistance using laws and theorems.
3. Explain different properties of electromagnets and phenomenon of electromagnetic induction in magnetic circuits.
4. Illustrate the different terms of AC and analyze single phase AC circuits.
5. Explain Three phase A.C circuits
6. Explain single phase Transformer and Safety in electrical installation.

| UNIT | Content: Basics of Electrical Engineering | No. of Lectures Required |
|---|---|---|
| 1 | **Fundamentals of Electrical Engineering**: Basic concepts of Current, Voltage, Power, energy and relationship between them. Resistance, Resistivity, Conductance, Conductivity, Network simplification of Resistances (Series, Parallel, Delta-Star and Star-Delta transformation) | 05 |

| | | |
|---|---|---|
| **2** | **DC Circuit Analysis:** Types of Sources, Current and voltage division principle, Source Transformation, Ohm's Law, Kirchoff's Laws (KCL and KVL) , Superposition Theorem, Thevenin's Theorem. | **05** |
| **3** | **Magnetic circuits and Electromagnetic Induction:** Basic concepts of Flux, flux density, MMF, Reluctance, Permeance, Magnetic field intensity and their relationship. Series Magnetic circuits, B-H curve, Principle of electromagnetic induction, Types of Magnetically induced EMF, Concept of self and mutual Inductance. | **05** |
| **4** | **A.C. Fundamentals**: Generation of sinusoidal alternating voltages and currents, Different terminologies associated with AC circuit. Behavior of AC circuit containing Pure R, L, and C. Phasor representation in rectangular & polar form, Impedance and admittance concept. Series R-L, R-C and R-L-C circuit, Resonance in Series R-L-C circuit, Power in single phase circuit: - Concepts of active, reactive and apparent power, Power factor. | **05** |
| **5** | **Polyphase Circuits :** Generation of Three phase voltages, current and power, Star connected and delta connected balanced circuits, Relationship between line current, phase current and line voltage, phase voltage , analysis of balanced three phase circuits Power measurement in Three phase circuit . | **05** |
| **6** | **Single phase Transformer:** Single-phase transformer construction and working (Ideal and practical), Types of Transformer, EMF equation of Transformer, Efficiency & Regulation of transformer, condition for maximum efficiency. **Electrical Safety :** Safety precautions in electrical installation, Earthing, Types of Earthing (Plate and Pipe Earthing) | **05** |
| | Total | **30** |

**Text Books:**


1. B. L. Thereja, Basic electrical engineering, S. Chand Publications.
2. D.P. Kothari, I.J. Nagrath, "Basic Electrical Engineering", TMH Publishing Co. Ltd., New Delhi, 3rd edition
3. Leonard S. Bobrow, "Fundamentals of Electrical Engineering", 2nd Edition, Oxford Press.
4. Kulshreshtha D.C., " Basic Electrical Engineering" , First Ed., TMH.


**Reference Books:**


1. Leonard S. Bobrow, "Fundamentals of Electrical Engineering", 2nd Edition, Oxford Press. R
2. A.E. Fitzgerald, D.E. Higginbotham, "Basic Electrical Engineering", McGraw Hill Book Co., New York, 2nd edition
3. Dr.S.L.Uppal, "Electrical Wiring, Estimating and Costing", Khanna Publishers.

# B.Tech. First Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 2SF04 | Biology for Engineers | 02 | 00 | 00 | 02 |

**Pre-requisite:** Nil

**Course Learning Objectives:**

1. To acquire the knowledge of basic concepts of biology and the need of the subject in Engineering.
2. To study the human organs and their analogy with engineering applications.
3. To be acquainted with the latest trends in bio-engineering.
4. To become familiar with the concept of Bio-mimicry and understand how nature has inspired innovations in technology.

**Course outcomes:**

1. Understand basic biological concepts and define the terminologies.
2. Understand various organs in body, their function; it's analogy with engineering applications.
3. Acquire knowledge of medical tools and machineries used in the treatment.
4. Understand the concepts of 3D printing and its biomedical applications and trends in bio-engineering
5. Understand the concepts like biosensors, biofuels and biochips.
6. Understand the concept of Bio-mimicry and nature inspired technology

| UNIT | Subject: Biology for Engineers | No. of Lectures Required |
|---|---|---|
| UNIT I | **Introduction to Basic Biology:** Cell: What is a Cell, Cell theory, Cell shapes, structure of a Cell, Cell cycle chromosomes, The Plant Cell and animal Cell, protoplasm, prokaryotic and eukaryotic Cell, Plant Tissue and Animal Tissue. Carbohydrates, proteins, Amino acid, nucleic acid (DNA and RNA) and their types | 04 |
| UNIT II | **Human Organ Systems and Bio Designs – 1** Brain as a CPU system (architecture, CNS and Peripheral Nervous System, signal transmission, EEG, Robotic arms for prosthetics.). Eye as a Camera system (architecture of rod and cone cells, optical corrections, cataract, lens materials, bionic eye). Heart as a pump system (architecture, electrical signaling - ECG monitoring and heart related issues, reasons for blockages of blood vessels, design of stents, pace makers, defibrillators). | 04 |

| | | |
|---|---|---|
| **UNIT III** | **Human Organ Systems and Bio Designs – 2**<br>Lungs as purification system (architecture, gas exchange mechanisms, spirometry, abnormal lung physiology - COPD, Ventilators, Heart-lung machine). Kidney as a filtration system (architecture, mechanism of filtration, CKD, dialysis systems). | **05** |
| **UNIT IV** | **Trends in Bioengineering-1**<br>Bioprinting techniques and materials, 3D printing of ear, bone and skin. 3D Printed tooth, Dental implants, DNA origami and Biocomputing, Bioimaging and Artificial Intelligence for disease diagnosis | **05** |
| **UNIT V** | **Trends in Bioengineering-2**<br>Cloning in microbes, plants and animals, Basics of biosensors, biochips, Bio fuels. Tissue engineering And its application, transgenic plants and animals. | **06** |
| **UNIT VI** | **Nature-Bioinspired Materials and Mechanisms:**<br>Bio-mimicry, Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf). Bird flying (GPS and aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Plant burrs (Velcro), Shark skin (Friction reducing swim suits), Kingfisher beak (Bullet train). Human Blood substitutes - hemoglobin-based oxygen carriers (HBOCs) and perfluorocarbons (PFCs). | **06** |
| | **Total** | **30** |

**Reference Books:**


1. Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022
2. Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.
3. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
4. Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.
5. Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
6. Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008.
7. Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N Geetha A C Udayashankar Lambert Academic Publishing, 2019.
8. 3D Bioprinting: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 2016.

# B.Tech. First Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 2SF05 | Universal Human Values (UHV) | 02 | 00 | 00 | 02 |

**Pre-requisite**: **NIL**

**Course Learning Objectives:**

1. To facilitate in students the understanding of Universal Human Values.
2. To imbibe professional Ethics in students.
3. To aware students about their role in all aspects of life, including their place in the family, society and nature.

**Course Outcomes:** Students will be able to

1. Understand the need for value education and its significance in personal and societal development.
2. Understand the harmony between the 'I' and the body and its significance for overall well- being.
3. Identify and appreciate the values in human-human relationships, emphasizing trust (Vishwas) and respect (Samman).
4. Develop a holistic perception of harmony at all levels of existence.
5. Communicate effectively about the importance of harmony in nature, promoting awareness and inspiring others to adopt sustainable practices.
6. Recognize the relevance of a humanistic constitution and humanistic universal order.

| UNIT | Subject: Universal Human Values | No. of Lectures Required |
|---|---|---|
| UNIT I | **Process for Value Education:** Understanding nature and scope for Value Education, Self-Exploration–concept and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being. | 5 |

| | | |
|---|---|---|
| **UNIT II** | **Understanding Harmony in the Human Being - Harmony in Myself:** Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' – Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body | **5** |
| **UNIT III** | **Understanding Harmony in the Family and Society- Harmony Human - Human Relationship:** Understanding harmony in the Family- the basic unit of human interaction, understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas. | **5** |
| **UNIT IV** | **Building the Universal Harmonious Order:** Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitvaas comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to worldfamily! | **5** |
| **UNIT V** | **Understanding Harmony in the Nature and Existence - Whole existence as Co-existence:** Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self- regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence. | **5** |
| **UNIT VI** | **Implications of the above Holistic Understanding of Harmony on Professional Ethics:** Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations. | **5** |
| | **Total** | **30** |

**Text Books:**


1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.


**Reference Books:**


2. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA.
3. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991.
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
6. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
7. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
8. A N Tripathy, 2003, Human Values, New Age International Publishers.
9. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi STantra Shodh,Amravati.
10. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
11. M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
12. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
13. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted2008.


**Term Work (50 marks):**

1. Analyze case studies on universal human values, such as ethical dilemmas or social issues.
2. Participate in group discussions on universal human values, including debates and presentations.
3. Visit community centers or NGOs working to uplift communities to demonstrate the values of selfless service.
4. Reading an article or literature on the people who were involved in selfless activities and prepare the report to express a view on the article.

**Marking Scheme:-**

1. Case Study: 10 Marks
2. Group Discussion: 10 Marks
3. Visit to community Centre: 10 Marks
4. Report on Article Reading: 10 Marks
5. Attendance -10 Marks

## B.Tech. First Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **2SAEKNX01** | **Introduction to Python** | 03 | 00 | 00 | 03 |

**Pre-requisite**: Basic Knowledge of Computer.

**Course Learning Objectives:** Throughout the course, students will be expected to demonstrate their understanding of Introduction to Python by being able to do each of the following:

1. Develop a strong foundational understanding of the Python programming language, including its basic concepts, data types, operators, and control flow structures.
2. Gain proficiency in working with strings, functions, and various data structures such as lists, tuples, and dictionaries.
3. Acquire skills in file handling, data manipulation using Pandas and NumPy, and object-oriented programming principles.

**Course Outcomes:** After Successful completion of this course, the student will be able to:

1. Define the basic concepts of Python, including variables, data types, and operators.
2. Explain different string manipulation techniques and functions.
3. Use python program flow to explore logic.
4. Create module to understand modularity.
5. Implement the concepts and procedures of file handling in Python for real-world scenarios.
6. Demonstrate the application of object-oriented programming principles in Python.

| UNIT | Subject: (2SAEKNX01) Introduction to Python | No. of Lectures Required |
|---|---|---|
| **Unit-1** | **An Introduction to Python:** Characteristics of Python, Why Python, Print statement, Comments, Python Variables, Data types, Operators in Python, Global and local variables, Basic Programs. | **07** |
| **Unit-2** | **Data Structures in Python:** Python Data Structures (List, Tuples, Dictionaries, Sets), Function related to data structure, Basic String Operations in Python (String Manipulation, Accessing Strings, Basic Operations, String slices), Simple Input and Output, Output formatting, Basic Programs | **07** |
| **Unit-3** | **Python Program Flow:** Indentation, if statement, and its related statements, while loop, for loop, range statement, break and continue, Assert, Examples of Looping. | **07** |
| **Unit-4** | **Functions and Modules:** Function: Functions, defining a function, Calling a function, Types of functions, Function Arguments, Create a Module, Standard Modules, Exception Handling | **07** |
| **Unit-5** | **Working with Data in Python:** Modes of file handling (Opening and closing file, Reading and writing files), Date and Time with its functions, Introduction to Modules and packages. | **07** |
| **Unit-6** | **Classes and Objects:** Overview of OOP, Class Definition, Creating Objects, Objects as Arguments, Objects as Return Values, Built-in Class Attributes, Inheritance, Overloading, Overriding, Programs. | **07** |
| | **Total** | **42** |

**Text Book:**


1. Martin C Brown, ―Python: The Complete Reference‖, McGraw Hill.
2. J. Mueller and L. Massaron, Python for data science. 2nd edition. Hoboken, NJ, John Wiley & Sons, Inc, 2019.


**Reference Books:**


1. Larry Lutz, ― Python for Beginners: Step By Step Guide to Learning Python Programming, CreateSpace Independent Publishing Platform, First edition, ISBN: 1717410588, 9781717410580, 2018.
2. Nicholas Ayden, ― Python Programming, Independently Published, First Edition, ISBN: 1707051933,9781707051939, 2019.
3. Michal Jaworski, Tarek Ziadé, ― Expert Python Programming, Packt Publishing Ltd., Third Edition, ISBN: 9781789808896, 2019.

# B.Tech. First Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 2SF06 | Indian Knowledge System | 02 | 00 | 00 | 02 |

**Pre-requisite**: **Nil**

**Course Learning Objectives:**

In this course students will know and understand contribution of ancient Indian scientists through

1. Introduction to contribution of Indian scientist in various fields of Science and Technology and Astronomy
2. Introduce to contribution of Indian scientist in Chemistry, Metallurgy and Mathematics.
3. Introduction to contribution of Indian scientist in Medical Sciences and Life Sciences.

**Course Outcomes:**

Students will be able to –

1. Discuss contribution of Indian Scientists in various fields of scientists and technology.
2. Narrate contribution of Indian Scientists in the field of Astronomy.
3. Discuss contribution of Indian Scientists in the field of Chemistry and Metallurgy.
4. Discover contribution of Indian Scientists in the field of Mathematics.
5. Collect contribution of Indian Scientists in the field of Medical Science and Ayurveda.
6. Discuss contribution of Indian Scientists in the field of Plant and Animal Science.

| UNIT | Subject: Indian Knowledge System | No. of Lectures Required |
|---|---|---|
| UNIT I | **India's Contribution to Science and Technology:** Pre-Independence contribution. Brief information about various fields of contributions. | 4 |
| UNIT II | **Contribution in Astronomy:** The Beginnings of Indian Astronomy, The Early Historical Period, The Siddhāntic Era, The Kerala School, Other Post-Siddhāntic Developments. | 4 |
| UNIT III | **Contribution to Chemistry and Metallurgy:** Early Chemical Techniques, Atomism in Vaiśeṣika, Chemistry in Early Literature, Classical Age, Laboratories and Apparatus Metallurgy before and during the Harappan Civilization, Iron Metallurgy and it's applications, Zinc Metallurgy. | 4 |

| | | |
|---|---|---|
| **UNIT IV** | **Contributions to Mathematics:** First Steps, contributions from: early historical period, the classical period, the classical period: post Aryabhatta, contributions of Shri P C Mahalanobis, Shri Shrinivasa Ramajujan. | **5** |
| **UNIT V** | Contributions to Medical Science and Ayurveda as way of life, health and wellbeing The tradition of surgery, Inoculation for smallpox, Microbioilogy and Paracitology, Communicable diseases and epidemics, An evolving pharmacopoeia, Cross-cultural interactions, What is Ayurveda? Integrative approach to healthcare, Integrative approach to healthcare, Principles of Ayurvedic healing, Five elements, three Doshas and Treating diseases to restore health. | **5** |
| **UNIT VI** | Contributions to Plant and Animal Science Plant Science in Ancient India, Animal Science in Ancient India, Indian Traditional Knowledge on Environmental Conservation. | **4** |
| | **Total** | **26** |

**Text Books:**

1. Indian Contributions to Science compiled by Vijnana Bharati

**Reference Books:**

1. History of Science and technology in India by Dr. Binod bihari satpathy
2. Hindu achievements In exact science by Benoy Kumar Sarkar
3. Science in Ancient India by Subhash C. Kak

**Term Work: (50 Marks)**

1. Interaction with traditional practitioners (Vaidyas, artists, craftsmen) and prepare a report after the interaction.
2. Drawing or designing based on traditional Indian art (Madhubani, Warli, etc).
3. Project on traditional agriculture, water harvesting system, mathematics in ancient India etc.
4. Research paper on specific topics in IKS, such as the significance of Ayurveda in modern healthcare, chemistry in ancient era etc.

**Marking scheme:**

1. Report on the interaction: 10 marks
2. Drawing or designing on traditional Indian art: 10 marks
3. Project on traditional activities: 10 marks
4. Research paper on specific topic of IKS: 10 marks
5. Attendance in theory classes: 10 marks

# B.Tech. First Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 2SF07 | Applied Chemistry Lab | 00 | 00 | 02 | 01 |

**Pre-requisite**:

1. Basic knowledge of qualitative and quantitative analysis.
2. Basic knowledge of titrations-based experiments.
3. Knowledge of chemistry lab precautions, prohibitions and safety aids.

**Course Learning Objectives:**

1. To impart skills of quantitative and qualitative analysis.
2. To provide knowledge of synthesis of co-crystal.
3. To familiar students with some fundamental of chemistry experiments.

**Course Outcomes:**

Students will be able to

1. Determine the properties of water, chemical fuel, lubricant and cement based on laboratory techniques.
2. Synthesis of co-crystals and determination of its melting point.
3. Handle some important analytical instruments.

| | **Subject**: Applied Chemistry Lab |
|---|---|
| Expt. 1 | Preparation of Paracetamol and oxalic acid co-crystal and determination of its melting point. |
| Expt. 2 | Determination of hardness of water by EDTA method. |
| Expt.3 | Determination Alkalinity (NaOH and $Na_2CO_3$) in given water sample |
| Expt.4 | Determination of chlorine in water sample. (Iodometry) |
| Expt.5 | Determination of Dissolved Oxygen in Water Sample. |
| Expt.6 | Determination of pH of unknown sample by pH meter |
| Expt.7 | Determination of $H^+$ ion concentration by conductivity meter. |
| Expt.8 | Determination of % CaO in given cement sample. |
| Expt.9 | Determination of % of moisture in coal sample by proximate analysis. |
| Expt.10 | Determination of viscosity of lubricating oil by Redwood viscometer No.1 |
| Expt.11 | Determination of viscosity of lubricating oil by Redwood viscometer No. 2 |
| Expt.12 | Determination of flash point of lubricating oil by Abel's apparatus |
| Expt.13 | Determination of acid value of lubricating oil. |
| Expt.14 | Determination of mass of Zn coating on galvanized article |
| | Total hours for the completion of minimum nine (09) experiments |

**Text Books:**


1. Experiments and Calculations in Engineering Chemistry by S. S. Dara, S. Chand & Company LTD.
2. Engineering Chemistry Practical Book by Dipika Jaspal and Arti Malviya.
3. Laboratory Manual on Engineering Chemistry by S. K. Bhasin and Sudha Rani, Dhanpat Rai Publishing Company.


**Reference Books:**


**1)** Experiments In Engineering Chemistry by Payal B Joshi.

**2)** Principles of Analytical Chemistry by Miguel Valcarcel

# B.Tech. First Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 2SF08 | Basics of Electrical Engineering Lab | 00 | 00 | 02 | 01 |

**Pre-requisite**: Nil

**Course Learning Objectives:**

**1.** To analyse DC Circuits.
**2**. To analyse single phase and three phase AC circuits.
**3**. To understand single phase transformers.

**Course Outcomes:**

After completion of this course the student shall be able to:

1. Estimate different electrical parameters like voltage, current in DC circuits using basic laws and theorems.
2. Determine various parameters of AC circuits and find relation between them in single phase AC circuits.
3. Analyze relation between electrical parameters of balanced three phase AC circuits and transformers.

**List of Experiments:**

**Minimum 08 practical's are to be conducted out of the following:**

1. To validate Kirchoff's Current Law for DC Circuits.
2. To validate Kirchoff's Voltage Law for DC Circuits
3. To verify Thevenin theorems for DC Circuits.
4. To verify the Superposition theorem for DC Circuits.
5. To analyze RLC Series circuit and to plot its phasor diagram.
6. To verify relationships between line and phase values for Star connected load.
7. To verify relationships between line and phase values for Delta connected load.
8. To conduct load test on single phase transformer and pre-determine its efficiency and regulation.
9. Open circuit and short circuit test on Single phase transformer.
10. Demonstration of Earthing.

## B.Tech. First Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **2SAEKNX02** | **Introduction to Python Lab** | **00** | **00** | **02** | **01** |

**Pre-requisite**: Nil

**Course Learning Objectives:** Throughout the course, students will be expected to demonstrate their understanding of Introduction to Python Lab by being able to do each of the following:

1. To introduce the fundamentals of Python programming including syntax, control structures, functions, and data types relevant to problem-solving.
2. To develop skills for working with Python libraries and modules that support data structures, file handling, and object-oriented programming.
3. To enable students to write, test, and debug Python programs for solving problems.

**Course Outcomes:**

After successfully completing the course, students will be able to-

1. Apply foundational knowledge of Python programming to design and conduct experiments aligned with specified objectives.
2. Use computer hardware, software tools, and relevant resources for the execution of Python-based practical tasks.
3. Analyze outputs, interpret results, formulate findings, and draw appropriate conclusions based on the objectives of the given practical.

**List of Experiment:**

*Minimum 8 to 10 practical's are to be conducted based on subject* ***2SAEKNX01 Introduction to Python.***

**List of Experiments/ Practical's:**

*The following is a probable list of experiments/practical's; however, the teacher may prepare or design and conduct other relevant practical's based on the syllabus.*

1. Introduction and Installation of Python.
2. Write a python program to find largest of three numbers.
3. Write a python script that prints prime numbers less than 20.
4. Write python program in which a function is defined and calling that function prints Hello World
5. Write python program to store data in list and then try to print them.
6. Write python program to print list of numbers using range and for loop
7. Write python program to demonstrate working with dictionaries in python.
8. Write python program to demonstrate working with tuples in python.
9. Write python program to create, concatenate and print the string and accessing substring from given string.
10. Write python program to load data from dataset and analyze the data.
11. Write python program to subtract five days from current date.
12. Write python program to convert string to date-time.

**Software Tools:**

**Python** (Basic Programming: math, random, datetime; Data Handling: pandas, NumPy; Visualization matplotlib, seaborn; File Handling and OS: os, sys, shutil, Json; Data Analysis and visualization Libraries: Pandas, NumPy, Matplotlib, Seaborn, Plotly, Bokeh).

**Python Interpreter Tool:** Python (CPython) Version: 3.8 or above

**Integrated Development Environments (IDEs):** VS Code (Visual Studio Code), PyCharm Community Edition, Thonny, Jupyter Notebook, Anaconda Distribution.

# B.Tech. First Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 2SF09 | Workshop/Digital Fabrication Lab | 00 | 00 | 02 | 01 |

**Pre-requisites:** Nil

**Course Learning Objectives:**

1. To make familiar with different tools, equipment and to understand their basic purposes.
2. To develop skills and get hands on experience of marking, measuring, cutting, machining, shaping, forming processes and joining processes
3. To make the students well versed with basic electrical, electronics and computer components.
4. To learn the modern manufacturing techniques such as CNC, Robotic Operations and 3D printing.

**Course Outcomes:**

At the end of this course, the students will be able to

1. understand manufacturing processes, tools & equipment‘s, which are commonly employed in industries.
2. Apply craftsmanship & fabricate the components using various manufacturing techniques.
3. Understand the modern electrical, electronics & computer components & their applications

**Group A**

1) **Fitting:** Introduction to different tools , equipment‘s and operations in Fitting Shop. Prepare one job in the Fitting shop, involving operations like marking, filing, hacksaw cutting, drilling and tapping etc.
2) **Sheet Metal:** Introduction to Sheet Metal tools and equipment‘s, their uses, different sheet metal joints and operations in Sheet Metal. Prepare one job in the Sheet Metal shop.
3) **Welding:** Introduction to Welding, welding tools and equipment‘s, their uses. Brief introduction to different welding processes, different welding joints. Prepare one job in the Welding shop.
4) **Smithy:** Introduction to different tools, equipments and Smithy operations like upsetting, drawing, bending, forming etc. Prepare one job in the smithy shop.
5) **Carpentry:** Introduction to different wood working tools, equipment‘s and machines, types of joints and operations performed in Carpentry Shop. Prepare one job in the Carpentry shop.
6) **Machining: -** Introduction and practice of basic machining operations on Drilling, Lathe and shaper machine tools.

**Group B**

1) To identify the computer hardware parts, understand working of these parts, & Assemble demonstrate its working
2) Identification of various electrical & electronic components & tools used in domestic/industrial applications
3) Development of circuit schematic using EDA tools
4) 3D printing demonstration
5) Robotic operations demonstration
6) CNC operations demonstrations

**NOTE:**

Students have to perform any 4 practical from group A & any 3 practical from group B

# B.Tech. Second Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 1SF01 | Applied Mathematics I | 03 | 00 | 00 | 03 |

**Pre-requisite:**

1. Basic idea of differential and integral calculus.
2. Fundamental knowledge of trigonometric functions.
3. Essential knowledge of Differential Equation.

**Course Learning Objectives:**

1. To familiarize with techniques in calculus.
2. To evaluate partial derivatives of explicit, implicit functions, maxima and minima values of the functions.
3. To solve differential equation of certain type of differential equations and its applications.
4. To determine infinite series and their convergence and divergence.

**Course Outcomes:**

Students will be able to:

1. Make use of derivatives for finding nth derivatives and to solve indeterminate forms.
2. Extend the basic ideas of the calculus of functions of single variables to functions of several variables and its concept.
3. Find maximum and minimum value of a function.
4. Solve certain types of differential equations by various methods.
5. Utilize it for engineering problems of electrical circuit.
6. Determine infinite series and their convergence and divergence.

| UNIT | Subject: Applied Mathematics I | No. of Lectures Required |
|---|---|---|
| **Unit I** | **Differential Calculus I:** Successive differentiation, Leibnitz's theorem on the nth derivative of a product, Indeterminate forms. | **7** |
| **Unit II** | **Differential Calculus II:** Partial differentiation, Euler's theorem on homogeneous function. | **6** |
| **Unit III** | **Differential Calculus II:** Partial differentiation, Euler's theorem on homogeneous function. | **7** |
| **Unit IV** | **Ordinary differential equations of first order and first degree:** Non-homogeneous differential equation, Linear differential equation, reducible to Linear differential equation, Exact differential equation and reducible to Exact differential equation. | **7** |
| **Unit V** | **Differential equations of first order and higher degree:** Solvable for p, solvable for x and solvable for y, Application to Orthogonal Trajectories and Electrical circuits by Kirchoff's law. | **6** |
| **Unit VI** | **Infinite Series:** Tests for convergence by p-series test, Comparison test, Ratio test, Rabbe's test and Root test. | **7** |
| | **Total** | **40** |

**Text Books:**


1. Wartikar P.N. & Wartikar J.N.- A Text Book of Applied Mathematics Vol.-I & II, Pune V.G. Prakashan, Pune.
2. Grewal B.S. - Higher Engineering Mathematics, 40/e, Khanna Publishers.


**Reference Books:**


1. Kreyszig E.K. - Advanced Engineering Mathematics, John Wiley.
2. Ramana B.V. - Higher Engineering Mathematics, (TMH).
3. Singh R.R. & Bhatt M. - Engineering Mathematics, (TMH).
4. Dass H. K. – Advance Engineering Mathematics, S. Chand.

# B.Tech. Second Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 1SF02 | Applied Physics | 03 | 00 | 00 | 03 |

**Pre-requisite**:

1. Elementary idea about electric charge, electricity & magnetism.
2. Basic knowledge of material science.
3. Fundamental knowledge of optics.

**Course Learning Objectives:**

1. To impart the essential knowledge and applications of ballistics of charged particles in electric and magnetic fields.
2. To impart the fundamentals of optics, fibre optics and laser physics and their various applications in engineering fields.
3. To impart the knowledge of crystallography, fluid dynamics and cathode ray oscilloscope and their applications.
4. To enhance the imagination and creativity in students by performing practical experiments on related topics.

**Course Outcomes:**

Students will be able to,

1. Apply the concepts of electric and magnetic fields in mass spectrograph and Cathode Ray Oscilloscope.
2. The students will gain the basic ideas about crystallography and will be able to identify different types of crystal structures in solids.
3. The students will be able to utilize the knowledge of interference and diffraction.
4. The Students will gain the knowledge of LASER, its types and applications.
5. The Students will acquire the knowledge of fibre optics, its types and applications.
6. The Students will gain the knowledge of fluid dynamics and its applications.

| UNIT | Subject: Applied Physics (AP) | No. of Lectures Required |
|---|---|---|
| **UNIT I** | **Electron Ballistics:** Motion of charged particle in uniform transverse electric and transverse magnetic fields, velocity selector (energy filter), Bainbridge mass spectrograph, Hall effect, cathode ray oscilloscope: working and its block diagram. | **8** |
| **UNIT II** | **Crystallography:** Crystal structure, Unit cell, Cubic crystal structure: SC, BCC and FCC, Unit cell characteristics: Effective number of atoms per unit cell, atomic radius, coordination number, atomic packing fraction, Miller indices, Bravais lattice Inter-planar distance between adjacent planes. | **6** |
| **UNIT III** | **Interference and Diffraction of Light:** Fundamental condition of interference, thin film interference due to reflected light, Newton's rings experiment and it's applications, Fresnel and Fraunhofer diffraction, plane transmission diffraction grating. | **7** |
| **UNIT IV** | **Laser Physics:** Absorption, spontaneous and stimulated emission of radiation, population inversion, pumping, metastable state, characteristics and applications of laser, Ruby laser,He-Ne Laser. | **6** |
| **UNIT V** | **Fibre Optics:** Snell's law, total Internal reflection, construction of optical fibre, acceptance angle and acceptance cone, numerical aperture, types of optical fibre, attenuation, fibre optic communication system. | **7** |
| **UNIT VI** | **Fluid Dynamics:** Viscosity, Stoke's law, streamline and turbulent flow of liquid, Poiseuille's equation, Continuity equation, Bernoulli's theorem. | **6** |
| | **Total** | **40** |

**Text Books:**


1. R.K.Gaur & S.L.Gupta: Engineering Physics, Dhanpat Rai & Sons.
2. Hitendra K. Malik & A.K.Singh: Engineering Physics, Tata McGraw Hill
3. M.N. Avadhanulu & P.G. Kshirsagar: Engineering Physics, S.Chand Pub., 2008


**Reference Books:**


1. Orazio Svelto: Principle of Lasers, Springer
2. Frank L.Pedrotti, Leno M. Pedrotti, Leno S. Pedrotti: Introduction to optics.

# B.Tech. Second Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 1SF03 | Engineering Graphics | 02 | 00 | 00 | 02 |

**Pre-requisite**:

1. Knowledge of basic math concepts and terms.
2. Ability to visualize objects in three dimensions.
3. Computer literacy.

**Course Learning Objectives:**

1. To acquire and apply engineering graphics knowledge for communicating ideas, information and instructions.
2. To understand the representations of 3D objects and their projections.
3. To understand the representations of orthographic and isometric views of objects.
4. To introduce & apply different drafting commands of CAD software.

**Course Outcomes:**

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

1. Use the drawing instruments effectively to dimension the given figures and describe the methods of projection.
2. Construct the various types of plane in different orientation.
3. Apply knowledge of projection to construct different view of regular solid objects
4. Identify the pictorial views of the object.
5. Recognize the pictorial views of the object and construct isometric scale, isometric projection & views
6. Develop the lateral surfaces of primitive solids by using CAD Software.

| UNIT | Subject: Engineering Graphics | No. of Lectures Required |
|---|---|---|
| **UNIT I** | **Basics of Engineering Drawing and Projection:** Introduction to drawing instrument and their uses, concept of dimensioning and scales, geometric construction. Projection of Point, Projection of Line. | **04** |
| **UNIT II** | **Projection of Plane:** Projection of different types of planes such as triangular plane, square plane, rectangular plane, pentagonal plane, hexagonal plane, circular plane etc. by using change of position method and auxiliary plane method. | **04** |
| **UNIT III** | **Projection of Solids:** Projection of solids for Prism, Pyramid, Cone and Cylinder. | **05** |
| **UNIT IV** | **Orthographic Projection:** Construction of elevation, plan and side view of given object by using first and third angle projection methods. | **05** |
| **UNIT V** | **Isometric Views and Projection:** Construction of isometric scale, isometric views and projection. | **06** |
| **UNIT VI** | **Fundamental of CAD Software:** Drafting environment and drafting screen, coordinate systems, drafting and dimensioning commands, editing commands, drafting of basic geometrical shapes, display commands, CAD software customization. | **06** |
| | **Total** | **30** |

**Text Books:**

**1.** Bhatt N. D. & Panchal V. M. Engineering Drawing, 49th Edn., Charotar Pub. House, Anand, Gujrat, 2007.

**2.** Shah P. J. – Engineering Drawing, S. Chand Publication, 2008.

**3.** Dhawan R. K. – Engineering Drawing, S. Chand Publication, (5th edition, 2008).

**4.** Ingole D.S. – Engineering Graphics, Nirali Publication, Pune (1st Edition 2020).

**5.** Tickoo Sham – AutoCAD, BPB Publications.

## B.Tech. Second Semester (Electronics & Telecommunication Engineering)

| Course code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **1SF04** | **Programming for Problem Solving** | **02** | **00** | **00** | **02** |

**Pre-requisite**: Basic Computer Knowledge, Logical Thinking.

**Course Learning Objectives:** Throughout the course, students will be expected to demonstrate their understanding of the Programming for Problem Solving

1. Develop a solid understanding of the fundamental concepts of programming and problem-solving, including the input-process-output cycle, algorithms, and program design principles such as top-down and bottom-up approaches.
2. Acquire proficiency in the C programming language, including the ability to write and execute basic C programs, effectively use input-output functions, work with variables, data types, and operators, and understand the concept of program execution.
3. Demonstrate competence in using control constructs such as decision-making statements and looping statements to create efficient and structured programs.

**Course Outcomes :**

After Successful completion of this course, the student will be able to:

1. Understand the basic concepts of computer organization, program design and Algorithms.
2. Explain the basic structure and fundamentals of C programming.
3. Compare and contrast the decision-making constructs and looping statements in C programming.
4. Understand the concept of arrays and string functions in C language.
5. Demonstrate the ability to write and use the concept of functions.
6. Apply the concepts of pointer declaration, assignment and arithmetic operation.

| UNIT | 1SF04 Programming for Problem Solving | No. of Lectures Required |
|---|---|---|
| **Unit-1** | **Introduction**: Characteristics of Computer, Organization of Computer, Input –Process Output Cycle Various Types of Memory (Primary Memory & Secondary Memory), Introduction to C language, Basic structure. | **05** |
| **Unit-2** | **C Fundamentals:** Program Execution First C Program, Input Output using scanf() and printf(), Data type, Variables, Keywords, Operators and their precedence. | **05** |
| **Unit-3** | **C Control construct:** Decision making using if, if-else,if-else-if and switch. Looping using for, while, do while, Jumps Statements (break, continue, goto, return), Basic Programs. | **05** |
| **Unit-4** | **Array and Strings:** Introduction to Array, 1-D array: Declaration & Initialization, 2-D array: Declaration & Initialization, Strings: Declaration & Initialization, String functions. | **05** |
| **Unit-5** | **Functions:** Function: Pre defined functions; User defined functions, Multi-function Program, Elements of user defined functions, Return value and their types, Function calls, Function Declaration. | **05** |
| **Unit-6** | **Pointers:** Definition and uses of pointers, pointer declaration, pointer assignment, pointer arithmetic, Pointers and Functions: Call by value and call by reference. | **05** |
| | **Total** | **30** |

**Text Book:**


1. R. S. Salaria : Programming for Problem Solving , Khanna Publication .
2. E Balagurusamy: Computing Fundamentals and C Programming- Tata McGraw Hill, Second Edition


**Reference Books:**


1. Herbert Schildt- C Complete reference (Tata McGraw Hill)
2. Yashwant Kanetkar- Let us C- Seventh Edition

## B.Tech. Second Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 1SF05 | Professional Communication Skills (PCS) | 01 | 01 | 00 | 02 |

**Pre-requisite**:

1. Basic knowledge of vocabulary and grammar of English.
2. Basic knowledge of LSWR skills.

**Course Learning Objectives:**

1. Introduce communication skills and improve vocabulary.
2. Enhance the Employability skills and develop problem solving attitude.
3. Develop confidence and help them attend interviews successfully.
4. Develop the importance of team building and networking.

**Course Outcomes:**

Students will be able to

1. Use words correctly in a sentence.
2. Become a competent communicator.
3. Express and present their ideas relevant to the given topic.
4. Develop critical thinking skills, decision making ability and team spirit.
5. Develop skills needed for approaching different types of interviews.
6. Become ethical confident individual professionally and socially.

| UNIT | Subject: Professional Communication Skills (PCS) | No. of Lectures Required |
|---|---|---|
| Unit I | **Communication Skills:** Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context Barriers to communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers | 5 |
| Unit II | Unseen passage, vocabulary building (Synonyms & Antonyms, Prefix and Suffix, Error Analysis, one word substitute), developing story on given outline. | 5 |

| | | |
|---|---|---|
| **Unit III** | Self-Introduction-organizing the material - introducing the topic – extempore speech –<br>Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Time Management—Visual presentation | **5** |
| **Unit IV** | Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic -– questioning and clarifying –GD strategies- activities to improve GD skills | **5** |
| **Unit V** | Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview & panel interview – FAQs related to job interviews | **5** |
| **Unit VI** | Recognizing differences between groups and teams- networking professionally- respecting social protocols-understanding career management-developing a long- term career plan-making career changes. | **5** |
| | **Total** | **30** |

**Text Books:**


1. Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015
2. Interact English Lab Manual for Undergraduate Students, OrientBalckSwan: Hyderabad, 2016.
3. M.Ashraf Rizvi, Effective technical communication. Tata McGraw-Hill Publishing Company Limited. New Delhi.


**Reference Books:**


1. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015.
2. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014.
3. S. Hariharanetal. Soft Skills. MJP Publishers: Chennai, 2010.
4. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011.


**Term Work (50 marks):**

1. **Oral Communication**: Self introduction, Extempore, Group discussion, Presentation, Role plays and Mock interview (Students should complete any two oral activities).
2. **Non verbal communication**: Body language, facial expressions, tone of voice**.**
3. **Written communication**: Test (short answers, developing story, expanding an idea, comprehending unseen passage) and Assignments based on the syllabus.

**Marking Scheme:-**

1. Oral activity I: 10 marks
2. Oral activity II: 10 marks
3. Written test based on syllabus: 10 marks
4. Assignments based on syllabus: 10 marks
5. Personal Interview: 10 marks

# B.Tech. Second Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 1SET01 | Electrical Measurement & Measuring Instruments | 02 | 00 | 00 | 02 |

**Pre-requisites:**

1. Concepts of Electrostatics and Current Electricity.
2. Fundamentals of Magnetic effect of electric current, magnetism and Electromagnetic Induction.

**Course Learning Objectives:**

1. To introduce Measurements**,** Measurement Systems and its significance
2. To analyse of Static characteristics, types of Errors , Statistical Parameters
3. To Understand Measurement of Resistance and Wheatstone Bridge
4. To Understand Measurement of Inductance and Capacitance
5. To Understand Measurement of Current, Voltage and PMMC Instruments.
6. To Understand Measurement of Power, Energy and Transducer with its classification.

**Course Outcomes:**

After completion of this course the student shall be able to:

1. Understand fundamentals of Electrical Measurements**,** Measuring instruments and its significance.
2. Analyse Static characteristics, Comprehend types of Errors and exhibit the knowledge of various Statistical Parameters.
3. Measure medium and low resistances using appropriate bridges.
4. Measure Capacitance and inductance using appropriate bridges.
5. Demonstrate the knowledge of DC & AC Current & Voltage measurements using PMMC & Moving Iron Instruments
6. Demonstrate the knowledge of measurement of Power using Electrodynamometer type Wattmeter & Energy using Induction type single phase Energy meter & understand importance of Transducers along with its classification.

| UNIT | Subject: Electrical Measurement & Measuring Instruments | No. of Lectures Required |
|---|---|---|
| Unit I | **Measurements and Measurement Systems:** Measurements and its significance, Methods of measurements, Types and classification of measuring instruments, Analog and digital modes of operations, Functions and applications of measurement systems, Elements of generalized measurement systems. | 7 |

| | | |
|---|---|---|
| **Unit II** | **Static characteristics:** Accuracy, Precision, Sensitivity, Linearity, Threshold, Resolution, Repeatability and Hysteresis. **Errors:** Gross error, Systematic error, Random error, Limiting error. **Statistical Parameters:** Arithmetic mean, Range, deviation, average deviation, Standard deviation, variance Probable error. (Numerical Expected) | **8** |
| **Unit III** | **Measurement of Resistance:** Classification of Resistance, Wheatstone Bridge, Sensitivity of Wheatstone Bridge, Precision measurement of medium resistances with Wheatstone Bridge, Low resistance measurement using Kelvin double bridge. | **7** |
| **Unit IV** | **Measurement of Capacitance and Inductance:** Measurement of Capacitance using Schering Bridge and modified De Sauty‘s Bridge.Measurement of Inductance using Maxwell‘s Bridge and Hay‘s Bridge. | **7** |
| **Unit V** | **Electrical Measuring Instrument:** Measurement of Current and Voltage,Construction, Principle of working of PMMC and Moving Iron Instruments, Range extensions of ammeters and voltmeters, Numerical on Range extensions. | **6** |
| **Unit VI** | **Measurement of Power and Energy:** Electrodynamometer type Wattmeter & Induction type single phase Energy meter. **Introduction to Transducers:** Transducer and its primary classification, Generalized Instrumentation system. | **7** |
| | **Total** | **40** |

**Text Books:**


1. H. S. Kalsi, Electronic Instrumentation, McGraw Hill Education Pvt Ltd., New Delhi, 1995.
2. A.K.Sawhney, A course in Electrical and Electronic Measurement and Instrumentation – Dhanpat Rai and Sons, New Delhi, 1999
3. B.C.Nakra and K.K.Chaudary, Instrumentation Measurement and Analysis, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1985.


**Reference Books:**


1. David A. Bell, Electronic Instrumentation and Measurements, Third Edition, Oxford Higher Education,
2. D.Patranabis, Principles of Industrial Instrumentation, Tata McGraw Hill Publishing Ltd., New Delhi, 1999.
3. R.K.Jain, Mechanical and Industrial Measurements, Khanna Publishers, New Delhi, 1999.
4. Ernest O. Doebelin, Measurement systems Application and Design, International Student Edition,

   IV Edition, McGraw Hill Book Company, 1998.4. Robert L.Boylestad, ―Electronic Devices and Circuit theory‖, Publ. Pearson Education

## B.Tech. Second Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 1SF06 | Design Thinking (DT) | 01 | 00 | 00 | 01 |

**Pre-requisite**: Nil

**Course Learning Objectives:**

1. To familiarize students with design thinking concepts and principles.
2. To ensure students can practices the methods, processes and tools of design thinking.
3. To ensure students can apply the design thinking approach and have ability to model real world situations.

**Course Outcomes:**

Students will be able to –

1. Understand design thinking principles and concepts.
2. Practice the methods, processes, and tools of design thinking.
3. Describe the role and purpose of the observation phase.
4. Explain the purpose and structure of the point-of-view phase.
5. Illustrate the purpose, flow, and importance of the ideate phase.
6. Clarify the role and purpose of the prototype phase.

| UNIT | Subject: Design Thinking | No. of Lectures Required |
|---|---|---|
| **Unit I** | **Fundamentals of Design Thinking**: Principles of Design Thinking, the process of Design Thinking, how to plan a Design Thinking project | **2** |
| **Unit II** | **Understanding the Design Problem:** Search field determination, Problem clarification, Understanding of the problem, Problem analysis, Reformulation of the problem | **3** |
| **Unit III** | **Observing the Problem:** Observation Phase, Empathetic design, Tips for observing, Methods for Empathetic Design | **2** |
| **Unit IV** | **Defining the Problem:** Point-of-View Phase, Characterization of the target group, Description of customer needs | **3** |
| **Unit V** | **Finding and Selecting Ideas:** Ideate Phase, The creative process and creative principles, Creativity techniques, Evaluation of ideas | **2** |
| **Unit VI** | **Prototyping:** Prototype Phase, Lean Startup Method for Prototype Development, Visualization and presentation techniques | **2** |
| | **Total** | **14** |

**Text Books:**


1. Christian Mueller-Roterberg, Handbook of Design Thinking, Research Gate November 2018.
2. Nigel Cross, Design Thinking: Understanding How Designers Think and Work, Amazon books.


**Reference Books:**


1. Dr. D. Ravindran, Introduction to Design Thinking, Notion Press.


**Term Work (50 marks)**

Students should complete the following activities

1. Participate in a design challenge to solve the real-world problem using design thinking principles.
2. Analyze case studies on design thinking application in various industries.
3. Design a project that applies design thinking principles to a specific problem or opportunity.

**Marking Scheme:-**

1. Participation in a design challenge -10
2. Case Study-10
3. Designing of a project-10
4. Assignments-10
5. Attendance in theory classes- 10

# B.Tech. Second Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 1SF07 | Applied Physics Lab | 00 | 00 | 02 | 01 |

**Pre-requisite:**

1. Identify and handle various equipment likes vernier calliper, micrometer screw gauge, multimeter, spectrometer.
2. Basic knowledge of graphical representation of observed values.

**Course Learning Objectives:**

1. To gain practical knowledge by applying experimental methods to correlate with the theory.
2. Apply the analytical techniques and graphical analysis to the experimental data.
3. To develop basic understanding of various experimental principles involved.

**Course Outcomes:**

Students will be able to,

1. Develop experimental skills to impart practical knowledge in real time.
2. Understand principle, concept, working and applications of areas in physics and compare the results obtained with theoretical calculations.
3. Conduct experiment and record experimental data, Analyse the obtained data and Draw conclusions from the Laboratory exercise based on the analysed data.

| | **Subject: Applied Physics Lab** |
|---|---|
| **Expt. 1** | Study of CRO I: To measure A.C voltage, D.C voltage and frequency using CRO. |
| **Expt. 2** | Study of CRO II: To determine frequency of unknown signal by using Lissajous patterns. |
| **Expt. 3** | To determine wavelength of monochromatic light by using Newton's Ring experiment. |
| **Expt. 4** | To determine wavelength of monochromatic light by using Plane transmission diffraction grating. |
| **Expt. 5** | Determination of grating element of diffraction grating, using LASER beam. |
| **Expt. 6** | Study of various crystal structures. |
| **Expt. 7** | To determine Miller Indices of crystal planes. |
| **Expt. 8** | To plot the V-I characteristics of LED and to find it's striking potential. |
| **Expt. 9** | To measure the intensity and divergence of given LASER beam. |
| **Expt. 10** | To determine the coefficient of viscosity using Stoke's law. |
| **Expt. 11** | Study of Hall effect in semiconductor. |
| | **Total (Minimum 8 particles are to be performed)** |

**Text Books:**


1. Dr. Ruby Das & C. S. Robinson: Engineering Physics Practical, Laxmi Publications.
2. Dr. B. Shriniwas Rao: Engineering Physics Practical, Laxmi Publication.


**Reference Books:**


1. William David Cooper: Electronic Instrumentation and Measurement Techniques, Eastern Economy Edition publications.

# B.Tech. Second Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 1SF08 | Engineering Graphics – Lab | 00 | 00 | 02 | 01 |

**Pre-requisite:**

1. Knowledge of basic math concepts and terms.
2. Ability to visualize objects in three dimensions.
3. Computer literacy.

**Course Learning Objectives:**

1. To understand the concepts of drawing as a language of communication of Engineers
2. To improve the visualization skills for better understanding of solids using CAD software.
3. To acquire skills to interpret and convert multi-views drawing into single view and vice-versa.

**Course Outcomes:**

At the end of course, Learner will be able to –

1. Illustrate the projection of points, lines and surfaces
2. Understand the concept of orthographic and isometric projection
3. Construct different types of solids in different positions by using CAD software

**List of Practical:**

Every student will submit a set of at least FIVE drawing sheets (from 1 to 6 listed below) and perform at least TWO practical (from 7 to 9 listed below) using CAD software.
Examination will consist of viva-voce based on the syllabus.

1. Projection of straight line
2. Projection of plane
3. Projection of solids
4. Orthographic projection
5. Isometric projection/view
6. Free hand sketches of simple machine elements, like
   (a) Screw threads ISI profile
   (b) Types of nuts, bolts, studs, set screws, washers, locking arrangement of nuts & bolts
   (c) Foundation bolts – Rag, eye, lewis types
7. Drafting of basic 2D geometrical shapes using CAD software
8. Drafting of basic 3D geometrical shapes using CAD software
9. Drafting of 2D and 3D objects using surface modelling commands

## B.Tech. Second Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **1SF09** | **Programming for Problem Solving Lab** | **00** | **00** | **02** | **01** |

**Pre-requisite**:

**Course Learning Objectives:** Throughout the course, students will be expected to demonstrate their understanding of Programming for Problem Solving Lab by being able to do each of the following:

1. Set up and use a C programming development environment (IDE, compiler, etc.) to write, compile, and run programs.
2. Understand and apply fundamental programming constructs such as variables, control structures, functions, arrays, strings, and pointers in C.
3. Develop algorithmic thinking using flowcharts or pseudocode to solve problems through a structured, top-down approach.

**Course Outcomes:**

After successfully completing the course, students will be able to-

1. Develop and execute basic C programs to solve simple problems using appropriate programming constructs.
2. Analyze and apply control flow mechanisms and data structures (arrays, strings, functions, and pointers) to implement efficient C programs.
3. Demonstrate problem-solving skills through the application of algorithmic logic and programming techniques

**List of Experiment:**

*Minimum 8 to 10 practical's are to be conducted based on subject* ***1SF04*** **Programming for Problem Solving**

**List of Experiments/ Practical's:**

Minimum 8 experiments are to be performed.

1. Set up a C programming environment (compiler, IDE, etc.).

2. Write a simple program to display "Hello, World!".

3. Solve a simple problem using a top-down approach and develop a program accordingly.

4. Use flowcharts or pseudo code to represent the algorithm for a specific problem.

5. Write program to illustrate precedence of operator

6. Write programs that demonstrate the use of if, if-else, and switch statements for decision making.

7. Create and manipulate 1-D, 2-D arrays (declaration, initialization, accessing elements).

8. Explore string manipulation functions (strcpy, strcat, strlen, etc.)

9. Write programs using user-defined functions to solve specific tasks

10. Understand and use return values and their types.

11. Explore the concept of call by value using pointers.

12. Explore the concept of call by reference using pointers

## B.Tech. Second Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 1SET02 | Electrical Measurement & Measuring Instruments Lab | 00 | 00 | 02 | 01 |

**Pre-requisites:**

1. Concepts of Electrostatics and Current Electricity.
2. Fundamentals of Magnetic effect of electric current, magnetism and Electromagnetic Induction.

**Course Learning Objectives:**

1. To introduce Measurements**,** Measurement Systems and its significance
2. To analyse of Static characteristics, types of Errors , Statistical Parameters
3. To Understand Measurement of Resistance and Wheatstone Bridge
4. To Understand Measurement of Inductance and Capacitance
5. To Understand Measurement of Current, Voltage and PMMC Instruments.
6. To Understand Measurement of Power, Energy and Transducer with its classification.

**Course Outcomes:**

After completion of this course the student shall be able to:

1. Understand fundamentals of Electrical Measurements**,** Measuring instruments and its significance.
2. Analyse Static characteristics, Comprehend types of Errors and exhibit the knowledge of various Statistical Parameters.
3. Measure medium and low resistances, Capacitance and inductance using appropriate bridges.

**Contents: This is a representative list of practicals. The student is required to perform Minimum Eight practical's as per his choice so as to cover entire contents of this course.**

- **List of Experiments:**

1. Measurement of resistance using Wheatstone's Bridge.
2. Measurement of resistance using Kelvin double bridge.
3. Measurement of capacitance using Schering Bridge.
4. Measurement of capacitance using modified De Sauty's Bridge.
5. Measurement of Inductance using Maxwell's Bridge.
6. Measurement of Inductance using Hay's Bridge.
7. Measurement of Power using two wattmeter method.
8. Measurement of single phase Energy using wattmeter method.
9. Design of multi-range DC ammeter.
10. Design of multi-range DC voltmeter.
11. Study of various types of Transducers.
12. Measurement of high resistance using Megger.

# B.Tech. Second Semester (Electronics & Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **1SF10** | **NSS/Sports/Yoga/Cultural/Community Service** | **00** | **00** | **02** | **01** |

**Pre-requisites**:

1. Basic physical and mental fitness.
2. Willingness to volunteer time.

**Course Learning Objectives:**

1. To develop a sense of responsibility, discipline and social values through participation in community base activity.
2. To enhance physical, mental and emotional wellbeing while fostering teamwork.
3. To strengthen, problem solving, decision making and organizing skill by addressing real world issues in the community.

**Course Outcomes:**

Students will be able to –

1. Demonstrate and understand community service and social responsibility through the participation in NSS activities.
2. Demonstrate proficiency in basic yoga posture and breathing techniques.
3. Develop leadership, creativity, self-expression and time management skills through the participation in sports activities, music, dance, drama or fine art.

| | **Subject: NSS/Sports/Yoga/Cultural/Community Service** |
|---|---|
| **ACTIVITY- I** | NSS- Cleanliness drive, Blood donation, Tree plantation, Health and hygiene awareness program, Plastic waste management. |
| **ACTIVITY-II** | SPORTS- Introduction to Sports, Importance of health and fitness, Brief information of any one outdoor game, Brief information of any one indoor game, Article writing on any recent match of your choice. |
| **ACTIVITY-III** | YOGA- Introduction to yoga, Importance of yoga, Suryanamaskar (12 yoga postures) with benefits, Importance of balanced diet, Meditation for mental health. |
| **ACTIVITY-IV** | CULTURAL- Skit, Mime & Street play, Light music (singing), Any one dance form, Poster/Rangoli (any theme ). |
| **ACTIVITY-V** | COMMUNITY SERVICE- Visit to blind home, Visit to Old age home, Visit to Orphanage, Distribution of clothes, medicine to needy people. |

**Text Book:**

1. "National Service Scheme: A Handbook for Volunteers" **by Dr. A. R. Anuradha.**
2. "Sports and Physical Education" by Dr. S. K. Sharma.

**Reference Book:**

1. "The Yoga Sutras of Patanjali" by Swami Sivananda.

**Term Work (50 marks):**

1. Field visits to 'Old age home', Orphanage or Ashram shala to run activities such as cleaning the premises, tree plantation, donating medicines, cloths etc., to develop the values of selfless service.
2. Participation in yoga sessions to promote physical and mental fitness and also to get aware about yoga.
3. Participation in outdoor and indoor games to promote physical
4. Participation in various cultural activities for the development of skills and to encourage creativity and talent.
5. Participation in community services such as making water bowls for birds, tree plantation, distribution of food to underprivileged families, etc.

**Marking Scheme:**

1. Field visit: 10
2. Participation in yoga: 10
3. Participation in outdoor and indoor games: 10
4. Participation in various cultural activities: 10
5. Participation in community services: 10

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# B.Tech. Third Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 3SE01 | Applied Mathematics – III | 02 | 00 | 00 | 02 |

## Pre-requisites:

1. Essential knowledge of differential and Integral Calculus
2. Knowledge of Vector Algebra.

### Course Learning Objectives:

1. To solve linear differential and difference equations with constant coefficients and study partial differential equations using appropriate mathematical techniques.
2. To apply Laplace and Fourier transforms to analyze mathematical functions and understand their applications in engineering problems.
3. To comprehend and implement fundamental numerical methods and vector calculus techniques for computational and analytical problem-solving.

## Course Outcomes:

After successfully completing the course, the students will be able to

1. Apply the knowledge to solve differential equations and difference equations by different methods.
2. Find Laplace Transform by making use of its properties.
3. Solve certain forms of difference equations and find Fourier transforms.
4. Use numerical methods to obtain appropriate solutions.
5. Identify and solve partial differential equation of first order.
6. Apply the knowledge of vector calculus to solve physical problem.

| Unit No. | Content: Applied Mathematics – III | No. of Lectures Required |
|---|---|---|
| 1 | **Ordinary differential equations:** Complete solution of linear differential equation by using complementary function and particular integral, Cauchy's linear differential equations. | 05 |
| 2 | **Laplace transform:** Definition, Standard forms, Properties of Laplace transform, inverse Laplace transform, Convolution theorem. | 05 |
| 3 | **a) Difference equation**: Complete solution of linear difference equation with constant coefficients. **b) Fourier Transform:** - Definition, standard forms Fourier transforms, Fourier sine and Fourier cosine transforms and its inverse transforms. | 05 |
| 4 | **Numerical Methods:** Solution of algebraic and transcendental equations by Newton-Raphson method, Solution of system of linear equations by Gauss-Seidal method, Numerical solution of differential equations by Picard's method, Taylor's series method and Runge-Kutta fourth order method. | 05 |
| 5 | **Partial differential equation**: Partial differential equation of first order of following form: (i) f $(p, q) = 0$; (ii) $f(p, q, z) = 0$; (iii) $f(x, p) = g(y, q)$; (iv) $Pp + Qq = R$ (Lagranges Form); $(v)z = px + qy + f(p, q)$(Clairauts form). | 05 |
| 6 | **Vector calculus:** Scalar and vector point functions, Differentiation of vectors, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point. | 05 |
| | **Total** | 30 |

**Text Books:**


1. Wartikar P.N. & Wartikar J.N.- A Text Book of Applied Mathematics Vol.- II, Pune V.G. Prakashan, Pune.
2. Grewal B.S. - Higher Engineering Mathematics, 40/e, Khanna Publishers.


**Reference Books:**


1. Kreyszig E.K. - Advanced Engineering Mathematics, John Wiley.
2. Ramana B.V. - Higher Engineering Mathematics, (TMH).
3. Singh R.R. & Bhatt M. - Engineering Mathematics, (TMH).
4. Dass H. K. – Advance Engineering Mathematics, S. Chand.

# B.Tech. Third Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 3SE02 | Electronic Devices & Circuits | 03 | 00 | 00 | 03 |

**Pre-requisites:**

1. Basic knowledge of Semiconductor Physics

**Course Learning Objectives:**

1. To study the characteristics, construction, and key parameters of semiconductor devices such as PN junction diodes, BJTs (in CB, CE, and CC configurations), JFETs, and MOSFETs, along with their practical applications.
2. To analyze various transistor biasing and stabilization techniques, emphasizing the importance of BJT biasing methods in achieving thermal and operational stability.
3. To understand the design and analysis of amplifier and oscillator circuits, including single-stage and multistage amplifiers as well as RC oscillator configurations.

**Course Outcomes:**

After completion of this course the student shall be able to :

1. Understand fundamentals of PN Junction diode, Static and Dynamic Resistance and application of diode as rectifier.
2. Learn the working of BJT, its modes and regions of operation with characteristics.
3. Analyze various stabilization techniques in BJT.
4. Study the concept of amplifier and RC oscillator and its types.
5. Learn numerous types of multistage amplifiers.
6. Comprehend JFET and MOSFET with parameters and Characteristics.

| Unit No. | Content: Electronic Devices & Circuits | No. of Lectures Required |
|---|---|---|
| 1 | **PN junction diode:** Formation of p-n junction, biasing the diode, V-I characteristics of diode, static and dynamic resistance, Analysis of Half Wave Rectifier (HWR), Full Wave Rectifier (FWR), introduction to C, L, LC and CLC filters, Zener diode and its application as voltage regulator. | **08** |
| 2 | **Bipolar Junction Transistors:** Operation of PNP and NPN transistor, CB, CE and CC configurations with characteristics and parameters, transistor as a switch | **07** |
| 3 | **Biasing & Stabilization Techniques in BJT:** DC load line, transistor biasing methods, bias stability, Introduction to voltage divider biased CE amplifiers using h-parameter model | **08** |
| 4 | **Feedback amplifiers:** Feedback concept, effects of negative feedback with analysis, **Sinusoidal oscillators:** Barkhausen's criteria for sustained oscillations , Hartley, Colpitts, RC Phase shift, Wein bridge and crystal oscillators | **07** |
| 5 | **Multistage Amplifiers**: Need of multistage, direct coupled amplifier, RC coupled amplifier, transformer coupled amplifier, emitter follower, Darlington emitter follower, bootstrapping principle | **07** |
| 6 | **JFET:** Theory, construction, characteristics and parameters<br>**MOSFET**: Theory, construction and characteristics of enhancement & depletion type MOSFET | **08** |
| | **Total** | **45 – Lectures** |

**Text Books:**


1. David Bell: Electronic Devices and Circuits, Oxford University Press, 2010.
2. Milliman and Halkias: Integrated Electronics, Tata McGraw Hill, New Delhi.


**Reference Books:**


1. Robert L.Boylestad, "Electronic Devices and Circuit theory", Publ. Pearson Education.
2. Floyd, "Electron Devices" Pearson Asia 5th Edition, 2001.
3. Donald A Neamen, "Electronic Circuit Analysis and Design" Tata McGraw Hill, 3rd Edition, 2003.

# B.Tech. Third Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 3SE03 | Digital System Design | 02 | 00 | 00 | 02 |

**Pre-requisites:**

**1.** Applied Physics

**Course Learning Objectives:**

1. To study the fundamental concepts and techniques used in digital electronics & illustrate reduction of logical expressions using Boolean algebra and k-map
2. To inculcate the design procedure of combinational logic circuits & Sequential logic circuits.
3. To understand the Synchronous logic circuits & to study the design procedures of synchronous state machines using flip-flops

**Course Outcomes:**

After completion of this course the student shall be able to:

1. Apply Boolean algebra and number system to solve logic function.
2. Simplify Combinational logic circuit using K-Map.
3. Analyze and design MSI circuit using 74xx series chip.
4. Apply the knowledge of flip-flops to design Sequential logic circuits.
5. Implement synchronous logic circuits.
6. Analyze and design synchronous state machines using flip-flops.

| Unit No. | Content: Digital System Design | No. of Lectures Required |
|---|---|---|
| 1 | **Boolean algebra:** Number system & their conversions, logic Gates, Boolean algebra & its Simplification. | 05 |
| 2 | **Minimization of Boolean functions:** Canonical and Standard Form, Karnaugh Map Method - Up to four Variables, Don't Care K-Map Entries upto 4 variables & Implementation using Logic gates. | 05 |
| 3 | **Combinational Logic Circuits design using MSI 74xx ICs:** Design Procedure, Adders: Half & full adder, Multiplexers, Demultiplexers, Decoders, Encoders, Magnitude Comparators, Parity Generator/Checker. | 05 |
| 4 | **Sequential logic circuit:** Concept of Sequential circuits, Memory element: flip-flops, SR, JK, Master Slave JK, D and T Type Flip Flops, Excitation Table of all Flip Flops. | 05 |
| 5 | **Registers and counters**: Registers: SISI, SIPO, PISO, and PIPO. Counter: Ripple counters, Synchronous Up counters. | 05 |
| 6 | **Synchronous Sequential Circuits:** Mealy Machine, Moore Machine**,** Analysis of clocked sequential circuit with state machine designing, State reduction and assignment, Design Procedure, Sequence detector using D, J-K, T FF | 05 |
| | **Total** | 30 |

**Text Books:**


1. R P Jain "Modern Digital Electronics" McGraw Hill Publication.
2. A.Anand Kumar "Fundamental of Digital Circuits" PHI 4th edition, 2018.n
3. Digital Electronics: Principles, Devices and Applications.


**Reference Books:**


1. Morris Mano, ―Digital Design, Prentice Hall of India, Third Edition.
2. Digital Principles and Applications, Malvino and Leach Tata McGraw Hill
3. Digital Electronics: Principles, Devices and Applications, Anil K Maini, Wiley 1st 2007

# B.Tech. Third Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 3SE04 | Electromagnetic Waves | 03 | 00 | 00 | 03 |

**Pre-requisites:**

1. Applied Mathematics-I
2. Applied Mathematics-II

**Course Learning Objectives:**

1. To understand fundamentals of orthogonal coordinate systems and interrelation with 1-D, 2-D & 3-D vectors.
2. To impart knowledge of Static Electric field and the associated laws.
3. To analyze time varying electric and magnetic fields at various boundary conditions and to understand concepts of propagation of EM waves.
4. To understand the concept of radiation due to monopole and Quarter wave monopole & half wave dipole.

**Course Outcomes:**

After successfully completing the course, the students will be able to

1. Apply concepts of vector calculus in three dimensional coordinate systems.
2. Explain and analyze the concept of electrostatic fields.
3. Explain and analyze the concept of magneto statics.
4. Analyze plane electromagnetic waves at boundaries between homogeneous media and elaborate Maxwell's equations.
5. Describe and analyze electromagnetic wave propagation in different media.
6. Analyze the electromagnetic radiation from localized charges considering retardation effects and from monopoles & dipols.

| Unit No. | Content: Electromagnetic Waves | No. of Lectures Required |
|---|---|---|
| 1 | **Review of Vector Analysis:** Cartesian, Cylindrical and Spherical Co-ordinate Systems, Vector products, Projection of Vectors, Gradient, Divergence and Curl, line, surface, volume integrals, Divergence Theorem and Stokes theorem. | **07** |
| 2 | **Electrostatics**: Coulomb's Law, Electric field intensity, Evaluation of Electric field intensity due to line charge, Surface charge and Volume charge distribution, Electric flux and Electric flux density, Gauss Law, Electrostatic potential, Potential gradient, Electric dipole and Polarization. | **07** |
| 3 | **Magnetostatics:** Biot–Savart Law, Ampere's Circuital Law, Magnetic field intensity, Magnetic field intensity evaluation due to infinite, finite and circular current carrying conductors, Magnetic flux and Flux density, Magnetic dipole and Magnetization. | **07** |
| 4 | **Boundary Conditions & Maxwell's Equations:** Boundary condition at Dielectric – Conductor interface, Dielectric – Dielectric interface, Boundary conditions for magnetic materials interface, Current continuity equation, Maxwell's equations. | **07** |
| 5 | **Electromagnetic wave propagation:** Electromagnetic wave equation for free space, lossy dielectric material and perfect conductor, Propagation constant, Attenuation constant & Phase shift constant, Skin depth, Poynting Theorem, Reflection of a plain wave in a normal incidence at Dielectric – Dielectric interface | **07** |
| 6 | **Radiation:** Scalar and Vector magnetic potential, Retarded potential, Electric & Magnetic fields, Power radiated and Radiation resistance due to oscillating dipole, Quarter wave monopole & Half wave dipole. | **07** |
| | **Total** | **42** |

**Text Books:**


1. Hayt W.H.: "Engineering Electromagnetic" Tata Mc Grawhill
2. Jordan E.C. and Balamin K.C.: "Electromagnetic Waves and Radiating System "Prentice Hall of India Private Limited.


**Reference Books:**


1. Mathew N.O., Sadiku "Principles of Electromagnetics" (Fourth Edition), Oxford University Press
2. Kranss J.D.: "Electromagnetic" Mc Grawhill Books co. (Third Edition)
3. Ramo S. and Whinnery R.: "Fields and Waves in Communication Electronics" John Wiley and sons, New Delhi.
4. Dr. TVS Arun Murthy, "Electromagnetic Fields (Theory & Problems)" S. Chand & Company Ltd.

# B.Tech. Third Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 3SEOE1A | Operation Management | 03 | 00 | 00 | 03 |

**Pre-requisites: Nil**

**Course Learning Objectives:**

1. To understand the fundamentals of production systems, including production classification, system design, and capacity planning.
2. To analyze decision-making methodologies, forecasting techniques, correlation methods, and their applications in production planning.
3. To study process and facility design, including location theory, layout classifications, and the functions of materials management.

## Course Outcomes:

After successfully completing the course, the students will be able to

1. Describe Production system, types of production and Factors affecting the productivity.
2. Analyze the different models in decision methodology.
3. Analyze the manufacturing system and importance of capacity decisions.
4. Analyze the Selecting a Suitable Location and economic location for plant layout.
5. Describe the different forecasting methods and applications and Control of Forecast.
6. Analyze the Purpose of a Product Design and scope of Materials Management.

| Unit No. | Content: Operation Management | No. of Lectures Required |
|---|---|---|
| **1** | **Operations Management Concepts:** Historical Development, Concept of Production, Production System, Classification of Production System, Production Management, Operations System, Operations Management & its Objectives, The Strategic Role of Operations, Productivity & Factors affecting the productivity. | **07** |
| **2** | **Operations Decision-Making**: Management as a Science, Characteristics of Decisions, Framework for Decision-Making, Types of Decision Methodology, Decision Support System, Economic Models, Statistical Models, Decision Tree. | **07** |
| **3** | **Systems Design and Capacity:** Manufacturing and Service Systems, Design and Systems Capacity, Capacity Planning, Process of Capacity Planning, Importance of Capacity Decisions. | **07** |
| **4** | **Facility Location and Layout:** Need for Selecting a Suitable Location, Factors Influencing Plant Location/Facility Location, Location Theories, Location Models, Locational Economics, Plant Layout, Classification of Layout, Design of Product Layout, Design of Process Layout. | **07** |
| **5** | **Forecasting Demand:** Forecasting Objectives and Uses, Forecasting Decision Variables, Forecasting Methods, Exponential Smoothing, Regression and Correlation Methods, Applications and Control of Forecast. | **07** |
| **6** | **Product Development and Design:** Purpose of a Product Design, Product Analysis, A Framework for Process Design, Design for Manufacture (DFM), Design for Excellence. **Materials Management:** Scope or Functions of Materials Management, Material Planning and Control, Purchasing, Stores Management, Standardization and its advantages & disadvantages. | **07** |
| | **Total** | **42** |

**Text Books:**


1. S. Anil Kumar & N. Suresh: "Operations Management" New Age International Pvt. Ltd
2. Jay Helzer and Barry Render.: "Operations Management" Pearson, Kindle Edition.


**Reference Books:**


1. William J. Stevenson: "Operations Management" (13th Edition), McGraw Hill
2. Christian Terwiesch: "Operations Management" (3rd Edition) Mc Graw Hill
3. Krajewski, Malhotra and Ritzman: "Operations Management Processes and supply chains" (11th Edition), Pearson.

# B.Tech. Third Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 3SEOE1B | OE-I-Marketing Management | 03 | 00 | 00 | 03 |

**Pre-requisites: Nil**

**Course Learning Objectives:**

1. To impart the knowledge of Marketing management and the basic concepts of consumer behavior.
2. To impart the knowledge of basic concepts of Marketing Research, pricing and product decisions, and channels of distribution.
3. To impart the basic knowledge of Advertising and Sales promotion strategies and Sales personnel Management.
4. To impart the basic knowledge of International marketing, Services marketing and Online Marketing.

**Course Outcomes:** After successfully completing the course, students will be able to-

1. Understand the concepts of Marketing Management consumer behavior.
2. Demonstrate the knowledge of Marketing Research and Pricing decisions.
3. Understand the concepts of Product development and channels of distribution.
4. Demonstrate the knowledge Advertisement development & strategies.
5. Understand the concepts of Sales promotion strategies and Sales personnel Management.
6. Understand the concepts of international marketing, Services marketing and Online Marketing.

| UNIT No. | Content: OE-I-Marketing Management | No. of Lectures Required |
|---|---|---|
| I | **Marketing Management**-Definition, Scope, and Objectives 4 P's of Marketing Mix for Products, Factors affecting consumer buying Behavior, Consumer Buying Decision Process, and Customer Relationship Management. | 07 |

| | | |
|---|---|---|
| **II** | **Marketing Research:** Objectives and scope, Marketing research Procedure, Major techniques of Marketing Research. **Pricing Decisions:** Meaning, significance and objectives of Pricing, Types and strategies of Pricing. Pricing under different competitive situations | **07** |
| **III** | **Product:** Meaning, classes of Products, classification of consumer products, Product Life cycle (PLC) process, New Product Development strategy, Functions of packaging as a marketing tool **Channel of distribution:** Role and importance, channel selection, types of intermediaries, objectives of physical distribution | **07** |
| **IV** | **Advertising:** Definition, objectives, Advertising organization, Advertising Budget, Media planning, classes of advertising, Advertising & Ethics, Steps in making layouts, Advertising Campaign, Push and Pull strategy in advertising | **07** |
| **V** | **Sales Promotion:** Meaning, objectives, types of sales promotion schemes, Promotion Mix, Objectives of Marketing organization, types of marketing organization **Sales Personnel:** Role of sales manager, sales personnel recruitment, selection and training, motivation, Appraisal of performance. Expenses control | **07** |
| **VI** | **International marketing**: Environment, Marketing mix strategy for International marketing, Documents for International marketing, Payment procedure in international trade. **Marketing of services:** Meaning, characteristics, classification of services, elements of marketing mix in service marketing:7 P's of marketing. **Online marketing:** Meaning, objectives, Understanding internet/ online consumers, Online Advertising, Advantages & Limitations of Online marketing | **07** |
| | **Total** | **42** |

**Text Books:**


1. Principles of Marketing, Philip T.Kotler, Pearson.
2. Marketing Management, Biplab S. Bose, Himalaya Publishing house.
3. Marketing Management – Verma & Duggal - Oxford University Press.


**References Books:**


1. K.S Chandrasekar, Marketing Management text and cases, Tata McGraw-Hill publications.
2. Kumar, R.S Case studies in marketing management.
3. Fundamentals of Marketing, Stanton, Etzel & Walker McGraw Hill.

# B.Tech. Third Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **3SEOE1D** | **OE (ii): Introduction to Cyber Laws** | **03** | **00** | **00** | **03** |

**Pre-requisites:**

1. General concepts of conventional law and order.
2. Fundamentals of computer and internet.

**Course Learning Objectives:**

1. To introduce the fundamentals of computers, internet technologies, and the principles of cyber law, including the Information Technology Act, 2000.
2. To develop an understanding of e-Commerce and internet security issues in the digital era.
3. To understand the nature and classification of cybercrimes and explore legal and preventive measures.

## Course Outcomes:

After completion of this course the student shall be able to-

1. Understand fundamentals of computer, internet and cyber law.
2. Understand fundamentals of E-Commerce.
3. Demonstrate the knowledge of cybercrimes.
4. Classify the cybercrimes.
5. Understand the principles of Information Technology Act.
6. Demonstrate the knowledge of Internet security issues.

| Unit No. | Content: OE (ii): Introduction to Cyber Laws | No. of Lectures Required |
|---|---|---|
| **1** | **Fundamentals of Computer, Internet and Cyber Law**: Functional Components of Computer, applications of computers, Internet architecture, world wide web, internet server and types, Need for Cyber Law, difference between Cyber Crimes and Conventional Crimes, | **07** |
| **2** | **Introduction to E-Commerce:** Electronic data interchange and legal issues, e-commerce models, e-banking, credit card, e-mail, e-governance and objective, models and types. | **07** |
| **3** | **Concepts of Cyber Crime:** Characteristics of Cyber Crime, Causes and Measures to combat Cyber Crimes, Cyber Crimes against Individuals, Institution and State. | **07** |
| **4** | **Categories of Cyber Crimes:** Classification of Cyber Crimes, Hacking, Cracking, Digital Forgery, Cyber Stalking/ Harassment, cyber terrorism, Cyber Pornography and Obscenity, Identity Theft, Cyber Defamation, Virus attacks, Computer Fraud, Social Networking Crimes. | **07** |
| **5** | **Information Technology Act, 2000:** Silent features of Information Technology Act, 2000, Definitions, Digital Signatures and Certificates, Security Procedures, Electronic Contracts, Penalties and Adjudication, Liabilities of Service Providers, | **07** |
| **6** | **Internet Security:** Internet Security, ethical issues of Information Technology- software piracy, firewall and types of firewall, biometrics and internet security products software. | **07** |
| | **Total** | **42** |

**Text Books:**


1. Pavan Duggal - Cyber law
2. Pavan Duggal – Cyber Frauds, Cybercrimes and Law in India
3. Nilakshi Jain, Ramesh Menon – Cyber Security and Cyber Laws
4. Sharma Vakul - Information Technology Law and Practice
5. Nandan Kamath - Law Relating to Computer, Internet and E-commerce,
6. Cyber Laws – Sony Prakashan, Nagpur

## B.Tech. Third Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 3SE05 | Fundamentals of Entrepreneurship | 02 | 00 | 00 | 02 |

**Pre-requisites:** Nil

**Course Learning Objectives:**

1. To explain the fundamental concepts of entrepreneurship and the role of entrepreneurs in various business situations.
2. To develop the ability to analyze the scope, challenges, and economic aspects of entrepreneurial ventures.
3. To understand the process of entrepreneurial project development and explore emerging trends in entrepreneurship.

### Course Outcomes:

After completion of this course the student shall be able to:

1. Pick up about Foundation of Entrepreneurship Development and its Theories
2. Learn entrepreneurial decision processes
3. Identify the type of entrepreneur and the steps involved in an entrepreneurial venture
4. Understand various steps involved in starting a venture
5. Comprehend financial aspects of a venture
6. Learn the steps to launch a new venture

| Unit No. | Content: Fundamentals of Entrepreneurship | No. of Lectures Required |
|---|---|---|
| 1 | **Introduction to Entrepreneurship**: Meaning and concept of entrepreneurship, the history of entrepreneurship development, role of entrepreneurship in economic development, agencies in entrepreneurship management and future of entrepreneurship | 05 |
| 2 | **Entrepreneur Skills:** Meaning of entrepreneur, the skills required to be an entrepreneur, the entrepreneurial decision process, and role models, mentors and support system. | 05 |
| 3 | **Business Opportunity Identification:** Business ideas, methods of generating ideas, and opportunity recognition | 05 |
| 4 | **Preparing a Business Plan:** Meaning and significance of a business plan, components of a business plan, and feasibility study. | 05 |
| 5 | **Financing the New Venture:** Importance of new venture financing, types of ownership securities, venture capital, types of debt securities, determining ideal debt-equity mix, and financial institutions and banks | 05 |
| 6 | **Launching the New Venture:** Choosing the legal form of new venture, protection of intellectual property, and marketing the new venture. | 05 |
| | **Total** | 30 |

**Text Books:**


1. Dr Bhavesh M. Patel: ENTREPRENEURSHIP, VIKAS PUBLISHING HOUSE PVT. LTD. 2020


**Reference Books:**


1. Barringer, B. R. and Ireland, R. D. Entrepreneurship: Successfully Launching New Ventures. Pearson Education, New Delhi.
2. Roy, R. Entrepreneurship. Oxford University Press, New Delhi.
3. Blundel, R, and Lockett, N. Exploring Entrepreneurship: Practices and Perspectives. Oxford University Press, New Delhi.
4. Kuratko, D. F. and Rao, T. V. Entrepreneurship: A South-Asian Perspective. Cengage Learning, New Delhi.


**Term Work: 50 Marks**

Marking Scheme:

1. Business Idea Presentation – 20 Marks
2. Business Idea Proposal – 10 Marks
3. Innovation and Execution – 10 Marks
4. Attendance – 10 Marks

## B.Tech. Third Semester (Electronics and Telecommunication Engineering)

| Course ode | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 3SE06 | Environmental Science | 02 | 00 | 00 | 02 |

**Pre-requisites: Nil**

**Course Learning Objectives:**

1. The importance of Environmental Studies.
2. The need of renewable and non-renewable energy resources.
3. The components, structures and types of ecosystem.
4. The Impact of different types of pollution.

**Course Outcomes:**

After successfully completing the course, students will be able to-

1. Understand the scope and importance of environmental studies.
2. Apply the knowledge of renewable and non-renewable energy resources.
3. Understand the concept of ecosystem.
4. Apply the knowledge of environmental pollution.
5. Understand the current environmental issues of India.
6. Understand the role of Information Technology in environment and human health.

| UNIT | Subject: Environmental Science | No. of Lectures Required |
|---|---|---|
| Unit-1 | **The Multidisciplinary nature of environmental studies:** Definition, scope and importance, Need for public awareness. | 05 |
| Unit-2 | **Renewable and non renewable resources:** Natural resources and associated problems, Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people. Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. **Energy Resources**: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, case studies, Role of individual in conservation of natural resources. | 05 |

| | | |
|---|---|---|
| **Unit-3** | **Eco Systems:** Concept of an eco system, structure and function of an eco system, Producers, consumers, decomposers, Food chains, food webs. Introduction, types, characteristic features, structure and function of the following eco systems: Forest ecosystem, Grass land ecosystem, Desert ecosystem, Aquatic eco systems (ponds, streams, lakes, rivers, oceans, estuaries). | **05** |
| **Unit-4** | **Environmental Pollution:** Definition, Causes, effects and control measures of: Air pollution, Water pollution, Noise pollution, role of an individual in prevention of pollution, Pollution Case Studies. | **05** |
| **Unit-5** | **Current Environmental Issues in India:** Water conservation-development of watersheds, Rain water harvesting and ground water recharge, Eutrophication and restoration of lakes, Conservation of wetlands, Ramsar sites in India. Climate Changes – Global warming, Acid rain, Ozone layer Deflection, Waste Management - Swachha Bharat Abhiyan. | **05** |
| **Unit-6** | **Human population and the environment:** Population explosion-family welfare program, Environment and human health, Human rights, Women and child welfare, Role of information technology in Environment and human health. Visit to environment assets-river / forest / grassland / hill / mountain. Visit to a polluted site-urban/rural/industrial/agricultural. Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hills lopes, etc (field work equal to 5 lecture works) | **05** |
| | **Total** | **30** |

**Text Book:**

1. Textbook of Environmental studies by Erach Bharucha, UGC

**References:**

1. Fundamental concepts in Environmental Studies by D D Mishra, S Chand & Co Ltd
2. Environmental studies, Nidhi Dhawan, Kiran Bist by I.K. International House Pvt Ltd.

**Term Work: 50 Marks**

**Marking Scheme:**

1. Field Visit – 10 Marks
2. Attendance – 10 Marks
3. Class Test (Internal) – 10 Marks
4. Assignment (2 Nos.) – 20 Mark

# B.Tech. Third Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 3SE07 | Electronic Devices & Circuits Lab | 00 | 00 | 02 | 01 |

**Pre-requisites:**

1. Basic knowledge of Semiconductor Physics

**Course Learning Objectives:**

1. To understand the basic principle and characteristics of semiconductor devices.
2. To understand the operation of various transistor configurations.
3. To provide practical exposure to students on various electronic components, semiconductor devices and electronics instruments which facilitates to design basic electronic circuits.

**Course Outcomes:**

After completion of this course the student shall be able to:

1. Use his/her understanding/knowledge of fundamental electronic component so as to design/conduct experimentation related to given aim/ objective.
2. Analyze various electronic circuits using hardware kits as well as on p-spice simulator and other concerned resources for the conduction of experiments.
3. Understand results, articulate findings, draw suitable conclusion and enabling the students to verify the theoretical concepts of electronic devices and circuits.

**List of Experiments:**

Minimum 08-10 experiments should be conducted based on 3SE02 Electronic Devices & Circuits syllabus.

# B.Tech. Third Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 3SE08 | Digital System Design Lab | 00 | 00 | 02 | 01 |

**Pre-requisites: Nil**

**Course Learning Objectives:**

1. To study the fundamental concepts and techniques used in digital electronics & to illustrate reduction of logical expressions using Boolean algebra and K-map.
2. To inculcate the design procedure of combinational logic circuits& Sequential logic circuits.

**Course Outcomes:**
After completion of this course the student shall be able to:

1. Apply Boolean algebra and number system to solve various logic functions & simplify Combinational logic circuit using K-Map.
2. Analyze and design MSI circuit using 74xx series IC & Apply the knowledge of flip-flops to design Sequential logic circuits.
3. Analyze and design synchronous state machines using flip-flops.

**List of Experiments:**

Minimum 8-10 Experiments should be conducted based on 3SE03 Digital System Design Syllabus

# B.Tech. Third Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 3SE09 | Object Oriented Programming Lab | 00 | 00 | 02 | 01 |

**Pre-requisite*:***

1. 1SF04 Programming for Problem Solving

**Course Learning Objectives:**

1. Design, implement, test, and debug simple programs in an object-oriented programming language.
2. Design and test the implementation of C++ programming concepts.

**Course Outcomes:**

After successful completion of this course, students will be able to-

1. Use his/her understanding/knowledge of Object Oriented Programming so as to develop computer program related to the given aim/objective.
2. Use equipment's/other concerned resources for conduction of experiments.
3. Interpret results, formulate findings, draw suitable conclusion and respond to inquiries, related to given experiment.

**List of Experiments:**

Minimum 08-10 experiments should be conducted based on 1SF04 – Programming for Problem Solving Syllabus

# B.Tech. Third Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 3SE10 | Community Engagement Project / Field Project (CEP/FP) | 00 | 00 | 04 | 02 |

**Pre-requisites:**

1. All courses / laboratories from I, II Semesters.

**Course Learning Objectives:**

Students shall UNDERTAKE and EXECUTE a Mini Project through a group of students to:

1. Understand the "Project Development Cycle", through Community Project.
2. Inculcate hardware and software knowledge implementation skills.
3. Develop students‟ abilities to transmit technical information clearly through Technical Report writing on the Mini Project work carried out.

**Course Outcomes:**

At the end of course, students will be able to**:**

1. Acquired knowledge within the chosen area of technology for project development.
2. Identify, reproduce, improve and refine the technical aspects of the chosen project with a comprehensive and systematic approach.
3. Work as an individual or in a team in development of technical projects and communicate and report effectively project related activities and findings.
4. Do the social survey, analyses it, identify problem and find probable solution for the befit of society.

**Minor Project Work:**

1. **Group Size:**

Minimum 5 and maximum 10 students can form a group for the mini project.

2. **Project Type:**

The selected mini project should be based on any of the following:

- Design and development of a prototype electronics system / product.
- Design and development of laboratory equipment's.
- Industry needs based basic survey or Testing or Analysis etc.
- Investigate performance of govt schemes for society benefits.
- Parametric analysis of components / systems / devices.
- Investigation of optimum process / material for product development.
- Solution for society / industry problems.

3. **General guidelines:**

**Project domain may be from the following, but not limited to:**

- Solar Systems. / IOT / RFID
- Robotics Mechanisms / Digital systems
- Mini model / Hardware / Software
- Analysis of varies apps
- Automation and Control Systems
- Microcontroller based Systems /Arduino
- Agriculture system.
- Smart systems using AI

4. **Project Report:**

**A project report with following contents shall be prepared:**

1. Title, Certificate and Index
2. Objectives.
3. Introduction,
4. Literature survey
5. Methodology-Experimental Method / Data collection and Analysis methods (using Google Form)/case study / survey Method / Research Method
6. Analysis-Graphical representation / Simulation/experimentation / survey / testing etc.
7. Problem Identification
8. Probable solution
9. Conclusion.

   References.

## B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **4SE01** | **Analog Circuits** | **03** | **00** | **00** | **03** |

**Pre-requisites:**

1. Electronic Devices & Circuits.

**Course Learning Objectives:**

1. To understand the basics and internal structure of Op-Amp.
2. To analyze and design linear and non-linear applications of Op-Amp.
3. To understand concepts of voltage regulators, and design waveform generators using IC 555, PLL IC 565 and active filters.

**Course Outcomes:**

After completion of this course the student shall be able to:

1. Comprehend the knowledge of basic concepts and performance parameters of Op-Amp.
2. Analyze and design electronic circuits for various linear applications.
3. Analyze and design electronic circuits for various non-linear applications.
4. Acquire and apply knowledge for design of voltage regulator circuits using ICs.
5. Design various waveform generator circuits using IC 555 & Data Converters.
6. Comprehend the knowledge of PLL, its applications and various types of active filters.

| Unit No. | Content: Analog Circuits | No. of Lectures Required |
|---|---|---|
| 1 | **Operational amplifier:** Operational amplifier Block diagram of Op-Amp, differential amplifier configurations using BJT, constant current source, level shifting, transfer characteristics, study of ICuA741, Op-Amp parameters. | **07** |
| 2 | **Linear applications of Op-Amp:** Linear applications of Op-Amp: Inverting and non-inverting amplifiers, summing amplifiers, differential amplifier, integrator and differentiator, sinusoidal RC oscillators: RC-phase shift, Wein bridge oscillator using IC 741. | **07** |
| 3 | **Non-Linear Applications of Op-Amp:** Non-Linear Applications of Op-Amp: comparator, zero-crossing detector, Schmitt trigger, Astable Multivibrator, Monostable Multivibrator. | **07** |
| 4 | Design of Voltage regulators using IC 78xx, 79xx, and LM 317, dual tracking regulators using 78xx and 79xx series, instrumentation amplifier. | **07** |
| 5 | Introduction to IC 555, IC 555 based design of Astable, Monostable multivibrator and their applications, Introduction to A to D converters, and D to A converters. | **07** |
| 6 | Operation of phase lock loop system, lock range and capture range, study of PLL IC LM 565 and its applications as AM detector, FM detector, Design of Butterworth first and second order low pass, and high pass filter. | **07** |
| | **Total** | **42** |

**Text Books:**


1. R.A. Gayakwad, "OP-AMP and Linear Integrated Circuits", Prentice Hall/ Pearson Education Publications.
2. Sergio Franco, "Design with Linear Integrated Circuits & Op-Amps", TMH Publications, Rai and Sons, New Delhi, 1999.


**Reference Books:**


1. Gray and Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley Intl. Publication.
2. Paul Horowitz, W. Hill, "The art of Electronics", Cambridge Publications.

## B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 4SE02 | Analog and Digital Communication | 03 | 00 | 00 | 03 |

### Pre-requisites:

1. Applied Mathematics-III

### Course Learning Objectives:

1. To understand and analyze various analog and digital modulation and demodulation techniques, including AM, FM, and pulse modulation systems.
2. To study the fundamental concepts of digital communication systems, including sampling, quantization, baseband transmission, and digital modulation techniques.
3. To explore the building blocks of digital communication systems and apply information theory to evaluate data transmission limits and performance.

### Course Outcomes:

After successfully completing the course, the students will be able to

1. Understand the necessity of modulation and identify the various components of analog and Digital communication systems.
2. Understand different modulation and demodulation schemes in analog communication systems and to compare the strengths and weaknesses of various analog communication systems.
3. Analyze the performance of various pulse modulation schemes.
4. Understand basic building blocks of digital communication system and formatting of digital signal.
5. Understand concepts of information theory and analyze information transmission over communication channel.
6. Analyze the performance of different digital modulation techniques.

| Unit No. | Content: Analog and Digital Communication | No. of Lectures Required |
|---|---|---|
| 1 | **AM Transmitters and Receivers:** Modulation, need of modulation, AM Modulation (Mathematical expression and related numerical), Principles of DSB-FC, DSBSC, SSB-SC modulation and their comparison, Details of DSB-FC Transmitter. Superheterodyne receiver, Need and types of AGC, Receiver Characteristics: Selectivity, Sensitivity & Fidelity. | 07 |
| 2 | **FM Transmitters and Receivers:** FM Modulation, Circuit & Analysis for direct FM generation using FET. Narrow Band and Wide Band FM, their comparison, Pre-emphasis and De-emphasis. | 07 |

| | | |
|---|---|---|
| | **FM Discriminator:** FM Receiver block diagram, Single Slope, Balanced slope detector and Ratio detectors. Performance Comparison of AM & FM systems. | |
| **3** | **Analog Pulse Modulation:** Band limited & time limited signals, Narrowband signals and systems, Sampling Theorem in time domain, Nyquist criteria, Types of sampling- ideal, natural, flat top, Aliasing & Aperture effect, PAM, PWM & PPM. | **07** |
| **4** | **Pulse Code Modulation:** Digital representation of Analog signal, PCM Generation and Reconstruction, Quantization (basic working), Quantization Noise, Companding, Delta Modulation, Adaptive Delta Modulation. | **07** |
| **5** | **Introduction to Digital Communication System:** Functional Blocks of Digital Communication System, Line Coding: Need for Line coding, Properties of Line Coding, Types of Line Coding and its comparison. Information Theory: Measure of Information, Entropy and Information Rate, Introduction of Binary Symmetric Channel. | **07** |
| **6** | **Digital Modulation:** BPSK, BFSK and ASK generation and reception, QPSK and MSK Transmitter and Receiver, Comparison of Digital modulation systems (should include Probability of Error parameter) Equalization: Need and types of equalization, Clock and Carrier Synchronization. | **07** |
| | **Total** | **42** |

**Text Books:**


1. Kennedy G. “Electronic Communication System” Tata Mc-Graw Hill Co., New Delhi (Third Ed).
2. Taub and Schilling D.L., “Principles of Communication Systems”, Mc-Graw Hill Co., New Delhi (Second Ed.).
3. Shanmugam K.S., “Digital & Analog Communication Systems”, John Wiley & Sons, New York, 1996.
4. Lathi B. P., “Modern Digital and Communication Systems”, Holt Rinchart and Winston Inc., New York, 1993.
5. Simon Haykin, “Digital Communication”, John Wiley and Sons, Pvt. Ltd., Singapore.


**Reference Books:**


1. Proakis J. K., “Digital Communication”, Mc-Graw Hill Book Co., London (Second Edition).
2. Glover and Grant, “Digital Communication”, Prentice Hall Publication
3. Collins Dennis, Collins John, “Electronic Communications” PHI.
4. Wayne Tomasi, “Electronic Communication Systems” Pearson Education, (Fifth Edition).
5. Wozencraft J. M. and Jacobs I. M., ``Principles of Communication Engineering’ ‘John Wiley, 1965.
6. Barry J. R., Lee E. A. and Messerschmitt D. G., ``Digital Communication'', Kluwer Academic Publishers, 2004

## B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 4SE03 | Network Theory | 03 | 00 | 00 | 03 |

**Pre-requisites:**

1. Basics of Electrical Engineering.
2. Applied Mathematics.

**Course Learning Objectives:**

1. To understand fundamental concepts of Node and Mesh analysis for linear circuits & study different Network Theorems for the circuit analysis.
2. To Understand Two Port Network parameters & apply Laplace Transform Technique for analysis of linear circuits.
3. To study Network Functions & basic concepts of circuit simulation with PSpice.

**Course Outcomes:**

After completion of this course the student shall be able to:

1. Analyze electrical circuits using Mesh and Node analysis.
2. Apply suitable Network Theorem to analyze electrical circuits.
3. To implement the concept of Laplace Transform for electrical circuit analysis.
4. To apply Two-Port network theory for electrical network analysis.
5. To evaluate different Network Functions.
6. Analyze and simulate the circuit using PSpice.

| Unit No. | Content: Network Theory | No. of Lectures Required |
|---|---|---|
| 1 | **Node and Mesh analysis**: Circuit components, assumptions for circuit analysis, Sources of electrical energy, Kirchhoff's laws, Node and Mesh analysis, Matrix approach of network containing voltage and current sources and reactance, Network equations for RLC networks. | 07 |
| 2 | **Network Theorems**: Superposition theorem, Reciprocity theorem, Thevenin's theorem, Norton's theorem and Maximum power transfer theorem | 07 |
| 3 | **Network Analysis using Laplace Transform**: Laplace transforms and its properties: Partial fractions, analysis of RC, RL and RLC networks with and without initial conditions. Initial and Final value theorems, Duality. | 07 |
| 4 | **Two port networks**: Open circuit impedance parameters, Short circuit admittance parameters, Transmission parameters, Inverse transmission parameters, Hybrid and Inverse hybrid parameters, Condition for reciprocity and symmetry of a two port network. | 07 |
| 5 | **Network functions**: Ports and terminal pairs, Network functions, poles and zeros, Necessary conditions for driving point function, Necessary conditions for transfer function, Application of network analysis in deriving functions, driving point and transfer impedance functions of LC networks. | 07 |
| 6 | **Introduction to PSpice:** Types of Analysis, Limitations of PSpice, Element Values, Nodes, Circuit Elements, Sources, Output Variables, PSpice output commands, Format of circuit files, format of output files, Examples of SPICE Simulation. | 07 |
| | **Total** | 42 |

**Text Books:**


1. D. Roy Choudhary, "Networks and Systems", New Age International.
2. Muhammad H. Rashid, "Introduction to PSpice Using OrCAD for Circuits and Electronics", PHI Learning Private Limited, Third Edition.


**Reference Books:**


1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 3rd Edition.
2. Sudhakar A., Shyammohan S. P. "Circuits and Network"; Tata McGraw-Hill New Delhi, 1994.
3. W. H. Hayt, J. E. Kemmerly and S. M. Durbin, "Engineering Circuit Analysis", 7th Edition, Tata McGraw-Hill education private Limited, New Delhi.
4. Abhijit Chakrabarti, "Circuit theory, Analysis and Synthesis", Dhanpat Rai and Co. Pub.

## B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **4SEOE2A** | **Aptitude for Engineers** | 03 | 00 | 00 | 03 |

**Pre-requisites:**

1. Basic knowledge of Mathematics.

**Course Learning Objectives:**

This course is designed to suit the need of the outgoing students and to acquaint them with frequently asked patterns in quantitative aptitude and logical reasoning during various examinations and campus interviews.

**Course Outcomes:**

After completion of this course the student shall be able to:

1. Understand the basic concepts of quantitative ability
2. Understand the basic concepts of logical reasoning Skills
3. Acquire satisfactory competency in use of reasoning
4. Solve campus placements aptitude papers covering Quantitative Ability
5. Logical Reasoning Ability
6. Compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC

| Unit No. | Content: Aptitude for Engineers | No. of Lectures Required |
|---|---|---|
| **1** | Number Systems, LCM and HCF, Decimal Fractions, Simplification, Square Roots, and Cube Roots | **07** |
| **2** | Problems on Ages, Surds & Indices, Percentages, Rate of interest | **07** |
| **3** | Basic concepts of Ratio and Proportion, Combination of Ratios, Introduction to Average | **07** |
| **4** | Series Completion: Types of Number Series, Alphabet Series, Alphanumeric Series, Continuous pattern series, Introduction to Coding – decoding, Letter coding, Direct letter coding, Number symbol coding, deciphering massage word codes | **07** |
| **5** | Basic concepts of Blood Relation, relation puzzle, coded relation, Important fact of a Clock and Calendar**,** Directional sense | **07** |
| **6** | **Data Interpretation:** Introduction to Tabulation, Basic concepts of Bar Graph Fundamentals of Pie Chart | **07** |
| | **Total** | **42** |

**Text Books:**


1. Quantitative Aptitude, Dr. R.S. Aggrawal, S. Chand & Company Ltd.
2. A Modern Approach to Verbal and Non Verbal Reasoning, Dr. R.S. Aggrawal, S. Chand & Company Ltd.


**Reference Books:**


1. A New Approach to Reasoning Verbal, Non Verbal and Analytical, BS Sijwali and Indu Sijwali, Arihant Publication Ltd
3. Complete Mathematics Part-1, Rishikesh Kumar, Lucent Publication Ltd.
4. Quantitative Aptitude, Abhijit Guha, McGraw Hill
5. Quantitative Aptitude for CAT, Trishna, Pearson Publication.

## B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **4SEOE2B** | **OE-2 : Financial Planning** | 03 | 00 | 00 | 03 |

**Pre-requisites: Nil.**

**Course Learning Objectives:**

1. Basic concepts of finance and economic environment.
2. Financial Institutions and fundamentals of investment.
3. Money market & retirement planning.

**Course Outcomes:**

At the end of course, Learner will be able to

1. Learn the basics of financial planning.
2. Understand the Money and Economic Environment.
3. Learn the functions and working of financial institutes.
4. Understand basic concepts of Investment.
5. Understand the Money market.
6. Understand the concept of Retirement Planning.

| Unit No. | Content: Financial Planning | No. of Lectures Required |
|---|---|---|
| 1 | **Introduction to financial planning :** Introduction to expenses & savings, Taxation : Taxes and Types of taxes, Utility of taxes, Income tax & it's computation | 07 |
| 2 | **Money and Economic Environment :** Inflation, Deflation, Kinds of money, Value of money, Economic liberalization, Privatization, Globalization | 07 |
| 3 | **Investment:** Meaning, Objectives and Significance & Mechanism of Investments, Issues and Dilemmas of Investments, Investment Options and Opportunities, Investment Return and Risk. | 07 |
| 4 | **Financial Institutions:** Functions of bank, Types of bank, Working, Functioning and Relevance of Reserve Bank of India, Commercial Banking, Non-Banking Finance Companies, Development Banking, Insurance. | 07 |
| 5 | **Money Market :** Stock Market Constitution, Functions. Performance of Indian Stock Market. **Sensex and Nifty:** Construction and Significance, Stock Market as the Leading Indicator of an Economy, Initial public offering. **Financial Derivatives :** Concept, Participants, Products, Uses, features, History of Derivatives Market, Myth about Derivatives & its regulation in India. | 07 |
| 6 | **Introduction to Retirement Planning** : Significance of Retirement Planning, Purpose and Need of Retirement Planning, Role of Financial Planner in Retirement Planning, Life expectancy vs Retirement age, Early retirements vs Delaying retirement, Post retirement activities and goals, Risk of living longer than expected. | 07 |
| | **Total** | 42 |

**Text Books:**


1. Financial Planning : Theory and Practice by Sid Mittra, SAGE Texts


**Reference Books:**


1. Investment Science by David G. Luenberger, Oxford University Press.
2. Indian Financial System by M.Vora, Anmol Publication
3. Retirement Planning, R.K. Mohapatra, Blue Rose Publishers.

## B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 4SE0E2C | OE-2 : Accounting & Costing | 03 | 00 | 00 | 03 |

**Pre-requisites:** Nil

**Course Learning Objectives:**

1. To explain the fundamental concepts, branches, and objectives of accounting, and understand its role as an information system along with key accounting terms.
2. To develop the ability to prepare and interpret financial statements, understand depreciation methods, and analyze annual reports for informed financial decision-making.
3. To understand the principles and practices of cost accounting, including cost sheet preparation, unit and overhead costing, marginal costing, break-even analysis, and the importance of cost audits.

**Course Outcomes:**

After completion of this course the student shall be able to:

1. Understand fundamental accounting concepts, branches, and objectives, showcasing comprehension of accounting as an information system.
2. Master financial statements, exhibiting proficiency in their preparation, interpretation, and analysis of annual reports.
3. Demonstrate expertise in depreciation concepts, causes, methods, and their practical implications in accounting scenarios.
4. Grasp the scope, objectives, and practical implications of cost accounting, connecting with both financial and management accounting.
5. Participate in discussions and demonstrate skills in preparing cost sheets, unit costing, and overhead costing, including tender price calculation.
6. Acquire and apply knowledge of Marginal Costing principles, conduct break-even.

| Unit No. | Content: OE-2 : Accounting & Costing | No. of Lectures Required |
|---|---|---|
| 1 | **Introduction of Accounting -**<br>Book Keeping & Accounting, Branches of Accounting, Objectives and Functions of Financial Accounting, accounting as an information system and its users, Accounting Terms. | **07** |
| 2 | **Financial Statement -**<br>Meaning, Importance & Limitation of Financial Statement. Preparation of Trading Account and Profit And Loss Account, Balance Sheet. Understanding the annual report of companies. | **07** |
| 3 | **Depreciation -**<br>Concept of depreciation; Causes of depreciation; Depreciation, depletion, amortization, and dilapidation; Depreciation accounting; Methods of recording depreciation. | **07** |
| 4 | **Introduction of Cost Accounting -**<br>Definition, Scope, objectives and significance of cost accounting, relationship with financial accounting and management accounting. Practical implication of cost accounting. | **07** |
| 5 | **Cost Sheet -**<br>Unit Costing, Preparation of Cost Sheet and Statement of Cost (Including calculation of tender price),Overhead costing, (Including calculation of machine hour rate.) | **07** |
| 6 | **Costing Method –** Marginal Costing- Profit – Volume Ratio, Break – Even Point, Margin of Safety, Application of Break-even Analysis. Cost Audit – Meaning, Importance and Techniques of Cost Audit, Cost Audit Programme. | **07** |
| | **Total** | **42** |

**Text Books:**


1. Financial Accounting for Management by Ambrish Gupta.
2. Financial Accounting: An Indian Perspective by Paresh Shah and Sejal Shah.
3. Corporate Accounting by Naseem Ahamed.
4. Cost Accounting: Theory and Practice by Bhabatosh Banerjee.
5. Cost Accounting: Principles and Practice by Rajasekaran.
6. Cost Accounting: Text and Problems by M. N. Arora.

## B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 4SE04 | SIGNALS AND SYSTEMS | 02 | 00 | 00 | 02 |

**Course Pre-requisite**:

1. (2SF01) Applied Mathematics-II
2. (3SE01) Engineering Mathematics-III

**Course Learning Objectives:**

1. To understand the fundamental characteristics of continuous signals and systems.
2. To analyse signals and systems in terms of the transform domains.
3. To analyse discrete time signals and systems in time and frequency domain.

**Course Outcomes:**

After successful completion of this course, students will be able to,

1. Describe signals mathematically and understand how to perform mathematical operations on signals.
2. Understand the continuous time systems, system classification.
3. Analyse the spectral characteristics of continuous-time periodic signal using Fourier analysis.
4. Analyse the spectral characteristics of continuous-time non-periodic signals using Fourier Transform.
5. Understand the classification of Discrete Time signal and systems along with the mathematical operations on signals.
6. Analyse the spectral characteristics of discrete-time signal using Discrete Time Fourier Transform (DTFT).

| Unit | Course: Signals and Systems | No. of Lectures Required |
|---|---|---|
| **Unit-1** | **Continuous time signals:** Signal, Signal operations, Signal Classification: Periodic-Non periodic signal, Causal-Non causal signal, Energy-Power signal, Even-Odd signal. | **05** |
| **Unit-2** | **Continuous time systems:** System, System Classification: Linear-Nonlinear system, Time variant-time invariant system, Causal-Non causal system, Static-Dynamic system, Stable-Unstable system. | **05** |
| **Unit-3** | **Signal Analysis using Fourier Series**: Trigonometric Fourier Series, Existence and Convergence of Fourier Series, Magnitude and phase plots of Fourier coefficients. | **05** |
| **Unit-4** | **Signal Analysis using Fourier Transform:** The Fourier Transform, Properties of Fourier Transform, Inverse Fourier Transform. | **05** |
| **Unit-5** | **Time-Domain Analysis of Discrete-Time Signals & Systems**: Signal Operations, Classification of signals, Classification of Discrete-Time Systems. | **05** |
| **Unit-6** | **Discrete Signal Analysis using DTFT:** Introduction to Discrete time Fourier Transform (DTFT), properties of DTFT, inverse DTFT | **05** |
| | **Total** | **30** |

**Text Books:**


1. Alan V. Oppenheim & Alan S. Willsky with S. Hamid Nawab, "Signals & Systems" PHI Publication, Second Edition.
2. Lathi B. P., "Principles of Linear Systems and Signals" Second Edition (International Version) Oxford University Press.


**Reference Books:**


1. Ambardar A., "Analog And Digital Signal Processing", Thomson Learning-2005.
2. Simon Haykin, Barry Van Veen, "Signals & Systems", IInd Edition, Wiley Pub.
3. Michael J. Roberts, "Signals and Systems Analysis Using Transform Methods and MATLAB", Mc Hill Publication.

## B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 4SE05 | Engineering Economics | 02 | 00 | 00 | 02 |

**Pre-requisites: Nil**

**Course Learning Objectives:**

1. The course aims to introduce the fundamentals and scope of Engineering Economics, emphasizing core economic principles, production theory, and the functioning of the banking system.
2. It focuses on understanding the financial aspects of engineering decisions through concepts like time value of money, cash flow analysis, and methods of depreciation.
3. Students will learn to evaluate engineering alternatives by applying economic analysis techniques to identify cost-effective and financially viable solutions.

**Course Outcomes:**

After completion of this course the student shall be able to:

1. Learn the concept of engineering economics with principles
2. Comprehend the laws of production and various cost curves
3. Understand the cash flow diagrams
4. Develop engineering alternatives
5. Learn and apply different depreciation analysis
6. Comprehend the banking system with special aid to commercial banks

| Unit No. | Content: Engineering Economics | No. of Lectures Required |
|---|---|---|
| 1 | **Definition and Scope of Engineering Economics**: Subject Matter of Economics, Principles of Engineering Economics, Micro-economics Vs Macro-economics , Utility Analysis, Laws of diminishing utility analysis, law of Demand, Elasticity of demand | **05** |
| 2 | **Theory of Production:** Theory, Isoquants and its properties, Marginal rate of Technical substitution, Law of variable proportions, Returns to Scale, Cost of Production and Cost of Curves, The law of supply, Price determination | **05** |
| 3 | **Time value of Money:** Techniques for adjusting time value of money, Uniform Gradient series factor, annuity, annuity due, calculation of deferred annuity , Types and components of cash flow, cash flow diagrams, Uses, significance and limitation of Cash flow statement | **05** |
| 4 | **Evaluation of Engineering alternatives:** Present worth method, Future worth Method, Equivalent annual worth comparison, Rate of return method, Project evaluation and Cost benefit analysis | **05** |
| 5 | **Depreciation Analysis:** Causes f depreciation, Depreciable property, depreciation methods, Digit method, Break even analysis, determination of breakeven point, Breakeven point in terms of quantity, sales and as percentage of capacity, Break even chart, Breakeven analysis assumptions | **05** |
| 6 | **Commercial Banking:** Functions of Commercial Banks , Role of Commercial banks in developing economy, sound baking system for under-developed countries, types of banks, balance sheet of a bank, New developments in banking system | **05** |
| | **Total** | **30** |

**Text Books:**


1. Engineering Economics and Costing , Second Edition, PHI, 2010 by Sasmita Mishra


**Reference Books:**


1. Engineering Economic Analysis, Volume 2, By Donald G. Newnan, Ted Eschenbach, Jerome P. Lavelle · 2004.
2. ENGINEERING ECONOMICS, PHI Learning, By R. PANNEERSELVAM · 2013

## B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 4SE06 | Analog Circuits Lab | 00 | 00 | 02 | 01 |

**Pre-requisites:** Nil

**Course Learning Objectives:**
This lab will facilitate students:

1. To understand the basics and internal structure of Op-Amp & to analyze and design linear applications of Op-Amp.
2. To synthesize the waveform generators using IC 555, IC 565 & active filters.
3. To enhance technical writing skills.

**Course Outcomes:**
After completion of this course the student shall be able to:

1. Comprehend the knowledge of basic concepts and performance parameters of Op-Amp. & Should be able to design electronic circuits for various linear& nonlinear applications.
2. Experiment the designed circuits using educational kits and other resources available in the laboratory.
3. Apprehend results, articulate findings, draw suitable conclusion and verify the theoretical concepts of experimented electronic circuits and express them in the journal.

## List of Experiments:

Minimum 8-10 Experiments should be conducted based on 4SE01 Analog Circuits Syllabus

## B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 4SE07 | Analog and Digital Communication Lab | 00 | 00 | 02 | 01 |

### Pre-requisites: Nil

**Course Learning Objectives:**

This laboratory work will enrich students:

1. To demonstrate the importance of modulation in both analog and digital communication through practical examples.
2. To perform experiments based on analog and digital modulation.
3. To realize and implement various digital modulation techniques and express through technical writing.

### Course Outcomes:

After successfully completing the course, the students will be able to:

1. Understand the concepts of analog and digital communication so as to design/conduct experimentation related to given aim/ objective.
2. Use equipment's/other concerned resources for the conduction of experiments.
3. Understand results, articulate findings, draw suitable conclusion and respond to queries, related to present experiment through journals.

**List of Experiments:**

Minimum 08-10 experiments should be conducted based on 4SE02- Analog and digital communication syllabus.

# B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 4SE08 | Network Theory Lab | 00 | 00 | 02 | 01 |

**Pre-requisites:** Nil

**Course Learning Objectives:**

This Laboratory will enable students to:

1. To apply knowledge of Mesh analysis (KVL + Ohm's Law) and Node analysis (KCL + Ohm's Law) and network theorems for a given network.
2. Perform experimentation on Network analysis.
3. To enhance his technical writing skills through analysis of experimental results.

**Course Outcomes:**

After successful completion of the lab course the students will be able to:

1. Use knowledge of Network Theory so as to design / conduct experimentation related to the given objective / aim.
2. Use equipment's / other concerned resources for conduction of experiments.
3. Interpret results, formulate findings, draw suitable conclusion and respond to inquiries, related to given experiment.

**List of Experiments:**

Minimum 08-10 experiments should be conducted based on 4SE03 Network Theory syllabus.

## B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 4SE09 | Signal & System Lab | 00 | 00 | 02 | 01 |

**Pre-requisites: Nil**

**Course Learning Objectives:**

This Laboratory will enable students:

1. To demonstrate basic concepts of Signals and System.
2. To validate the theory through experimentation.
3. To analyse experimental results through journal writing.

**Course Outcome:**

After successful completion of this course, students will be able to:

1. Use his/her understand the classification of various Signal and Systems.
2. Implements methodologies for signal operations, signal parameters, system response using Octave tool.
3. Analyse and express the outcomes of Signal & System in journal and viva-Voce.

**List of Experiments:**

Minimum 08 experiments should to be conducted based on 4SE04 Signal and System syllabus.

## B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 4SEH | PLC & Automation | 03 | 00 | 00 | 03 |

**Pre-requisites:**

1. Instrumentation
2. Digital System Design

**Course Learning Objectives:**

1. To understand the basic architecture of PLCs and explore various input and output peripherals along with communication standards used in industrial applications.
2. To study basic instructions for ladder programming and develop skills to write and implement fundamental PLC programs.
3. To gain knowledge of SCADA systems and their applications in industrial automation.

**Course Outcomes:**

After completion of this course the student shall be able to:

1. Describe working of various blocks of basic PLC Architecture.
2. Understand the Interface the Input peripherals with PLC.
3. Understand the Interface the output peripherals with PLC.
4. To study Basic Instructions used for Ladder programming.
5. To develop skills to write basic PLC programming.
6. Understand SCADA and its application in industrial automation.

| Unit No. | Content: PLC & Automation | No. of Lectures Required |
|---|---|---|
| 1 | **PLC Basic:** Introduction to PLC, Need of PLC, Types of PLC, Block diagram, processor section, solid state memory, Input modules & output module (Analog, Digital, Discrete). | 07 |
| 2 | **Input Devices:** Mechanical switches, proximity switches, encoders, Transducer and Sensor- RTD, Thermistors, Thermocouple, Displacement, position, motion sensor, pressure, liquid level detector, fluid flow measurement, optical sensors. | 07 |
| 3 | **Output Devices:** Relays, Solenoid, directional control valve, Various types of DC motors, stepper motors. Advantages and limitations of Automation. | 07 |
| 4 | **PLC Functions:** Symbols of ladder diagram, Symbols of I/O Devices, PLC Timer functions, PLC Counter functions, Comparison functions, data handling functions, Bit functions, data move functions, skip & bypass IO functions. | 07 |
| 5 | **PLC Programming for Electronic Application:** Types of programming language, Development of ladder diagrams: Various types for ladder programming, flowchart, ladder programming for logic gets, flip- flop (JK, RS, D, T), | 07 |
| 6 | **SCADA:** Introduction to supervisory control: Introduction, Block diagram, what is real time, scan interval, Communications in SCADA- types & methods used, Remote Terminal Unit (RTU), and Industrial Application of SCADA system. | 07 |
| | **Total** | 42 |

**Text Books:**


1. "Programmable logic controller principle and application", John W. Webb, PHI publication.
2. "Process Control Instrumentation Technology", Curtis Johnson PHI publication.
3. "SCADA supervisory control and data acquisition", Stuart A. Boyer, ISA Publication.


**Reference Books:**


1. "PLCs & SCADA: Theory and Practice", Rajesh Mehra & Vikrant Vijay, Laxmi Publications.
2. "Programmable Logic Controllers", John R Hackworth, Pearson education.
3. "Introduction to programmable logic controllers", Gary A Dunning.
4. "Mitsubishi FX programmable logic controllers Application and programming" by John Ridley.

## B.Tech. Semester V (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **5SE01** | **Microcontroller & Applications** | 03 | 00 | 00 | 03 |

**Pre-Requisite**:

1. (3SE03) Digital System Design
2. (3SE02) Electronic Devices & Circuits.

**Course Objectives:**

1. To understand the architectural details of Microprocessor and Microcontroller.
2. To enrich students with C Language Programming concepts of Microprocessor & Microcontroller.
3. To interface different peripheral devices with Microprocessor and Microcontroller.

**Course Outcomes:**

After successful completion of the course, students will be able to-

CO1: Describebasic architecture and operation of Microprocessor & Microcontroller.

CO2: Elaborate the concept interfacing and programming of 8255 PPI with 8085 Microprocessor.

CO3: Discuss the fundamentals of microcontroller systems.

CO4: Apply the concept of the C language programming for microcontrollers.

CO5: Analyze the interfacing of different types of peripheral devices with Microcontroller.

CO6: Elaborate the basics of RISC Architecture.

| UNIT | Course: Microcontroller & Applications | L |
|---|---|---|
| **Unit-1** | **Introduction to Microprocessor:** 8085: Pin Diagram and Architecture, Addressing Modes and Instruction Set, Timing Diagram For Data Transfer instructions, Interrupt system. | **08** |
| **Unit-2** | **I/O Interfacing & Programming of 8085:** Introduction to 8255, interfacing with 8085 and related programming, Address space partitioning schemes. Comparison of Microprocessor & Microcontroller. | **08** |
| **Unit-3** | **Introduction to 8051 Microcontroller:** Architecture, Signal description, Register set, Timer structure and their modes. | **06** |
| **Unit-4** | **8051 programming in C**: Data types and time delay in 8051, IO programming, Logic operations, and Data conversion programs in 8051. | **06** |
| **Unit-5** | **Interfacing and programming of 8051 using C**: Interfacing and programming of 8051 with ADC 0809, DAC 0808, Relays and Opto-isolators, Stepper Motor & DC motor. | **08** |
| **Unit-6** | **Introduction to RISC Processors**: Difference between CISC and RISC, Study of ARM NXP LPC2148 Microcontrollers with ARM 7 architecture. | **06** |
| | **Total** | **42** |

**Text Books:**


1. Gaonkar R.S,"Microprocessor Architecture Programming and Applications with the 8085", Penram International Pub.
2. B. Ram , "Fundamental of Microprocessor & Microcontrollers", Dhanpat Rai Publications.


**Reference Books:.**


1. M. A. Mazidi, J. G. Mazidi and R. D. McKinley : "The 8051 Microcontroller and Embedded Systems using Assembly and C", Pearson Education (2nd Ed.)
2. K. J. Ayala : "The 8051 Microcontroller", Penram Int. Pubs., 1996 4. Furber: "ARM System on Chip Architecture", 2nd Edition, Person India 5. Phillips NXP LPC 2148 User Manual.

## B.Tech. Semester V (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 5SE02 | Power Electronics | 03 | 00 | 00 | 03 |

**Pre-Requisite**:

1. (2SF03) Basics of Electrical Engineering.
2. (3SE02) Electronic Devices & Circuits.

**Course Objectives:**

1. To introduce power electronic devices such as SCR, TRIAC, IGBT, MOSFET and their characteristics.
2. To study various converter topologies based on power devices.
3. To comprehend the knowledge of power devices in analyzing various applications.

**Course Outcomes:**

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

CO1: Describe basic operation of SCR & firing techniques.

CO2: Explain the characteristics of various power electronics devices.

CO3: Elaborate the concept of controlled rectifiers and dual converters.

CO4: Analyze different types of inverter circuits.

CO5: Analyze basic chopper and cyclo-converter circuits.

CO6: Explore various applications of power electronics

| UNIT | Course: Power Electronics | L |
|---|---|---|
| **Unit-1** | **SCR & firing techniques:** SCR -construction, characteristics, two transistor analogy for turning ON-OFF a SCR, different methods of turning ON of a SCR, turn OFF mechanism, Thyristor firing circuit using UJT, Protection of SCR (snubber circuit). | **07** |
| **Unit-2** | **Characteristics of power electronic devices:** Triac, Diac-construction, characteristics. power transistor, power MOSFET, IGBT - their construction & characteristics, Introduction to GTO, Classification of circuit for forced commutation. | **07** |
| **Unit-3** | **Rectifiers and dual converters:** Principle of phase control, single phase half wave controlled rectifier, half controlled bridge & fully controlled bridge rectifier for resistive and RL load, derivation for output voltage and current, effect of freewheeling diode, single phase dual converters. | **07** |
| **Unit-4** | **Inverter circuits:** Series inverter, improved series inverter, parallel inverter, principle of operation for single phase transistorized bridge inverter, and three phase bridge inverters in 120 deg. and 180 deg. mode. | **07** |
| **Unit-5** | **Chopper circuits:** Basic principles of chopper, time ratio control and current limit control techniques, voltage commutated chopper circuit, Jones chopper, step-up chopper, AC chopper. | **07** |
| **Unit-6** | **Applications of power electronics:** Single phase to single phase cycloconverter, speed control of DC series motor using chopper, speed control of DC shunt motor using phase-controlled rectifier, UPS, Speed control of single phase AC motor. | **07** |
| | **Total** | **42** |

**Text Books:**


1. M. D. Singh, K. B. Khanchandani, “Power Electronics”, Tata McGraw-Hill.
2. Muhammad H. Rashid, “Power electronics”, Prentice Hall of India.


**Reference Books:**


1. P.C. Sen., “Modern Power Electronics”, Edition II, Chand & Co.
2. V. R. Moorthi, “Power Electronics”, Oxford University Press.
3. Cyril W., Lander,” Power Electronics”, edition III, McGraw Hill.
4. SCR manual from General Electric.

## B.Tech. Semester V (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **5SE03** | **Digital Signal Processing** | 03 | 00 | 00 | 03 |

**Pre-requisites:**

1. (3ETC01) Engineering Mathematics-III
2. (4ETC04) Signals and Systems

**Course Learning Objectives:**

1. To understand discrete signal and system fundamentals.
2. To analyze the discrete-time signals in the frequency domain, using Z-transform and DFT.
3. To design FIR and IIR filters and to understand the architecture of DSP processor, filter bank and some applications of multi-rate DSP.

**Course Outcomes:**

After completion of this course the student shall be able to:

CO1: Apply signal operations on discrete time signals.

CO2: Compute the Z-transform of a sequence, identify its region of convergence and compute the inverse Z-transform.

CO3: Evaluate the Fourier transform of a signal.

CO4: Design FIR filters.

CO5: Design and Implement IIR filters.

CO6: Explain the concepts of Multi-rate Digital Signal Processing, need of Filter banks and the application of Digital Signal Processing.

| Unit | Course: Digital Signal Processing | L |
|---|---|---|
| **Unit-1** | **Discrete Time Signals and systems:** Sampling of analog signal, representation of discrete time Signals, Basic Operations on signals, Linear Convolution. | **06** |
| **Unit-2** | **Z-Transform:** Definition and Properties of Z-Transform, Concept of Region of Convergence [ROC], Inverse Z- transform using long division, Power Factor Expansion and residue method. | **06** |
| **Unit-3** | **Discrete and Fast Fourier Transform:** Discrete Fourier Transform (DFT), Definition and Properties of DFT and IDFT, Circular convolution. Fast Fourier Transforms (FFT), Radix-2 decimation in time and decimation in frequency FFT algorithms. | **08** |
| **Unit-4** | **Finite Impulse Response (FIR) filters:** Specifications, FIR filter design by Rectangular, hanning and hamming window, FIR filter realization. | **08** |
| **Unit-5** | **Infinite Impulse Response (IIR) filters:** IIR Filter Design by Mapping of S-plane to Z-plane: Impulse Invariance method, Bilinear Transformation method, Realization of IIR filter structures: Direct form-I, Direct Form-II, Cascade and Parallel form. | **08** |
| **Unit-6** | **Multi-rate Digital Signal Processing:** Sampling, Sampling rate conversion, multi-level filter bank. Overview and architecture of DSP processor TMS320C54XX. Applications of DSP: Block diagram of Speech Signal, RADAR & SONAR. | **06** |
| | Total | **42** |

**Text Books:**


1. Proakis & Manolakis D. G., “Digital Signal Processing”, PHI.
2. Nagoorkani, “Digital Signal Processing”, Tata McGraw-Hill Education, Second Edition.
3. S. Salivahanan, A. Vallavaraj, “Digital Signal Processing”, Tata McGraw-Hill Education, 2001.


**Reference Books:**


1. Oppenheim & Schafer, “Discrete time processing”, PHI.
2. Mitra S. K., “Digital Signal Processing”, TMH.
3. Roman Kuc, “Digital Signal Processing”, MGH.
4. Ifeacher E. C., Jervis B. W., “Digital Signal Processing”, Addison Wesley.
5. P. P. Vaidyanathan, “DSP and MultiMate Systems”, PHI.

## B.Tech. Semester V (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 5SE04PE1A | PEC I- Control System | 02 | 00 | 00 | 02 |

**Pre-requisites:**

1. (1SF01) Applied Mathematics
2. (4SE03) Signals and Systems

**Course Objectives:**

1. To understand the fundamental concepts of Control systems and mathematical modeling of the physical systems.
2. To analyze time domain and frequency domain response of the LTI system
3. To analyze State Variables of the system.

**Course Outcomes:**

After completion of this course the student will be able to:

CO 1: Ellaborate mathematical models of Physical systems.

CO 2: Determine transfer function from block diagrams and signal flow graph.

CO 3: Evaluate transient response and steady state response parameters.

CO 4: Analyze stability of the LTI system using Routh criterion and root locus

CO 5: Analyze stability of the LTI system using Bode plot and Polar Plot.

CO 6: Create state model and Evaluate response of system using state variable method.

| Unit | Course: Control System | L |
|---|---|---|
| **Unit-1** | **Fundamentals of Control system:** Types of control systems, Classification of control system, Physical Systems, Electrical Analogous Systems, Force-voltage analogy, force-Current analogy. | **04** |
| **Unit-2** | **Control system Representation:** Block diagram reduction technique & Rules, Signal flow graphs, Estimation of Transfer Function using Mason's gain formula. | **04** |
| **Unit-3** | **Time Response Analysis:** Standard test signals, Time domain response of first and second order system, impulse response function, Transient domain specifications. **Steady state analysis:** Types of steady state error and constants, dynamic error coefficients. | **05** |
| **Unit-4** | **Stability of Control System:** Necessary conditions for stability, Routh stability criterion. **Root locus Techniques**: Introduction, Construction of root locus, construction rules, Stability analysis of systems using root locus. | **05** |
| **Unit-5** | **Frequency- Domain analysis using Bode plot:** General procedure for construction, Gain margin and phase margin, Stability analysis of systems using Bode plots, Basic concepts of Polar plot. | **05** |
| **Unit-6** | **State space Analysis:** Space model representation of LTI systems, Relationship between state variable model and transfer function. Concept of Controllability and Observability. | **05** |
| | **Total** | **28** |

**Text Books:**

1. Nagrath I. J. and M. Gopal, "Control Systems Engineering", 5th Ed. New Age International.
2. K. Ogata, "Modern Control Engineering", Fourth Edition (PHI).

**Reference Books:**

1. Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", 11th Ed., Pearson Education.
2. M. Gopal, "Control System–Principles and Design", Tata McGraw Hill, 4th Edition, 2012.
3. Norman S. Nise, "Control System Engineering", 5th Edition, Wiley.
4. Bhattarcharya, "Control System Engineering", 2nd Edition (Pearson Education).
5. Benjamin C. Kuo, "Automatic Control System", JOHN WILEY & SONS, INC. 9th Edition.

**B.Tech. Semester V (Electronics and Telecommunication Engineering)**

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **5SE04PE1B** | **PEC-1: Speech and audio processing** | 02 | 00 | 00 | 02 |

**Pre-requisite**:

1. (4SE04) Signals and Systems.
2. (4SE02) Analog and Digital Communication

**Course Objectives:**

1. To relate human physiology and anatomy with signal processing paradigms.
2. To acquire the knowledge of speech generation and speech recognition models.
3. To understand methods/techniques used in speech signal estimation & detection

**Course Outcomes:**

After successfully completing the course, students will be able to,

CO1: Illustrate how the speech production is modelled

CO2: Analyse the techniques involved in collecting the features from the speech signal in time and frequency domain.

CO3: Elaborate the various speech coding techniques.

CO4: Describe the process of Speech Synthesis.

CO5: Apply techniques/methods used for speech enhancement.

CO6: Analyse techniques/methods used for speech recognition

| Unit | Course: Speech and audio processing | L |
|---|---|---|
| **Unit-1** | **Speech Production and Acoustic Phonetics:** Process of speech production, Articulatory phonetics, Acoustic Phonetics, Acoustic theory of speech production, Co- articulation, Prosody, Digital models of speech signals. | **05** |
| **Unit-2** | **Speech Analysis:** Time and frequency domain methods for analysis of speech: Methods for extracting energy, average magnitude, zero crossing rate, silence discrimination using ZCR and energy. | **05** |
| **Unit-3** | **Coding of Speech Signals:** Introduction, Quantization, Speech redundancies, Time domain waveform coding, Linear predictive coding: Linear Delta Modulation ,Adaptive Delta Modulation | **05** |
| **Unit-4** | **Speech Synthesis:** Principles of speech synthesis, Articulatory synthesis, Formant synthesis and LPC synthesis | **05** |
| **Unit-5** | **Speech Enhancement:** Introduction, Nature of interfering sounds, speech enhancement techniques: spectral subtraction and filtering, harmonic filtering, Spectral subtraction, Adaptive noise cancellation | **04** |
| **Unit-6** | **Speech Recognition:** Introduction, Baye's rule, Segmental feature extraction, MFCC, DTW, HMM approaches for speech recognition | **04** |
| | **Total** | **28** |

**Text Books:**


1. Douglas O'Shaughnessy, "Speech Communications: Human & Machine", Universities Press.
2. Rabiner and Schafer, "Digital Processing of Speech Signals", Prentice Hall, 1978.


**Reference Books:**


1. Thomas F. Quatieri, "Discrete-Time Speech Signal Processing: Principles and Practice", Publisher: Prentice Hall.
2. Nelson Morgan and Ben Gold, "Speech and Audio Signal Processing: Processing and Perception of Speech and Music", John Wiley & Sons.
3. J. L. Flanagan, "Speech Analysis Synthesis and Perception", Second edition, Springer-Verlag(1972).
4. Gold & Morgan, "Speech and Audio Signal Processing", Wiley and Sons, 1999.

**B.Tech. Semester V (Electronics and Telecommunication Engineering)**

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **5SE04PE1C** | **PEC-1: Fiber Optic Communication** | 02 | 00 | 00 | 02 |

**Pre-Requisite**:

1. (3SE04) Electromagnetics waves
2. (4SE02) Analog & Digital Communication

**Course Objectives:**

1. To understand the fundamentals of optical fibers and its transmission characteristics.
2. To explore the different aspects of optical sources, their quantum efficiencies and other parameters.
3. To learn the concepts of optical receivers, parameters and optical communication systems.

**Course Outcomes:**

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

CO1: Describe the principles of fiber-optic communication, modes and types of optical fibers.

CO2: Explain the transmission characteristics of optical fiber.

CO3: Elaborate different aspects of Optical sources.

CO4: Describe principle of operation of Optical detectors and related parameters.

CO5: Illustrate the aspects of optical fiber coupler and switches.

CO6: Elaborate concepts of WDM and DWDM systems.

| UNIT | Course: Fiber Optic Communication | L |
|---|---|---|
| Unit-1 | **Optical Fiber Communication System:** Basic optical laws and definitions, Optical fiber modes and configurations, Numerical Aperture; Step index, Graded index, Single mode and Multi-mode fibers, Cutoff wavelength, Block Diagram of fiber optic communication. | **05** |
| Unit-2 | **Losses and Dispersion in fibers:** Attenuation: Absorption, Scattering losses, Radiation losses, Bending losses, Intra & intermodal dispersion. | **05** |
| Unit-3 | **Optical Sources:** Material for Optical sources, Light Emitting Diodes – Structure, Power and Efficiency, Laser Diodes: Basic concepts, threshold conditions, Types of LASER. | **05** |
| Unit-4 | **Optical Detectors:** Principles of photodiode, Quantum Efficiency, Responsivity, and types – P-N Photodiode, PiN Photodiode, APD Photodiode. | **05** |
| Unit-5 | **Optical Couplers and** Amplifiers**:** Introduction to Fiber Couplers: Three & four port coupler, Star coupler, Optical amplifiers – Erbium Doped Fiber Amplifier, Raman amplifier. | **04** |
| Unit-6 | **Wavelength Division Multiplexing:** Need of WDM, Principles of WDM networks, Nonlinear effects in fiber optic links, Concept of self-phase modulation, Introduction to DWDM. | **04** |
| | **Total** | **28** |

**Text Books:**


1. Gerd Keiser, "Optical Fiber Communication", 5th Edition, Mc Graw Hill Education (India) Pvt Ltd, 2015.
2. John M Senior, "Optical Fiber Communications", Principles and Practice, 3rd Edition, Pearson Education, 2010,


**Reference Books:**


1. Seniors J. M., "Optical Fibre Communication and Applications", Prentice Hall of India Pvt.Ltd., New Delhi.

## B.Tech. Semester V (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **5SE05PE2A** | **PEC-2 SENSORS AND TRANSDUCERS** | 02 | 00 | 00 | 02 |

**Prerequisites:**

1. (2SF03) Basic of Electrical Engineering.
2. (2SET01)Electrical Measurement & Measuring Instruments.

**Course Learning Objective:**

1. To make students aware of Types of transducers, their characteristics and Instrumentation system.
2. To impart knowledge of different types of transducers to students.
3. To enrich students with knowledge of sensors and applications.

**Course Outcomes:**

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

1. Describe the role of sensors and transducers in instrumentation systems.
2. Comprehend the characteristics of instrumentation system & Transducers.
3. Discuss the operation of different types of Temperature & Radiation Transducers.
4. Elaborate Transducers for measurement of displacement, Flow & level.
5. Explain the working and operation of different type of Humidity & Pressure Transducers.
6. Discuss of strain measurement & working of smart sensors.

| UNIT | Course: SENSORS AND TRANSDUCERS | L |
|---|---|---|
| **Unit-1** | **Sensor & Transducers:** Definition-basic principle- characteristics-types of Sensors & Transducers. Selection of sensors, Need of sensor, Difference between Sensors & Transducers, Classification of Transducer. Introduction to Generalized Instrumentation system with example. | **05** |
| **Unit-2** | **Characteristic, parameters and Errors:** Static characteristics of instruments and Statistical Parameters with numerical.<br>**Error and its Types:** Gross error, Systematic Error, Random Error. | **05** |
| **Unit-3** | **Thermal sensors**: Resistance type: Resistance thermometer (RTD), Thermistor. Thermo EMF Sensor: Thermocouples. Radiation Sensor: Total radiation Pyrometers. IC LM 35. | **04** |
| **Unit-4** | **Transduction Sensor (Displacement Measurement):** Resistive: Potentiometric Type. Inductive: Linear Variable Differential Transformer. (LVDT). Capacitive: Variable Distance-Parallel plate, Variable area, **Measurement of Flow:** Hot wire anemometer. **Measurement of Level:** Resistive method, Ultrasonic level detector. | **05** |
| **Unit-5** | **Humidity Measurement**: Definition, Resistive, Capacitive and Piezoelectric. **Measurement of Pressure:** Capacitive, Piezo- electric and its material. **Low Pressure (Vacuum):** Pirani gauge | **04** |
| **Unit-6** | **Strain Measurement:** Introduction, types of strain gauge, gauge factor, materials for strain gauge, resistance strain gauge bridges, and temperature compensation and applications of strain gauges. **Introduction to Smart Sensors**: Components of Smart Sensor, general architecture of Smart Sensor, Industrial application of Smart Sensor. | **05** |
| | **Total** | **28** |

**Text Books:**


1. Shawhney A. K. "A Course In Electrical and Electronics Measurements and Instrumentation", Dhanpat Rai& Sons, 11th Ed., 1999.
2. Kalsi H. S. "Electronic Instrumentation", Tata McGraw-Hill Education.


**Reference Books:**


1. D. Patranabis ,"Sensor & transducers", 2nd edition, PHI.
2. J B Gupta ,"A Course In Electrical and Electronics Measurements and Instrumentation".

**B.Tech. Semester VI (Electronics and Telecommunication Engineering)**

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **5SE05PE2B** | **PEC-2: Introduction to Java** | 02 | 00 | 00 | 02 |

**Pre-requisites:**

(3SE09) Object Oriented Programming Lab

**Course Learning Objectives:**

1. To learn basics of Java programming.
2. To understand the principals of Object-Oriented Programming.
3. To study the exception and file handling of Java programming language.

**Course Outcomes:**

After completion of this course the student shall be able to-

CO1: Understand fundamentals of Object-Oriented Programming and can build & run a basic application at their own.

CO2: Discuss the basic building blocks of Java Programming Language.

CO3: Apply the knowledge of selection & repetition statements in Java Program.

CO4: Create methods and use classes and objects to solve real world problems.

CO5: Elaborate and apply the concept of inheritance in Java programming language.

CO6: Demonstrate the exception handling and create user defined exception and also apply file handling in Java.

| Unit | Course: Introduction to Java | L |
|---|---|---|
| **Unit-1** | **Java Basics:** History of Java, Characteristics of Java, Types of Java Program, an introduction to Classes & Objects, Messages & methods, introduction to Inheritance, Software Engineering & Software Life Cycle. | **05** |
| **Unit-2** | **Java Building Elements:** Identifiers, Variables, Constants, Data types, Arithmetic Expressions, Standard Input & Output, Programming Style & Documentation. | **04** |
| **Unit-3** | **Control Structure:** Selection Statements: if, if…else, Nested if, switch. Repetition Statements: for loop, while loop & do loop, using break & continue. | **04** |
| **Unit-4** | **Object Oriented Programing:** Objects & classes, Passing Objects to methods, Instance Variables & class Variables, Instance Methods & Class Methods, Scope of Variables, Introduction to Packages, the Math Class. | **05** |
| **Unit-5** | **Inheritance:** Super classes and Subclasses, the super keyword, *this* keyword, the Object class, the final and abstract modifiers, the concept of Wrapper Classes, Introduction to Interfaces. | **05** |
| **Unit-6** | **Exception Handling:** Exception as objects, Exception hierarchy, Try catch finally, throw, throws. **File Handling:** File & J File Chooser Objects, Low-Level File I/O, High Level File I/O. | **05** |
| | **Total** | **28** |

**Text Books:**


1. Y. Daniel Liang, "An Introduction to Java Programming", Eastern Economy Edition, PHI.
2. C. Thomas Wu, "An Introduction to Object-Oriented Programming JAVA", Fourth Edition, Tata McGraw Hill.


**Reference Books:**


1. Kathy Sierra & Bert Bates, "Head First Java", O'REILLY.
2. E Balagurusamy, "Programming with JAVA, A Primer", Third Edition, Tata McGraw Hill.

## B.Tech. Semester V (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **5SE05PE2C** | **PEC-2: Cryptography & Network Security** | 02 | 00 | 00 | 02 |

**Pre-Requisite**:

1. (3SE01) Applied Mathematics – III

**Course Objectives:**

1. To explain the objectives of information security, confidentiality, integrity, authentication and availability.
2. To impart the knowledge of various cryptographic algorithms.
3. To enrich students with the knowledge of basic categories of threats to computers and networks.

**Course Outcomes:**

After successfully completing the course, students will be able to-

CO1: Understand the basic cryptographic algorithms.

CO2: Discuss the message and web authentication and security issues.

CO3: Identify and implement information system requirements.

CO4: Comprehend the current legal issues towards information security.

CO5: Explain the fundamentals of public-key cryptography.

CO6: Elaborate E-Mail Security and architecture.

| UNIT | Course : Cryptography & Network Security | L |
|---|---|---|
| **Unit-1** | **Security Concepts:** Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security mechanisms, A model for Network Security. **Cryptography Concepts and Techniques:** Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, Basic aspects of steganography. | **05** |
| **Unit-2** | **Symmetric key Ciphers:** Block Cipher principles, DES, AES, Blowfish, Block cipher operation, Stream ciphers, RC4. | **05** |
| **Unit-3** | **Asymmetric key Ciphers:** Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm. | **05** |
| **Unit-4** | **Cryptographic Hash Functions:** Message Authentication, Secure Hash Algorithm (SHA-512), **Message authentication codes:** Authentication requirements, HMAC, CMAC, Digital signatures, Message Digest code. | **05** |
| **Unit-5** | **Transport-level Security:** Web security considerations, HTTPS, Secure Shell (SSH). **Wireless Network Security:** Wireless Security, Mobile Device Security, Introduction to IEEE 802.11 Wireless LAN and IEEE 802.11i Wireless LAN Security. | **04** |
| **Unit-6** | **E-Mail Security:** Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, Internet Key Exchange. | **04** |
| | **Total** | **28** |

**Text Books:**


1. William Stallings, “Cryptography and Network Security - Principles and Practice”, 6th Edition, Pearson Education.
2. Atul Kahate, “Cryptography and Network Security”, 3rd Edition, Mc Graw Hill.


**Reference Books:**


1. C K Shyamala, N Harini, Dr T R Padmanabhan, “Cryptography and Network Security”, 1st Edition, Wiley India.
2. Forouzan Mukhopadhyay, “Cryptography and Network Security”, 3rd Edition Mc Graw Hill.
3. Mark Stamp, “Information Security, Principles, and Practice”, Wiley India.
4. WM Arthur Conklin, Greg White, “Principles of Computer Security”, TMH.
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning.

## B.Tech. Electronics and Telecommunication, Semester V

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **5SE06** | **Microcontroller & Applications Lab** | 00 | 00 | 02 | 01 |

**Pre-Requisite**: (3SE03) Digital System Design
(3SE02) Electronic Devices & Circuits.

**Course Objectives:**

1. Implement a basic program on a microprocessor-based development board (e.g., Dynalog 8085) and a microcontroller-based development board (e.g., NVIS 8051 kit) that demonstrates a fundamental difference in their operation
2. Develop and debug C language programs to control at least five different on-board peripherals (e.g., GPIOs, Timers, UART, ADC, DAC, LCD, Keyboard) on a chosen microcontroller development board (e.g., NVIS, 8051 DVK), achieving a specified functionality for each.
3. Develop and validate a C program that reads data from a digital sensor and controls an actuator (e.g., an LED or a small motor) through an appropriate interface, demonstrating real-time interaction and error handling.

**Course Learning Objectives:**

After successfully completing the course, students will be able to-

1. Successfully program a basic task (e.g., LED blink) on both a microprocessor and a microcontroller.
2. Interface and program an 8255 PPI to control I/O (e.g., turn on/off LEDs, read switches) with an 8085 microprocessor.

3. Identify the function of key components in a given microcontroller datasheet.

4. Develop and debug C programs to control at least three different peripherals (e.g., GPIO, UART, Timer) on a microcontroller.

5. Control an actuator (e.g., motor, relay) using a microcontroller and appropriate interfacing.

**List of Experiment:**

Performance of Minimum 8-10 practicals based on 5SE01 Microcontroller & Application theory syllabus.

## B.Tech. Semester V (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **5SE07** | **Power Electronics Lab** | 03 | 00 | 02 | 03 |

**Pre-Requisite**:

3. (2SF03) Basics of Electrical Engineering.
4. (3SE02) Electronic Devices & Circuits.

**Course Learning Objectives:**

4. To introduce power electronic devices such as SCR, TRIAC, IGBT, MOSFET and their characteristics.
5. To study various converter topologies based on power devices.
6. To comprehend the knowledge of power devices in analyzing various applications.

**Course Outcomes:**

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

CO1: Describe basic operation of SCR its firing techniques and explain the Characteristics of various power electronic devices

CO2: Elaborate the concept of controlled rectifiers and dual converters and analyze different types of inverter circuits.

CO3: Analyze basic chopper and cyclo-converter circuits.

**Practical's:** Performance of Minimum 8-10 practical's based on 5SE07 Power Electronics.

**B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)**

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 5SE08 | Digital Signal Processing Lab | 00 | 00 | 02 | 01 |

**Pre-requisite:** Digital Signal Processing (5SE03)

**Course Objectives:**
This Laboratory will enable students:

1. To demonstrate basic concepts of digital signals and systems.
2. To validate the theory through experimentation.
3. To analyse experimental results through journal writing.

**Course Outcome:**
After successful completion of this course, students will be able to:

1. Understand the classification of various digital signals and its processing.
2. Implements methodologies for signal operations, signal parameters, system response using Octave tool.
3. Analyse and express the outcomes of Digital Signal Processing in journal and viva-Voce.

**List of Experiments:**
Performance of Minimum 8-10 practicals based on 5SE03 Digital Signal Processing syllabus.

## B.Tech. Semester V (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 5SEOE3C | OE-III : Human Resource Management | 03 | 00 | 00 | 03 |

**Course Pre-requisite:** 1. 1SF05 Professional Communication Skills

2. 2SF05 Universal Human Values

**Course Learning Objectives:**

1. To understand the fundamentals of Human Resource Management (HRM).
2. To explore HRM functions like recruitment, selection, training, and performance management.
3. To analyse HR policies, labour laws, and ethical practices in HR

**Course Outcomes:**

1. Explain the key principles, functions, and importance of Human Resource Management in an organization.
2. Analyse the processes of human resource planning, job analysis, recruitment, and selection, with a focus on IT and IoT-based companies.
3. Evaluate different training methods and employee development strategies, emphasizing their importance in fast-evolving tech environments.
4. Examine performance appraisal methods, compensation structures, and employee motivation techniques relevant to IT and IoT industries.
5. Interpret various labour laws, workplace ethics, and employee relations policies, ensuring compliance with organizational and legal standards.
6. Assess the impact of digital transformation, AI-driven HR tools, and remote work trends on modern HR practices in tech industries.

| UNIT | Course: Human Resource Management | L |
|---|---|---|
| **Unit-1** | Introduction to Human Resource Management: Definition, Scope, and Evolution of HRM, Functions and Objectives of HRM, HRM vs. Personnel Management, Role of HR in IT and IoT Industries, Strategic HRM and its Importance. | **07** |
| **Unit-2** | HR Planning and Recruitment: Human Resource Planning (HRP) Process, Job Analysis, Job Description, and Job Specification, Recruitment: Sources and Methods, Selection Process: Tests, Interviews, and Selection Criteria, Onboarding and Induction Programs. | **07** |
| **Unit-3** | Employee Training and Development: Need for Training in the IT Industry, Training Methods: Online vs. Offline, On-the-Job vs. Off-the-Job, Employee Development and Career Planning, Importance of Continuous Learning in IoT & AI Fields, Evaluating Training Effectiveness | **07** |
| **Unit-4** | Performance Management and Compensation: Performance Appraisal: Purpose, Methods, and Challenges, Key Performance Indicators (KPIs) in Tech Companies, Compensation and Benefits in IT and IoT Sectors, Incentives and Reward Systems, Employee Motivation and Engagement Strategies | **07** |
| **Unit-5** | Employee Relations and Legal Aspects: Employer-Employee Relationship in Tech Firms, HR Policies and Workplace Ethics, Labor Laws and Employment Regulations in India, Grievance Handling and Conflict Resolution, Workplace Safety, Diversity, and Inclusion | **07** |
| **Unit-6** | HRM in the Digital Age: Role of HR Analytics and Data-Driven Decision Making, Artificial Intelligence in HRM (HR Chatbots, Resume Screening), Remote Work and Virtual Team Management. | **07** |
| | **Total** | **42** |

**Textbooks:**

1. "Human Resource Management" by Gary Dessler
2. "Human Resource Management: People, Data, and Analytics" by Talya Bauer, Berrin Erdogan, David Caughlin, and Donald Truxillo

**Reference Books:**

1. "HRM, Artificial Intelligence and the Future of Work", by Tony Dundon and Adrian Wilkinson
2. "Human Resource Management" by Sangeetha N.

## B.Tech. Semester V (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **5SEH** | **Electronic Circuit design** | 02 | 00 | 00 | 02 |

**Pre-requisites:**

1. (4SE03) Analog circuits
2. (3SE02) Electronics Devices & Circuits
3. (3SE03) Digital system Design

**Course Learning Objectives:**

1. To understand principles of electronic circuit design.
2. To comprehend the procedures for designing and analyzing electronic circuits.
3. To learn the concepts of digital circuit design using VHDL.

**Course Outcomes:**

After completion of this course the student shall be able to:

CO1: Understand the design specifications, components and electronic system design.

CO2: Formulate, analyze and design fundamental analog circuits.

CO3: Demonstrate the design of instrumentation amplifier, Temperature controller and indicator.

CO4: Discuss the basic Concepts of VHDL.

CO5: Develop VHDL code for various Combinational Circuits.

CO6: Design synchronous and asynchronous of sequential circuits.

| Unit | Content: Electronic Circuit design | L |
|---|---|---|
| **Unit-1** | Design of regulated power supply using transistor, design of DC amplifier, comparator, window detectors using IC 741 /IC 324. | **06** |
| **Unit-2** | Design of waveform generator using IC 741, IC 8038, IC 566. Design of sweep generator, voltage controlled oscillator. | **06** |
| **Unit-3** | Design of instrumentation amplifier, Temperature controller / indicator using thermocouple, resistance thermal detector, thermo sensors AD590, LM35. | **06** |
| **Unit-4** | VHDL : Design flow, EDA tools, code structures, data types, operators and attributes. Signals & Variables, packages and components, configuration. | **06** |
| **Unit-5** | Design of combinational blocks such as multi-bit adders, ALU, MUX, DEMUX, encoders, decoders. | **04** |
| **Unit-6** | Design of sequential circuits, asynchronous and synchronous design, state machine modeling (Moore and Mealy machines). | **04** |
| | **Total** | **28** |

**Textbooks:**


1. R.A. Gayakwad : "OP-AMP and Linear Integrated Circuits",4th Edition, PHI
2. Brown & Vranesic, "Digital Logic Design using VHDL", TMH.
3. J. Bhaskar, "VHDL Primer",Pearson Education.


**Reference Books:**


1. Sergio Franco, "Design with Linear Integrated Circuits & Opamps".
2. Douglas L. Perry," VHDL" , 3rd Edition , McGraw Hill.
3. Paul Horowitz-W.Hill, "The art of Electronics",Cambridge publication.
4. Volnei Pedroni, " Circuit Design with VHDL", PHI , 2005 edition.

## B.Tech. Semester V (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 5SEOE3A | OE-III: Waste to Energy | 03 | 00 | 00 | 03 |

**Pre-requisites: NA**

**Course Learning Objectives:**

**1**: To understand the principles of waste management and its significance in environmental sustainability.

**2**: To analyse various sources of waste, their classification, and their impact on the environment.

**3**: To explore methods of energy generation through bio-chemical and thermo-chemical conversions, and their role in waste-to-energy processes.

**Course Outcomes:**

After completion of this course the student shall be able to:

CO1: Familiarized with the concept of Waste Management.

CO2: Explain waste sources and its classification.

CO3: Understand the concept of energy generation by Bio-chemical conversion.

CO4: Understand the concept of energy generation Thermo-chemical conversion.

CO5: Understand the need of Energy from Plastic Wastes.

CO6: Discuss about Biofuels.

| UNIT | Course : OE-III: Waste to Energy | No. of Lectures Required |
|---|---|---|
| **Unit-1** | **Introduction:** The Principles of Waste Management and Waste Utilization. Waste Management Hierarchy and 3R Principle of Reduce, Reuse and Recycle. Waste as a Resource and Alternate Energy source. | **06** |
| **Unit-2** | **Waste Sources & Characterization:** Waste production in different sectors such as domestic, industrial, agriculture, postconsumer, waste etc. **Classification of waste** – agro based, forest residues, domestic waste, industrial waste (hazardous and non-hazardous). Characterization of waste for energy utilization. Waste Selection criteria. | **07** |
| **Unit-3** | **Biochemical Conversion –** Energy production from organic waste through anaerobic digestion and fermentation. | **06** |
| **Unit-4** | **Thermo-chemical Conversion –** Combustion, Incineration and heat recovery, Pyrolysis, Gasification; Plasma Arc Technology and other newer technologies. | **06** |

| | | |
|---|---|---|
| **Unit-5** | **WASTE TO ENERGY OPTIONS:** Landfill gas, collection and recovery. Energy from Plastic Wastes – Non-recyclable plastic wastes for energy recovery. Energy Recovery from wastes and optimization of its use, benchmarking and standardization. E-waste: E-waste in the global context, Growth of Electrical and Electronics Industry in India, Environmental concerns, health hazards and Recycling. | **07** |
| **Unit-6** | **Introduction to biofuels:** Definition of fuels and biofuels; Emission factors, Comparative analysis of the chemical composition of the raw biomass materials; Evolution of the production of biofuels – (from I generation to IV generation). Process of Bioethanol Production from Biomass. | **07** |
| | Total | **39– Lectures** |

**Text Book (s):**


1. P. Aarne Vesilind, William A. Worrell and Debra R. Reinhart. "Solid Waste Engineering", Second edition, Cengage learning India Pvt. Limited, 2016
2. Nicholas P. Cheremisinoff, "Handbook of Solid Waste Management and Waste Minimization Technologies", An Imprint of Elsevier, New Delhi, 2003
3. Zander Ellis, "Industrial Waste Management", Larsen and Keller Education, 2017


**Reference Books(s) / Web links:**


1. The Biofuels Handbook By Natasha Ramroop Singh.
2. C Parker and T Roberts (Ed), "Energy from Waste – An Evaluation of Conversion Technologies", Elsevier Applied Science, London, 1985
3. Sofer, Samir S, Oskar R. Zaborsky, "Biomass Conversion Processes for Energy and Fuels", Springer, 2012
4. Hagerty, D.Joseph; Pavoni, Joseph L; Heer, John E., "Solid Waste Management", New York, Van Nostrand, 1973
5. Amalendu Bagchi. "Design of Landfills and Integrated Solid Waste Management". 3rd edition, John Wiley and Sons. New York, 2004
6. C. S. Rao. "Environmental Pollution Control Engineering", Wiley Eastern Ltd. New Delhi (1995)
7. "E-waste in India: Research unit, Rajya Sabha Secretariat, New Delhi, June 2011"
8. KL Shah, "Basics of Solid and Hazardous Waste Management Technology", Prentice Hall, 2003
9. M Datta, "Waste Disposal in Engineered Landfills", Narosa Publishing House, 1997

## B.Tech. Semester V (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 5SEOE3B | **Intellectual Property Rights (IPR)** | 03 | 00 | 00 | 03 |

**Pre-Requisite**: NIL

**Course Learning Objectives:**

4. Impart awareness on Intellectual Property Rights (IPR) and various regulatory issues related to IPR.
5. Familiarize students with the shades of Intellectual Property Rights (IPR).
6. Awareness on intellectual property rights and various regulatory issues related to IPR.

**Course Outcomes:**

After successfully completing the course, students will be able to-

1. Understand the concept of intellectual property and list its various forms.
2. Explain the process of obtaining a patent, including eligibility criteria and rights associated with patents.
3. Apply copyright laws to determine eligibility for protection and understand procedures for registration.
4. Analyze trademark classification and evaluate criteria for registration.
5. Synthesize understanding to develop strategies for registration and protection of industrial designs.
6. Evaluate the significance of trade secrets in business operations and analyze precautionary measures for protection.

| UNIT | Course: Intellectual Property Rights | L |
|---|---|---|
| **Unit-1** | **Introduction to Intellectual Property Rights**: Role of IP in the Economic and Cultural Development of the Society, IP Governance. IP as a Global Indicator of Innovation, Origin of IP, History of IP in India. Patents, Copyrights and Related Rights, Trademarks, Trade Secrets. | **07** |
| **Unit-2** | **Patents:** Conditions for Obtaining a Patent Protection, To Patent or Not to Patent an Invention, Rights Associated with Patents, Enforcement of Patent Rights, and Inventions Eligible for Patenting, Non-Patentable Matters, Patent Infringements, Process of Patenting. | **07** |

| | | |
|---|---|---|
| **Unit-3** | **Copyrights:** Classes of Copyrights, Criteria for Copyright, Ownership of Copyright, Copyrights of the Author, Copyright Infringements, Liability of Owner of an Auditorium/Hall, Fair Use Doctrine, Non-Copyright Work, Copyright Registration, Judicial Powers of the Registrar of Copyrights, Fee Structure, Copyright Symbol, Validity of Copyright. | **07** |
| **Unit-4** | **Trademarks:** Eligibility Criteria, Who Can Apply for a Trademark, Acts and Laws, Designation of Trademark Symbols, Classification of Trademarks, Registration of a Trademark is Not Compulsory, Validity of Trademark, and Types of Trademarks Registered in India, Trademark Registry, and Process for Trademarks Registration. Famous Case Law: Coca-Cola Company vs. Bisleri International Pvt. Ltd. | **07** |
| **Unit-5** | **Industrial Design:** Eligibility Criteria, Acts and Laws to Govern Industrial Designs, Design Rights, Enforcement of Design Rights, Non-Protectable Industrial Designs India, Protection Term, Procedure for Registration of Industrial Designs, Importance of Design Registration, Cancellation of the Registered Design, Application Forms, Famous Case Law: Apple Inc. vs. Samsung Electronics Co. | **07** |
| **Unit-6** | **Trade Secret:** Criteria for Trade Secret, Registration and Protection Time of Trade Secrets, Rights Associated with Trade Secrets, Enforcement of Trade Secrets, When to Apply for Trade Secret Protection, Precautionary Measures to be Taken by Enterprises/Organizations, Disparity Between Trade Secrets and Patents, Renowned Trade Secrets. | **07** |
| | **Total** | **42** |

**Text Books:**


1. Prof. Rupinder Tewari and Ms. Mamta Bhardwaj, "Intellectual Property: A Primer for Academia" by, Publication Bureau, Panjab University, Chandigarh, 2021.
2. K. V. Nithyananda, "Intellectual Property Rights: Protection and Management", by Cengage Learning India Private Limited, 2019.


**Reference Books:.**


1. Deborah E. Bouchoux, "Intellectual Property for Paralegals – The Law of Trademarks, Copyrights, Patents & Trade Secrets", 4th Edition, Cengage Learning, 2012.
2. N. S. Gopalakrishnan and T. G. Agitha, "Principles of Intellectual Property", Eastern Book Company, Lucknow, 2009.
3. M. M. S. Karki, "Intellectual Property Rights: Basic Concepts", Atlantic Publishers, 2009.
4. Ganguli Prabuddha, "Intellectual Property Rights--Unleashing the Knowledge Economy", Tata McGraw Hill, 2001.

## B.Tech. Semester VI (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **6SE01** | **Microwave Theory & Techniques** | 03 | 00 | 00 | 03 |

**Pre-requisites:** (3SE04) Electromagnetic Waves.

**Course Learning Objectives:**

1. To understand Basic concepts of Microwave active and passive devices.
2. To acquire the knowledge of Transmission characteristic of microwave through waveguide and Parallel strip line.
3. To comprehend Concepts of Microwave resonators and Microwave components and formulation of scattering matrix.
4. To understand the techniques of Measurement of microwave parameters.

**Course Outcomes:**

After completion of this course the student shall be able to:

CO1: Understand the principles of operation of microwave tubes.

CO2: Analyze the operational characteristics of microwave solid-state devices.

CO3: Analyze microwave propagation through waveguides and parallel strip lines.

CO4: Illustrate various types of microwave resonators.

CO5: Formulate Scattering matrix for microwave components.

CO6: Apply appropriate measurement techniques to measure and evaluate parameters of ` microwave systems.

| Units | Course: Microwave Theory & Techniques | L |
|---|---|---|
| **Unit-1** | **Microwave Tubes:** Introduction to microwave Engg. and applications, advantages, frequency bands, Limitation of Conventional devices at high frequency, Microwave Tubes: Two cavity, reflex klystron, Cylindrical Cavity Magnetron, TWT. | **07** |
| **Unit-2** | **Semiconductor Microwave Devices:** Gunn diode: RWH theory, Gunn domain, modes of Gunn oscillation, Negative resistance amplifier (principle), Parametric amplifiers: operation & types, Principle of operation of IMPATT, TRAPATT diodes, & MASER. | **07** |

| | | |
|---|---|---|
| **Unit-3** | **Waveguide system and Parallel Strip lines:** Waveguides: Rectangular Wave guide: TEM wave in Rectangular Waveguide, Field Expressions and parameters, Circular Waveguide: Field Expressions and parameters. Introduction to Parallel strip lines. | **08** |
| **Unit-4** | **Microwave Resonator:** Basics concepts of Resonant circuits, Series and parallel resonant circuits (RLC), transmission line resonators – Half wavelength and quarter wavelength long open circuited and short circuited line, Cavity resonators: rectangular and circular cavities, resonant frequency, and quality factor of resonators. | **07** |
| **Unit-5** | **Microwave passive components & Scattering matrix:** Introduction to scattering matrix and properties, formulation of Scattering Matrix for Two hole directional coupler, E-plane tee, H-plane tee, Magic tee and Circulators. Microwave propagation in ferrites, devices employing Faraday rotation: Gyrator, Isolator. | **07** |
| **Unit-6** | **Microwave Measurements:** Frequency Measurements, Power Measurements, Attenuation Measurements, VSWR Measurements, Impedance Measurements, insertion Loss Measurements, Dielectric constant Measurements. | **06** |
| | **Total** | **42** |

**Text Books:**


1. Liao, Samuel Y., "Microwave Devices & Circuits", Tata Mc-Graw Hill Co. Ltd., New Delhi.
2. David M Pozar, "Microwave Engineering" Wiely 3 rd Edition.
3. Collin, Robert E., "Foundations for Microwave Engineering", Mc- Graw Hill, New York.


**Reference Books:**


1. Kennedy G., "Electronics Communication Systems", Tata Mc-Graw Hill Book Co., New Delhi.
2. K.C. Gupta, "Microwave Engineering", New Age.
3. Reich, Scolnik, Ordung, Krangs, "Microwave Principles", PHI.
4. M.L. Sisodiya and G.S. Raghuwanshi, "Microwave Circuits and Passive devices", John Wiley & Sons Ltd.
5. Mathew M. Radmanesh, "RF and Microwave Electronics – Illustrated", Prentice Hall.

## B.Tech. Semester VI (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **6SE02** | **Digital Image Processing** | 3 | 00 | 00 | 3 |

**Pre-Requisite**:

1. (3SE01) Mathematics-III
2. (5SE03) Digital Signal Processing

**Course Objectives:**

1. To understand fundamentals of digital image processing.
2. To analyze Digital image filtering techniques in spatial and transform domain.
3. To comprehend the knowledge of segmentation, morphological concepts and image processing operations.
4. To understand image compression techniques and color image processing.

**Course Outcomes:**

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

CO1: Describe the fundamentals of digital image processing.

CO2: Analyze different image enhancement methods in the spatial domain.

CO3: Analyze different image enhancement methods in the transform domain.

CO4: Elaborate image segmentation and morphological processes.

CO5: Explain the image degradation model and various image compression techniques.

CO6: Elaborate concepts of colour image processing.

| UNIT | Course: Digital Image Processing | L |
|---|---|---|
| **Unit-1** | **Introduction and Digital Image Fundamentals:** Human Visual System, Image as a 2-D signal, image sampling and quantization, image types-Binary, Gray, RGB and Multi-spectral; Pixel neighbourhood, adjacency, connectivity and distance measures. | **07** |
| **Unit-2** | **Image Enhancement in the Spatial Domain:** Enhancement: Image negation, Brightness, contrast modification, Histogram, Histogram Equalization, Bit plane slicing; Linear, Order-Statistic (Nonlinear) Filters, Laplacian filter using the Second Derivative. | **07** |
| **Unit-3** | **Image Enhancement in the Frequency Domain:** Properties of 2D DFT: Transactional and Periodicity; Low pass & High Pass Filters - Ideal, Butterworth and Gaussian; Homomorphic Filter. | **07** |
| **Unit-4** | **Image Segmentation and Morphology:** Segmentation Fundamentals, Line detection, Edge detection using Prewitt, Sobel and canny Karnel; Region Growing, Region splitting and merging; Erosion and Dilation, Opening and Closing | **07** |
| **Unit-5** | **Image restoration and Compression techniques:** Wiener filtering Types of Redundancy, Loss less compression (Huffman coding), Lossy compression-predictive and transform coding; JPEG, JPEG-2000, PNG Image compression standards | **07** |
| **Unit-6** | **Color Image Processing:** Color Models: RGB, CMY and CMYK; Pseudo color Image processing, Image Smoothing and Sharpening, Image segmentation in RGB vector space. | **07** |
| | **Total** | **42** |

**Text Books:**


1. Gonzaleze and Woods, “Digital Image Processing”, 3rd edition, Pearson Publication.
2. S. Jayaraman, S. Esakkirajan, T. Veerakumar, “Digital Image Processing”, 2nd edition, McGraw Hill publication.


**Reference Books:**


1. Anil Kumar Jain, “Fundamentals of Digital Image Processing”, 2nd edition, Prentice Hall of India, 2004.
2. Arthur R. Weeks, “Fundamentals of Electronic Image Processing”, Wiley–Blackwell.
3. William Pratt,” Digital Image Processing: PIKS Inside”, 4th Edition, A WISP.

## B.Tech. Semester VI (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **6SE03** | **Embedded systems** | 03 | 00 | 00 | 03 |

**Pre-Requisite:**

1. (3SE03) Digital System Design.
2. (3SE09) Object Oriented Programming Lab
3. (5SE01) Microcontroller & Applications

**Course Objectives:**

1. To understand the concept of Embedded Systems.
2. To study architecture and inbuilt peripherals of AVR Microcontroller.
3. To learn and apply RTOS to embedded systems.

**Course Outcomes:**

After successful completion of the course, students will be able to-

CO1: Describe the concept of Embedded Systems.

CO2: Explain the quality attributes of Embedded System.

CO3: Articulate the architecture and inbuilt peripherals of AVR Microcontroller.

CO4: Evaluate the programming of AVR Microcontroller in C and C++.

CO5: Compare task, process & threads in Real Time Embedded System.

CO6: Evaluate validation and debugging of Embedded System.

| Units | Course: Embedded Systems | L |
|---|---|---|
| **Unit-1** | **Introduction to Embedded systems:** History of Embedded system, Embedded systems vs. General computing systems, Classification of Embedded systems, Major application areas of Embedded systems, Purpose of Embedded systems. | **08** |
| **Unit-2** | **Building blocks of Embedded systems:** Core of the Embedded system, Memory Devices, Sensors and Actuators, Communication Interface, Embedded Firmware, Other System components, Characteristics of Embedded systems, Quality attributes of Embedded System. | **07** |
| **Unit-3** | **Introduction to AVR Microcontroller:** AVR microcontroller, History, Features and AVR family and its inbuilt Peripherals, Architecture of ATMega 32: signal description, registers of AVR, Data Memory, data formats. | **07** |
| **Unit-4** | **AVR Application and Programming in C:** Data types, I/O programming, I2C, Timer Structure, Watch dog timer, UART, Interrupt Structure, Analog to Digital convertors. | **07** |
| **Unit-5** | **RTOS based Embedded System Design:** Operating System basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Processes and Scheduling. | **07** |
| **Unit-6** | **Embedded System Architecture:** Architecture Styles, implementation Aspects, validation & debugging of embedded systems, hardware – software co-design in an embedded system. | **06** |
| | **Total** | **42** |

**Text Books:**


1. Shibu K. V., "Introduction to Embedded System", McGraw Hill Education
2. S.V. Iyer & Pankaj Gupta, "Embedded Real-time Systems Programming", McGraw Hill Education.
3. Muhammad Ali Mazidi, Sarmad Naimi and Sephers Naimi, "AVR Microcontroller and Embedded systems using assembly and C", Pearson Education, Inc. publishing as Prentice Hall 2013.


**Reference Books:**


1. Rajkamal, "Embedded Systems", 2nd Edition, Tata McGraw Hill
2. Cottet, Delacroix & Mammeri, "Scheduling in Real Time Systems", John Wiley & Sons.

## B.Tech. Semester VI (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **6SE04PE3A** | **PEC-3: Internet of Things** | 03 | 00 | 00 | 03 |

**Pre-Requisite**:

1. (1SET01)Electrical Measurements & Measuring Instruments
2. (5SE05PE2A)Sensors and transducers
3. (5SE01)Microcontroller and Applications

**Course Learning Objectives:**

1. To understand the concepts of terminologies and architecture of IoT systems, Use sensors and actuators for design of IoT.
2. To impart the knowledge of various protocols for design of IoT systems.
3. To explore associated IOT Technologies and various applications of IoT.

**Course Outcomes:**

After successfully completing the course, students will be able to:

CO1: Describe the various concepts, terminologies and architecture of IoT systems.

CO2: Apply the knowledge of sensors and actuators for design of IoT.

CO3: Apply various protocols for design of IoT systems.

CO4: Explain visualization, Cloud model and other associated IOT Technologies.

CO5: Comprehend various applications of IoT.

CO6: Analyze IoT with Case Studies.

| UNIT | Course: Internet of Things | L |
|---|---|---|
| **Unit-1** | **Introduction to IoT:** Introduction to Internet of Things, Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, IoT Challenges, IoT Networking Components. | 07 |
| **Unit-2** | **IoT Sensing and Actuation:** Types of Sensors, Sensor Characteristics, Sensorial Deviations, Types of Actuators, Actuator Characteristics, Examples and Working. | 07 |
| **Unit-3** | **Basics of Networking:** Introduction, Network Types, Layered network models, Basics of Networking, Communication Protocols, Machine-to-Machine Communications, Difference between IoT and M2M, IoT Communication Protocol (MQTT). | 07 |
| **Unit-4** | **Associated IoT Technologies:** Cloud Computing: Introduction, Virtualization, Cloud Models, Service-Level Agreement in Cloud Computing, Cloud Implementation, Sensor-Cloud: Sensors-as-a-Service. | 07 |
| **Unit-5** | **Applications of IoT:** Overview, Block Diagram and Working of real world IoT applications : Smart Home automation, Agricultural System and Smart Parking, Health and Lifestyle, Industrial IoT | 07 |
| **Unit-6** | **Iot Case Studies and Future Trends: Vehicular IoT**: Introduction, **Healthcare IoT**: Introduction, Case Studies, **IoT Analytics:** Introduction. | 07 |
| | **Total** | **42** |

**Text Books:**


1. Sudip Misra, Anandarup Mukherjee, Arijit Roy, "Introduction to IoT", Cambridge University Press 2021.
2. Hakima Chaouchi, "The Internet of Things Connecting Objects to the Web" ISBN : 978-1- 84821-140-7, Wiley Publications.


**Reference Books:**


1. S. Misra, C. Roy, and A. Mukherjee., "Introduction to Industrial Internet of Things and Industry 4.0" 2020..
2. Raj Kamal, "Internet of Things architecture and Design Principles" ,McGrawhill Education private limited, 2017.
3. Olivier Hersent, David Boswarthick, and Omar Elloumi, "The Internet of Things: Key Applications and Protocols", WileyPublications.

## B.Tech. Semester VI (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **6SE04PE3B** | **PEC-3: BIO-MEDICAL ELECTRONICS** | 03 | 00 | 00 | 03 |

**Course Requisite:**

1. (6SE04PE3B) Electronic Devices and Circuits
2. (5SE05PE2A) Sensors and Transducers

**Course Learning Objectives:**

1. To understand the role of engineers in medical field and studying various electrical signals generated in human body.
2. To study various transducers, electrodes, recorders, problems for recording biomedical signals and different medical imaging systems.
3. To analyze patient care, safety and various therapeutic lifesaving instruments.

**Course Outcomes:**

After completion of this course the student shall be able to:

CO1: Understand fundamentals of Medical Instrumentation, Biomedical Signals and Electrode.

CO2: Identify and classify various Biomedical Transducers.

CO3: Illustrate the significance of human signals and recording techniques.

CO4: Familiarize with Modern medical imaging systems.

CO5: Conceptualize requirements and importance of Patient Care and Monitoring and Safety.

CO6: Describe the function and necessity of Physiological and electrotherapy equipment's.

| UNIT | Course: BIO-MEDICAL ELECTRONICS | L |
|---|---|---|
| **Unit-1** | **Introduction:** Sources of bioelectric potentials, Different bioelectric signals like ECG, EMG and EEG, Bio potential Electrode theory, Basic electrode, Electrodes for EEG, ECG, EMG. Skin contact Theory, motion artifacts, Nernst Equation. | **07** |
| **Unit-2** | **Biomedical transducers:** Classification of Transducers-Pressure, force, acceleration, flow, respiration sensor, Smart sensors, pulse sensor, temperature, potential, dissolved ions and gases. | **07** |
| **Unit-3** | **Biomedical Recorders and Measurement:** Biomedical recorders for EEG, ECG, EMG, **Measurement of Blood Pressure:** Direct method, Indirect methods- The Rheographic method, Ultrasonic Doppler shift method, Blood flow meter - square wave electromagnetic, Measurement of Heart rate, Measurement of pulse rate. | **07** |
| **Unit-4** | **Medical Imaging System:** Instrumentation for diagnostics X-rays, X-rays basics properties, X-ray machine, Special imaging techniques: Computerized Axial Tomography (CAT), Ultrasonic imaging system: Physics of Ultrasound, Biological effect of ultrasound. Ultrasonics: A-scan, M-scan, B-scan. | **07** |
| **Unit-5** | **Patient Care and Monitoring and Safety:** System concepts, Bedside patient monitors, central monitors, Intensive care monitoring. **Biotelemetry:** Single channel and Multichannel bio-telemetry, **PATIENT SAFETY:** Electric shock hazards, leakage current. Types of Leakage current, measurement of leakage current, methods of reducing leakage current, precautions to minimize electric shock hazards. | **07** |
| **Unit-6** | **Therapeutic Equipment's & Ventilators:** Need of Physiological and electrotherapy equipment's. Cardiac pacemakers, Cardiac Defibrillators, Nerve and Muscle stimulators. Diathermy Machines: Short wave, Microwave, Ultrasonic. Ventilators: Mechanics of respiration, Artificial Ventilators, Microprocessor controlled Ventilators. | **07** |
| | **Total** | **42** |

**Text Books:**


1. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata Mc-Graw Hill, New Delhi.
2. Cromwell L. & Wiebell. F. J., "Biomedical Instrumentation", PHI Publications.


**Reference Books:**


1. Webstar J.G., "Medical Instrumentation", Third ed. John Wiely & Sons.
2. Carr & Brown, "Introduction to Biomedical Equipment Technology", Prentice Hall**.**

## B.Tech. Semester VI (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 6SE04PE3C | PEC-3 Database Management System | 03 | 00 | 00 | 03 |

**Pre-requisites:** None

**Course Learning Objectives:**

1. To introduce with the basic knowledge of file structure, Data Base, Entity Relation Diagram, data modelling and SQL query and structure.
2. To apply the process of building normalization and Transaction for the database system.
3. To understand the storage mechanism for data base management system.

**Course Outcomes:**

After completion of this course the student shall be able to:

CO1: Understand knowledge of fundamentals of DBMS, database design, Entity Relation Diagram and data modelling.

CO2: Elaborate the basic principal of relational model.

CO3: Apply the basics of SQL for retrieval and management of data.

CO4: Describe the basics of transaction processing and concurrency control.

CO5: Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database

CO6: Comprehend the database storage structures and access techniques.

| UNIT | Course: Database Management System | L |
|---|---|---|
| **Unit-1** | **Introduction to Database Design**: Data Independence, Structure of a DBMS Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model. | **07** |
| **Unit-2** | **Introduction to the Relational Model:** Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus. | **07** |
| **Unit-3** | **SQL Structure:** SQL: Basic Structure, Set Operations, Aggregate Functions, Null Values, Nested Sub queries, Views. Integrity and Security, Domain Constraints, Referential Integrity, Assertions, Triggers, Security and Authorization, Authorization in SQL. | **07** |
| **Unit-4** | **Normalization:** Purpose of Normalization, Data Redundancy and Anomalies, Non-Loss decomposition and Functional Dependencies, First, Second and Third Normal Forms, Boyce/Codd Normal Form (BCNF). | **07** |
| **Unit-5** | **Transaction Processing:** The Concept of Transaction, States of Transaction, Concurrent Execution of Multiple Transactions, Serializability - Conflict and View Serializability. | **07** |
| **Unit-6** | **Storage:** Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Comparison of File Organizations, B+ Trees: A Dynamic Index Structure. | **07** |
| | **Total** | **42** |

**Text Books:**


1. Silberschatz, Korth, and Sudarshan, "Database System Concept", 4th Edition, Mc Graw Hill.
2. Raghu Ramkrishnan, Johannes Gehrke, "Database Management System", 3rd Edition, Mc Graw Hill.


**Reference Books:**


1. C. J. Date, "An Introduction to Database System", 8th edition, Pearson Education.
2. Connolly & Begg, Database System, 6th edition, Pearson Education.
3. Peter Rob & Carlos Coronel, "Database System Design, Implementation and Management", 7th Edition, Thomson Course Technology.

## B.Tech. Semester V (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **6SE05PE4A** | **PEC-4 Adaptive Signal Processing** | 03 | 00 | 00 | 03 |

**Course Pre-requisite**:

1. (3SE01) Applied Mathematics-III
2. (4SE04) Signals and Systems
3. (5SE03) Digital Signal Processing

**Course Learning Objectives:**

1. To introduce with adaptive signal processing and adaptive systems.
2. To be acquainted with desired response, mean square error performance and Wiener Filters.
3. To make familiar with gradient search algorithms, LMS, LLS, RLS algorithms.

**Course Outcomes:**

After successfully completing the course, students will be able to:

1. Comprehend adaptive system and functions.
2. Evaluate the performance of various methods for designing adaptive filters through estimation of different parameters.
3. Understand the concepts of gradient and mean square error performance in adaptive systems.
4. Analyse convergence and stability issues associated with adaptive filter design and come up with optimum solutions.
5. Apply an adaptive filter algorithm that recursively finds the coefficients that minimize a weighted linear least squares cost function.
6. Implement applications of adaptive signal processing.

| Unit | Course: Adaptive Signal Processing | L |
|---|---|---|
| **Unit-1** | **Adaptive Systems:** Adaptive Systems: Definition and characteristics, General Properties, Applications and examples of an adaptive system. Review of probability, random variables and random processes | **07** |
| **Unit-2** | **Wiener Filters:** Input signal and weight vectors, desired response and error, Mean Square Error (MSE), Principle of Orthogonally, FIR Wiener Filters, Wiener Hopf equation. | **07** |
| **Unit-3** | **Steepest Descent Algorithms:** Searching the performance surface Methods & Ideas of Gradient Search methods, Gradient Searching Algorithm & its Solution, Stability & Rate of convergence, Method of Steepest Descent | **07** |
| **Unit-4** | **Least Mean Square (LMS) Algorithms:** Derivation of LMS algorithm, Convergence, Stability and performance analysis of LMS Algorithm, Normalized Least-Mean-Square Algorithm. | **07** |
| **Unit-5** | **Recursive Least Square Algorithms:** Linear Least Square Estimation Problem, Introduction to Recursive Least-Squares Adaptive filters, Matrix Inversion Lemma, RLS Algorithm | **07** |
| **Unit-6** | **Applications of Adaptive filtering:** System identification, Adaptive Equalization, noise cancellation, linear prediction, Echo Cancellation, Lattice Filters | **07** |
| | **Total** | **42** |

**Text Books:**


1. Simon Haykin, "Adaptive Filter Theory", 3rd Ed, Prentice Hall Inc, 2002.
2. Bernard Widrow & Samuel. D. Stearns, “Adaptive Signal Processing”, Pearson Edu, 2001.


**Reference Books:**


1. Alexander D.Poulanikas & Zayed M Ramadan, "Adaptive Filtering Primer with MATLAB", Taylor & Francis Series, CRS Press.
2. Bernard Widrow, "Adaptive Signal Processing", Prentice-Hall Signal Processing Series.
3. Sen M. Kuo, Bob H. Lee and Wenshun Tian, "Real Time Digital Signal Processing: Implementation and Applications", 2nd Ed, John Wiley & Sons, 2006.
4. Maurice G Bellanger, "Adaptive Digital Filters", 2nd Edition,
5. Marcel Dekkar Inc. T Ogunfummi, "Adaptive Nonlinear System Identification", Springer

## B.Tech. Semester VI (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **6SE05PE4B** | **PEC-04: Renewable Energy Sources** | 03 | 00 | 00 | 03 |

**Pre-requisites:**

1. (2SF03) Basics of Electrical Engineering.

**Course Learning Objectives:**

1. To understand the different types of conventional and non-conventional energy sources
2. To learn the different renewable energy sources
3. To comprehend the need and importance of electric vehicle and battery systems.

**Course Outcomes:**

After completion of this course the student shall be able to:

CO1: Understand the environmental aspect of renewable energy resources in comparison with various conventional energy systems.

CO2: Describe the use of Solar Energy and Various Components use in energy production.

CO3: Discuss the conversion principles of wind energy.

CO4: Elaborate the conversion process of biomass energy and working of hydropower plant.

CO5: Explain the knowledge about other renewable energy sources.

CO6: Illustrate the Basic Knowledge of electric Vehicles.

| Units | Course: Renewable Energy Sources | L |
|---|---|---|
| **Unit-1** | **Renewable Energy (RE) Sources:** Conventional Energy Sources, Non-Conventional Energy Sources, Importance of Renewable Energy, Types of Renewable Energy Sources, Limitation of Renewable Energy Sources. | **07** |
| **Unit-2** | **Solar Energy :** Solar Photovoltaic System, Basic Principle of SPV Conversation, Types of Solar Cells, Photovoltaic Cell Concept- Cell, Module , Array, I-V Characteristics of P-V Module, Efficiency and Quality of The Cell, Series and Parallel Connection, Maximum PowerPoint Tracking , Applications**.** | **07** |
| **Unit-3** | **Wind Energy :** Power in the wind, Types of Wind Power Plants (WPPs), Component of WPPs, Working of WPPs, Grid Integration Issues of WPPs**,** | **07** |
| **Unit-4** | **Biomass and Hydro Energy:** Introduction to Biomass Resources, Energy From Biomas, Conversation Process of Biomass, Mini /Micro Hydropower Plant Classification of Hydro Power Schemes, Essential Component of Hydroelectric System**.** | **07** |
| **Unit-5** | **Other Energy Sources:** Tidal Energy System, Wave Energy System, Geothermal Energy, Energy Storage System | **07** |
| **Unit-6** | **Electric vehicles:** Benefits of Using EVs, Types of Electric Vehicles, EV Motor Drive Technology, EV Energy Sources Technologies, Introduction to Battery Parameters, Lithium Ion Battery, Battery Pack Development, Battery pack Design. | **07** |
| | **Total** | **42** |

**Text Books:**


1. G D Rai ,"Non- Conventional Energy Sources", Fourth Edition, Khanna Publication.
2. S.Rao and Dr. B.B Parulekar ,"Energy Technology", Khanna Publication.
3. Subhas p Sukhatme ,"Solar energy", 2nd Edition ,TataMc Graw hill,1996.


**Reference Books:**


1. A.W.Culp Jr ,"Principles of Energy Conversion", McGraw Hill, 1996.
2. Shobh Nath Singh ,"Non- Conventional Energy Resourcse" , Person, 2018.

**B.Tech. Semester VI (Electronics and Telecommunication Engineering)**

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **6SE05PE4C** | **PEC4-Antenna & Wave Propagation** | 3 | 00 | 00 | 3 |

**Prerequisites:**

1. (3SE04) Electromagnetic Waves
2. (4SE03) Analog and Digital Communications

**Course Learning Objectives:**

1. To understand basic terminology and concepts of Antennas.
2. To learn the basic antenna operation, antenna array as well as their usage in real time.
3. To understand the principle of smart antennas and to study the propagation of the waves in free space.

**Course Outcomes:**

After completion of this course the student shall be able to:

CO1: Discuss the fundamental aspects of antenna.

CO2: Explain the antenna array system its excitation and field patterns.

CO3: Elaborate concepts of Aperture antennas and its application.

CO4: Describe the concepts and applications of broadband and microstrip antennas.

CO5: Explain the concept and benefit of smart antennas

CO6: Apply the means of propagation of electromagnetic waves.

| UNIT | Course: Antenna & Wave Propagation | L |
|---|---|---|
| **Unit-1** | **Antenna Fundamentals:** Transmission lines & equivalent Circuits, Concept of radiation, Radiation pattern, near and far fields, reciprocity, directivity and gain, effective aperture, polarization, input impedance, efficiency, Friis transmission equation. | **07** |
| **Unit-2** | **Antenna Arrays:** Radiation from wires and loops- Infinitesimal dipole, finite-length dipole, small circular loop, antenna array, analysis of uniformly spaced array with uniform and non-uniform excitation amplitudes, extension to planer arrays. | **08** |
| **Unit-3** | **Aperture antennas:** Huygen's principle, radiation from rectangular and circular apertures, design consideration, Babinet's principle, Radiation from sectorial and pyramidal horns, design concepts, parabolic reflector and Cassegrain antennas. | **07** |
| **Unit-4** | **Broadband Antennas:** Broadband Antennas: Log periodic and yagi-uda antenna, frequency independent antennas.<br>**Microstrip antenna:** Basic characteristics of microstrip antenna, feeding methods, Introduction of rectangular and circular patch antenna. | **07** |
| **Unit-5** | **Smart Antennas:** Smart Antennas: Concept and benefit of Smart Antennas, fixed weight beam forming basics, Adaptive beam forming. | **06** |
| **Unit-6** | **Wave Propagation:** Modes of Propagation: Ground, sky and space wave propagation, structure of Atmosphere, Fading, Ionospheric Absorption, Multi hop propagation and super refraction. | **07** |
| | **Total** | **42** |

**Text Book:**


1. C.A. Balanis, "Antenna Theory and design", 3rd ed. John wiley and sons,2005.
2. John D. Kraus, "Antennas", 2nd Ed. McGraw-Hill, 1988.


**References:**


1. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", 2nd ed., PHI, 2000.
2. K.D. Prasad, Satya Prakashan, "Antennas and Wave Propagation", Tech India Publications, New Delhi, 2001.
3. Harish A.R., "Antenna and wave propagation", Oxford university press.2010

## B.Tech. Semester VI (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 6SE06 | MICROWAVE THEORY & TECHNIQUES LAB | 03 | 00 | 02 | 05 |

**Pre-requisites:**

1. (3SE04) Electromagnetic Waves

**Course Learning Objectives:**

1. Makes student aware of basic concepts of Microwave active and passive devices.
2. To enrich with knowledge of transmission characteristic of microwave through waveguide and parallel strip line.
3. To impart the Concepts of Microwave resonators and Microwave components.
4. To explain various techniques for measurement microwave parameters.

**Course Outcomes:**

After successfully completion of the course, the students will be able to

CO1. Understand the Fundamentals of Microwave Devices

CO2. Analyze Microwave Transmission Techniques

CO3. Measure and Evaluate Microwave System Performance.

**List of Experiments:**

Performance of Minimum Eight Practicals based on 6SE01 Microwave Theory and Techniques syllabus.

**B.Tech. Semester VI (Electronics and Telecommunication Engineering)**

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 6SE07 | Digital Image Processing Lab | 03 | 00 | 02 | 03 |

**Pre-Requisite:**

4. (4ETC04) Signals and Systems
5. (5ETC03) Digital Signal Processing
6. Mathematics (Matrices & Transform Methods).

**Course Learning Objectives:**

1. To understand the fundamentals of digital image processing and enhancement in spatial and frequency domain
2. To apprehend the knowledge of image transform and analyse the various image compression techniques used in digital image processing.
3. To understand the fundamentals of video processing and segmentation.

**Course Outcomes:**

After successful completion of the course, students will be able to-

CO1: Able to understand and perform on the basic concepts of digital image & video processing in practical Lab.

CO2: Able to develop logic & write to a code to process images using OCTAVE/MATLAB Software.

CO3: Able to express inference, finding and outcomes of experiment in journal and viva-Voce.

**Practical's:**

Performance of Minimum Eight Practicals based on 6SE02 Digital Image Processing Syllabus.

## B.Tech. Semester VI (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **6SE08** | **Embedded Systems Lab** | 03 | 00 | 02 | 03 |

**Pre-Requisite:**

7. (3SE03) Digital System Design.
8. (3SE09) Object Oriented Programming Lab
9. (5SE01) Microcontroller & Applications

**Course Learning Objectives:**

4. To understand the concept of Embedded Systems.
5. To study architecture and inbuilt peripherals of AVR Microcontroller.
6. To learn and apply RTOS to embedded systems.

**Course Outcomes:**

After successful completion of the course, students will be able to-

CO1: Understand the concept of Embedded Systems.

CO2: Design embedded applications using embedded C.

CO3: Develop the interfacing between various applications of Embedded Systems.

**Practical's:**

Performance of Minimum Eight Practicals based on 6SE03 Embedded Systems Syllabus.

## B.Tech. Semester VI (Electronics and Telecommunication Engineering)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 6SE0 | MINI PROJECT Lab | 03 | 00 | 02 | 05 |

**Pre-requisites:**

1. Basic knowledge of Electronics and Telecommunication.

**Course Learning Objectives:**

1. To let the students apply the knowledge of theoretical concepts of the undergraduate courses to real time problems or situations
2. To provide valuable hands-on experience in building and testing electronic circuits or systems.
3. To spark innovation and encourage students to think about applying theoretical knowledge, developing practical skills, and fostering essential engineering competencies
4. To communicate their findings effectively through presentation and documentation.

**Course Outcomes:**

After successfully completion of the course, the students will be able to

**CO1**. Understand the Fundamentals problems in the field of Electronics and Telecommunication to define the problem and formulate the objectives

CO2. Implement a Methodology/ Experimental Procedure in order to develop a Prototype / working model etc.

CO3. Ability to work and communicate effectively as an individual and in a team in preparing the presentation, documentation.

**Guidelines:**

The mini project is a team activity having 3-4 students in a team. This is electronic product design work with a focus on electronic circuit design. The mini project may be a complete hardware or a combination of hardware and software. Mini Project should cater to a small system required in laboratory or real life. It should encompass components, devices, analog or digital ICs, micro controllers with which functional familiarity is introduced. Based on comprehensive literature survey/ Industry requirements analysis, the student shall identify the title and define the aim and objectives of the mini project.

**B.Tech. Semester VI (Electronics and Telecommunication Engineering)**

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **6SEH** | **Cognitive Radio** | 03 | 00 | 00 | 03 |

**Course Objectives:**

1. To learn the design of the wireless networks based on the cognitive radios
2. To study the spectrum sensing techniques in cognitive radio
3. To understand the different challenges in Cognitive Radio

**Course Outcomes:**

After successfully completing the course, students will be able to-

CO1: Describe the fundamental concepts of cognitive radio networks.

CO2: Discuss the techniques for spectrum holes detection in cognitive radio.

CO3: Explain technologies of TVWS for radio communications based on two spectrum sharing business models/policies.

CO4: Elaborate fundamental issues regarding dynamic spectrum access, the radio-resource management and trading.

CO5: Analyze the spectrum trading.

CO6: Discuss different research challenges in Cognitive Radio.

| Units | Course : Cognitive Radio | L |
|---|---|---|
| **Unit-1** | **Introduction to Cognitive Radios:** Digital dividend, cognitive radio (CR) architecture, functions of cognitive radio, dynamic spectrum access (DSA), components of cognitive radio, potential applications of cognitive radio. | **07** |
| **Unit-2** | **Spectrum Sensing:** Spectrum sensing, detection of spectrum holes (TVWS), collaborative sensing, geo-location database and spectrum sharing business models (spectrum of commons, real time secondary spectrum market) | **07** |
| **Unit-3** | **Optimization Techniques of Dynamic Spectrum Allocation:** Linear programming, convex programming, integer programming, dynamic programming, | **07** |
| **Unit-4** | **Dynamic Spectrum Access and Management:** Spectrum broker, cognitive radio architectures, centralized dynamic spectrum access, distributed dynamic spectrum access, learning algorithms and protocols. | **07** |
| **Unit-5** | **Spectrum Trading:** Introduction to spectrum trading, classification to spectrum trading, radio resource pricing, brief discussion on economics theories in DSA (utility, auction theory), classification of auctions | **07** |
| **Unit-6** | **Research Challenges in Cognitive Radio:** Network layer and transport layer issues, cross layer design for cognitive radio networks. Introduction to Software Defined Radio(SDR) | **07** |
| | **Total** | **42** |

**Text Books:**


1. Ekram Hossain, Dusit Niyato, Zhu Han, "Dynamic Spectrum Access and Management in Cognitive Radio Networks", Cambridge University Press, 2009.
2. Kwang-Cheng Chen, Ramjee Prasad, "Cognitive radio networks", John Wiley & Sons Ltd., 2009


**Reference Books:**


1. Bruce Fette, "Cognitive radio technology", Elsevier, 2nd edition, 2009.
2. Huseyin Arslan, "Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems", Springer, 2007.
3. Francisco Rodrigo Porto Cavalcanti, Soren Andersson, "Optimizing Wireless Communication Systems" Springer, 2009
4. Linda Doyle, "Essentials of Cognitive Radio", Cambridge University Press, 2009.

# B.Tech. Final Year AY 2023-24 (For Branch EXTC )

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 7SE01 | Communication Network | 3 | 00 | 00 | 3 |

**Prerequisite: -**

**Course Objectives:**

1. To impart the knowledge of OSI, TCP/IP models, Data Link control protocol and comparison of the different network Topologies and devices.
2. To comprehend students with network and Data Link layer protocol.
3. To explain the function of transport layer with congestion control.
4. To describe and compare function of Data link, Network, Transport and Application layer Protocols.

**Course Outcomes:**

**After successful completion of the course the student will be able to:**

1. To understand OSI/TCP-IP model and identify the types of network, networking devices with functions.
2. To elaborate responsibilities of data link control and compare flow control techniques.
3. To comprehend and compare the different multiple, medium access control protocols.
4. To describe responsibilities of network layer with routing algorithm and traffic control.
5. To comprehend and compare the TCP and UDP and resource allocation.
6. To discuss the various Application layer Protocols.

# B.Tech. Final Year AY 2023-24 (For Branch EXTC )

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 7SE01 | Communication Network | 3 | 00 | 00 | 3 |

**Prerequisite: -**

**Course Objectives:**

1. To impart the knowledge of OSI, TCP/IP models, Data Link control protocol and comparison of the different network Topologies and devices.
2. To comprehend students with network and Data Link layer protocol.
3. To explain the function of transport layer with congestion control.
4. To describe and compare function of Data link, Network, Transport and Application layer Protocols.

**Course Outcomes:**

**After successful completion of the course the student will be able to:**

1. To understand OSI/TCP-IP model and identify the types of network, networking devices with functions.
2. To elaborate responsibilities of data link control and compare flow control techniques.
3. To comprehend and compare the different multiple, medium access control protocols.
4. To describe responsibilities of network layer with routing algorithm and traffic control.
5. To comprehend and compare the TCP and UDP and resource allocation.
6. To discuss the various Application layer Protocols.

| Unit No. | Course: Communication Network | No. of Lectures Required |
|---|---|---|
| **Unit-1** | **Data Communication Network:** OSI Reference Model, Overview of TCP/IP architecture, Addresses in TCP/IP. **Types of Network:** LAN, MAN, WAN. **Network connecting Devices:** Hubs, Repeater, Bridges, Switches, Routers, Gateways. Network Topology: Mesh, Bus, Tree, Ring, Star. | **08** |
| **Unit-2** | **Data Link Control Protocols:** Need for Flow control, Stop and Wait Flow Control, Sliding Window Flow Control, Stop and wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ. | **07** |
| **Unit-3** | **Multiple Access Control Protocols:** **Random Access Techniques:** ALOHA, Slotted ALOHA, **Contention Techniques:** CSMA, CSMA/ CD (IEEE 802.3), CSMA/CA. **Controlled Access Techniques:** Polling, Token Passing. **Medium Access Control Protocols:** Token Bus (IEEE 802.4), Token Ring (IEEE802.5). | **08** |
| **Unit-4** | **Network layer:** IPv4-Classful and Classless Addressing, Datagram networks, Dijkstra‟s Algorithm (Problems expected), Bellman Ford Algorithm (Problems expected). Traffic Control: Leaky bucket algorithm and Token bucket algorithm. | **07** |
| **Unit-5** | **Transport layer:** **Process to process delivery:** Connectionless versus Connection Oriented Service, Reliable versus Unreliable. UDP, TCP Services, TCP Features, TCP Segment and TCP Connection. | **06** |
| **Unit-6** | **Application Layer:** Domain Name Space (DNS), TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, DHCP. | **06** |
| | **Total** | **42** |

**Text Books:**


1. B. Forouzan, “Data Communications and Networking”, 4th Edition, McGr-Hill.
2. Andrew S. Tanenbaum and David J. Wetherall, “Computer Networks”, 5th Edition, Pearson Education, Inc.
3. William Stallings, “Data and Computer Communication”, 8th Edition, Pearson Education, Inc.


**References Books:**


1. James F. Kuross, Keith W. Ross, “Computer Networking A Top-Down Approach Featuring the Internet”, Third Edition, Addison Wesley, 2004.
2. Nader F. Mir, “Computer and Communication Networks”, Pearson Education, 2007.
3. Comer, “Computer Networks and Internets with Internet Applications”, Fourth Edition, Pearson Education, 2003.

# B.Tech. Final Year AY 2023-24 (For Branch EXTC )

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 7SE02 | VLSI design | 03 | 00 | 00 | 03 |

**Course Pre-Requisite**:

1. Electronic devices & circuits(3SE02)
2. Digital system design(3SE03)

**Course Learning Objectives:**

1. To enrich students with MOS transistor theory, designing of compound gate using CMOS logic and analyze the operation of sequential circuits.
2. To make students understand the fabrication process of Integrated Circuits and to learn Layout drawing of simple CMOS Circuits using lambda based rules with Stick diagram.
3. To explain the basics of Verilog HDL, and Design combinational and sequential circuit using various Modeling styles in Verilog HDL.
4. To enhance the knowledge of various constructs in the Designing of circuits using behavioral modeling.

**Course Outcomes:**

After completion of this course the student will be able to:

1. Apply the knowledge about the trends in VLSI semiconductor technology along with CMOS implementation of compound gates.
2. Discuss the operation of Latch, flip-flop and Memory cells such as SRAM, DRAM.
3. Comprehend the CMOS fabrication steps and Implement the Layout of simple CMOS Circuits using lambda based rules with Stick diagram.
4. Explain basics of Verilog HDL.
5. Implement combinational and sequential circuit using various Modeling styles in Verilog HDL.
6. Describe the timing control, conditional statement, loops, various blocks, function.

| Unit No. | Content | No. of Lectures Required |
|---|---|---|
| **Unit -1** | **CMOS Circuit Design-I:** Moore‟s Law**,** MOS structure capacitance, Channel capacitance, Junction capacitance, MOS Transistor Switches, CMOS Logic gates, CMOS Inverter - DC Characteristics, CMOS combinational logic design, Introduction to Delays in CMOS, Power consumption / Dissipation Issues. | **07** |
| **Unit -2** | **CMOS Circuit Design-II:** Clocked Latch and Flip-Flop Circuits, CMOS Transmission Gates (Pass Gates), Static Read - Write Memory (SRAM) Circuits, Dynamic Read-Write Memory (DRAM) Circuits. | **07** |
| **Unit -3** | **CMOS Technology & Design Rules:** CMOS fabrication processing steps, p-well CMOS Process, n-well CMOS Process, Twin well process, CMOS Lambda-based Design Rules, Stick Diagrams, Physical layout of simple CMOS Logic Gates. | **07** |
| **Unit -4** | **VLSI Clocking & Digital System Design using Verilog HDL:** VLSI Design flow, Module, ports, Data types, Compiler, Directives, Operators, Propagation Delay (Inertial & Transport) | **07** |
| **Unit -5** | **Digital System Design using Verilog HDL:** Gate-Level Modeling, Data Flow Modelling, Structural Modeling using combinational and sequential circuits examples, behavioral Modeling, Initial & always statements, procedural assignments. | **07** |
| **Unit -6** | **Digital system design using Verilog HDL:** Timing controls, Conditional Statements, Loops, Sequential and Parallel Blocks, Generate blocks, Task and Functions. | **07** |
| | **Total** | **42** |

**Text Books :**

1. Neil H. Weste, D. Harris, “Principles of CMOS VLSI design A Circuit & System Perspective”, 4th Edition, Pearson (Addison-Wesley), 2011.
2. Samir Palnitkar, “Verilog HDL: A guide to Design and Synthesis”, 2nd Edition, Prentice Hall PTR, 2003.
3. Jan M. Rabaey, A. Chandrakasan, B. Nikolic, “Digital Integrated Circuits: A Design Perspective”, 2nd Edition. Pearson.

**Reference Books:**

1. Navabi Z., “Verilog Digital System Design”, McGraw-Hill Publishing, New York, 1999.
2. S. M. Sze (Ed), “VLSI Technology”, McGraw Hill.
3. J.Bhaskar, „Verilog HDL primer“, Prentice Hall of India.

# B.Tech. Final Year AY 2023-24 (For Branch EXTC)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 7SE03PE5A | PEC-5 High Speed Electronics | 02 | 00 | 00 | 02 |

**Course Pre-Requisite:**

1. Electronic devices & circuits(3SE02)
2. Microwave Theory & Techniques (6SE01)

**Course Learning Objectives:**

1. Understand the fundamental principles of signal integrity in high-speed electronic systems.
2. Analyze and design high-speed transmission lines and interconnects.
3. Evaluate the performance limitations due to parasitics, crosstalk, and electromagnetic interference (EMI).
4. Understand the high-speed behavior of semiconductor devices and ICs.

**Course Outcomes:**

After completion of this course the student shall be able to:

1. Analyze signal integrity problems in high-speed PCB and IC design.
2. Model and simulate transmission line behavior using tools like SPICE or ADS.
3. Evaluate performance degradation due to high-frequency effects and EMI.
4. Design high-speed analog blocks such as amplifiers, buffers, and comparators.
5. Apply layout techniques for minimizing noise, skew, and signal loss.
6. Critically analyze high-speed system behavior through measurement techniques.

| Unit No. | Content | No. of Lectures Required |
|---|---|---|
| **Unit-1** | **Introduction to High-Speed Design:** Need for high-speed design, Signal frequency vs data rate, Bandwidth considerations, Time and frequency domain analysis. | **05** |
| **Unit-2** | **Transmission Line Theory:** Lumped vs distributed systems, Transmission line parameters: R, L, C, G, Transmission line equations, Impedance matching, reflection, and termination techniques. | **05** |
| **Unit-3** | **Signal Integrity and Timing :** Crosstalk and coupling, Skew and jitter, Eye diagrams, Clock distribution networks, Timing analysis and budgeting. | **05** |
| **Unit-4** | **High-Speed PCB and IC Layout Considerations:** Controlled impedance routing, Return paths and via effects, Differential pair routing, Shielding and grounding strategies. | **05** |
| **Unit-5** | **High-Speed Semiconductor Devices:** High-speed BJT and MOSFET behavior, Device parasitics and packaging effects, IC layout for high-speed circuits. | **05** |
| **Unit-6** | **High-Speed Circuit Design :** Design of broadband amplifiers, Limiting amplifiers, Comparators and clock recovery circuits, Phase-Locked Loops (PLL) basics. | **05** |
| | **Total** | **30** |

**Text Books:**


1. **Howard Johnson**, *High-Speed Digital Design: A Handbook of Black Magic*, Prentice Hall.
2. **Stephen H. Hall**, *High-Speed Digital System Design: A Handbook of Interconnect Theory and Design Practices*, Wiley.
3. **Razavi, Behzad**, *Design of Analog CMOS Integrated Circuits*, McGraw Hill.


**Reference Books:**


1. **Bogatin, Eric**, *Signal and Power Integrity – Simplified*, Prentice Hall.
2. Application Notes from Keysight, Texas Instruments, Analog Devices, etc.

# B.Tech. Final Year AY 2023-24 (For Branch EXTC)

| Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **7SE03PE5B** | **Computer Architecture** | 02 | 00 | 00 | 02 |

**Pre-Requisite**: (3SE03) Digital System Design

(5SE01) Microcontroller & Applications

**Course Objectives:**

1. To familiarize students with basic concepts and structure of computers.
2. To comprehend students with different types of memories and their organization.
3. To make students understand the concept of parallel processing and multi-processor architecture.

**Course Outcomes:**

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

1. Elaborate the fundamentals and different components of computer architecture.
2. Explain the processing units of computers.
3. Discuss the memory organization in computer architecture.
4. Elaborate the I/O organization in Computer Architecture.
5. Elaborate the concepts of parallel processing.
6. Comprehend the fundamentals of Multi-processors.

| Unit No. | Content | No. of Lectures Required |
|---|---|---|
| **Unit-1** | **Basic Structure of Computers:** Hardware & software Functional units, Basic operational concepts, Bus structures, Addresses, Basic I/O operations. | **05** |
| **Unit-2** | **Processing Unit:** Processor organization, information representation, number formats, Arithmetic operation, ALU designs, Floating point arithmetic. | **05** |
| **Unit-3** | **Memory Unit:** Concept of virtual memory, Memory hierarchies, Main memory allocation, Cache memories, Associative memories. | **05** |
| **Unit-4** | **I/O Organization:** Accessing I/O devices, Interrupts, Enabling and disabling interrupts, handling multiple devices, DMA. | **0**5 |
| **Unit-5** | **Parallel Processing:** Basic concepts and types of parallel processors. Pipeline processor: Pipeline types. | **05** |
| **Unit-6** | **Multiprocessors:** Types & performance, parallel programming, Multiprocessor Architecture, Interconnect network. | **05** |
| | **Total** | **30** |

**Text Books:**

1. Hayes J. P., “Computer Architecture and Organization”, PHI, Second edition

2. A. S. Tanenbum, “Structured Computer Organization”, PHI, Third edition

3. M. M. Mano, “Computer System Architecture”, Third edition

**Reference Books:**

1. V. Carl Hammacher, “Computer Organization”, McGraw Hill, Fifth Edition

2. Y. Chu, "Computer Organization and Microprogramming”, Prentice Hall, Second Edition

3. C. W. Gear, “Computer Organization and Programming”, McGraw Hill, N.V. Edition

# B.Tech. Final Year AY 2023-24 (For Branch EXTC)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 7SE03-PE5C | PEC-5 Error Correcting Codes | 02 | 00 | 00 | 02 |

## Pre-requisites:

Digital Communication

**Course Learning Objectives (CLOs)**

1. To introduce the fundamental concepts of digital communication systems and various line coding techniques.
2. To impart knowledge on error control coding, including detection and correction techniques using linear block and cyclic codes.
3. To develop understanding of convolution codes, Turbo Codes their generation, and decoding techniques.

**Course Outcomes (POs)**

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

1. Describe the functional blocks of a digital communication system.
2. Analyze and implement various line coding techniques.
3. Design and evaluate linear block codes, compute Hamming distance, and implement syndrome decoding.
4. Apply principles of cyclic coding, including encoding and decoding using generator and parity-check matrices.
5. Interpret and construct convolutional codes using trellis and code tree representations, and perform decoding operations.
6. Evaluate the performance of advanced coding techniques, such as LDPC, and Polar codes.

| Unit No | Content | No of Lectures Required |
|---|---|---|
| **Unit1** | **Introduction to Digital Communication System**: Functional Blocks of Digital Communication System; Source Encoder and Decoder, Channel Encoder and Decoder, Modulator and Demodulator.<br>**Line Coding:** Need for Line coding, Properties of Line Coding, Unipolar RZ and NRZ, Polar RZ and NRZ, Bipolar NRZ (AMI), Split Phase Manchester Coding. | **5** |

| | | |
|---|---|---|
| **Unit II** | **Error Control Coding:** Introduction to Error Control Coding, Types of Errors, Methods of Controlling Errors,<br>**Linear Block Codes:** Matrix Description of Linear Block codes, Hamming Distance, Hamming Weight, Minimum Hamming Distance, Hamming Codes, and Encoder for Linear Block code. | **5** |
| **Unit III** | **Cyclic Codes:** Properties of Cyclic Codes, Systematic and Non-Systematic generator Matrix, Parity Check Matrices for Cyclic Codes, Encoders for Cyclic Codes. | **5** |
| **Unit IV** | **Convolution Codes:** Time Domain Approach and Transform domain approach for convolution code generation, Code Tree and Code Trellis for Convolution code. | **5** |
| **Unit V** | **Turbo Codes:** LDPC Codes- Codes based on sparse graphs, Decoding for binary erasure channel, Log-likelihood algebra, Brief propagation, Product codes, Iterative decoding of product codes. | **5** |
| **Unit VI** | **Advanced Coding Techniques and Applications:** Fountain codes and rate less coding, Polar codes and their applications, Error correction in data storage (CDs, DVDs, Flash Memory). | **5** |
| | **Total Hours** | **30** |

**Textbook:**


1. Nagi El Naga, “Error Detecting and Correcting Systems Design,” Lecture Notes, ECE Department, California State University, Northridge.


**Reference Book:**


1. Shu Lin, "An Introduction to Error-Correcting Codes", Prentice-Hall
2. Wakerly, John, "Error Detecting Codes, Self-Checking Circuits and Applications."
3. Peterson, W. W. and E.J. Weldon, Jr., "Error-Correcting Codes", the M.I.T. Press, Cambridge, MA 1970
4. Lin, Shu/D. J. Costello, Jr., "Error Control Coding: Fundamentals and Applications", Prentice-Hall, 1983

# B.Tech. Final Year AY 2023-24 (For Branch EXTC)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 7SE03PE6A | PEC-6 Introduction to MEMS | 02 | 00 | 00 | 02 |

**Course Pre-Requisite:**

1. Electronic devices & circuits (3SE02)
2. Microwave Theory & Techniques (6SE01)

**Course Learning Objectives:**

1. Understand the fundamentals, evolution, and multidisciplinary nature of MEMS technology.
2. Analyze the operating principles of MEMS sensors and actuators.
3. Apply basic design concepts and material selection criteria for MEMS devices.
4. Explain microfabrication techniques used in MEMS manufacturing, including lithography, etching, and deposition processes.

**Course Outcomes:**

After completion of this course the student shall be able to:

1. Explain the basic concepts, characteristics, and applications of MEMS devices.
2. Describe mechanics and materials used in MEMS manufacturing.
3. Analyze sensing and actuation mechanisms employed in MEMS systems.
4. Design and evaluate simple MEMS structures using fundamental engineering principles.
5. Describe various microfabrication processes
6. Investigate emerging MEMS applications and technological advancements in different engineering domains.

| Unit No. | Content | No. of Lectures Required |
|---|---|---|
| **Unit-1** | **Introduction to MEMS:** Historical development and evolution of MEMS, Advantages and challenges of MEMS technology, MEMS versus conventional electromechanical systems, Applications. | **05** |
| **Unit-2** | **MEMS Materials:** Overview, Physical Properties, **Materials:** Piezoelectric, Electrostrictive, Magnetostrictive, Magneto-electric; **Fluids:** Magnetorheological and Electrorheological Fluids. | **05** |
| **Unit-3** | **MEMS Sensors:** Principles of sensing Mechanical, thermal, optical, and chemical sensing Capacitive sensors, Piezoresistive sensors, Piezoelectric sensors, MEMS accelerometers, MEMS pressure sensors, Gyroscopes and inertial sensors. | **05** |
| **Unit-4** | **Mechanics of solids in MEMS:** Stress, Strain, Hookes‟s law, Poisson effect, Linear Thermal Expansion, Bending; Overview of Finite Element Method, Modeling of Coupled Electromechanical Systems. | **05** |
| **Unit-5** | **Review of Basic MEMS fabrication methods:** Oxidation, deposition techniques, lithography (LIGA), Etching, Surface Micromachining, sacrificial layer processes, isotropic and anisotropic etching. | **05** |
| **Unit-6** | **Applications of MEMS**: Electronics, automotive and medical; automotive airbag sensor, medical pressure sensor, blood Pressure Sensors, microphone, Bio-MEMS, acceleration sensing, gyros. | **05** |
| | **Total** | **30** |

**Text Books:**


4. **Nadim Maluf and Kirt Williams,** An Introduction to Microelectromechanical Systems Engineering, Artech House.
5. **G. K. Ananthasuresh, K. J. Vinoy, S. Gopalkrishnan K. N. Bhat, V. K. Aatre,** “Micro and Smart Systems”, Wiley India, 201


**Reference Books:**


1. **Mohamed Gad-el-Hak,** The MEMS Handbook**,** CRC Press.
2. **Tai-Ran Hsu,** MEMS and Microsystems: Design and Manufacture**,** McGraw-Hill.

# B.Tech. Final Year AY 2023-24 (For Branch EXTC)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 7SE04PE6B | PE-6B: Introduction to Artificial Intelligence & Machine Learning | 02 | 00 | 00 | 02 |

**Pre-Requisite**:

1. 1SF04 Programming for Problem Solving
2. 1SE04 Introduction to Python Programming
3. 3SE01 Mathematics III

**Course Objectives:**

1. To acquire the basic concepts of AI
2. To Formulate Problems and Evaluation of Uniformed Search Strategies and Understand the various searching techniques
3. To understand various key paradigms for machine learning approaches
4. To familiarize with the mathematical and statistical techniques used in machine learning
5. To understand and differentiate among various machine learning techniques

**Course Outcomes:**

After successfully completing the course, students will be able to-

1. Explain concepts of Artificial Intelligence and different types of intelligent agents and their architecture.
2. Evaluate different uninformed search algorithms on well formulated problems
3. Explain the fundamentals of machine learning.
4. Apply mathematical techniques to solve machine learning algorithms
5. Perform optimization techniques for predicting and Design prediction model using clustering techniques
6. Apply regression model to perform specific task. Demonstrate classification techniques.

| Unit No. | Content | No. of Lectures Required |
|---|---|---|
| Unit-1 | **Introduction To Artificial Intelligence:** Basic Introduction of AI, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, AI vs Machine Learning vs Deep Learning, **Intelligent agents:** definition, types, and environments. Identification of Problem, **Uninformed Search Strategies:** Breadth First Search, Depth First Search, Iterative search, Bidirectional Search. | 05 |

| | | |
|---|---|---|
| **Unit-2** | **Informed Search Strategy:** Generate-and-Test, Hill Climbing, Best-first Search, A* Algorithm, Problem Reduction, AND-OR Graphs, The AO* Algorithm, Minmax Algorithm. Knowledge Representation and approaches, Resolution in Propositional Logic and Predicate Logic. | 05 |
| **Unit-3** | **Introduction To Machine Learning:**<br>What is machine learning, fundamentals of machine learning. Types of Learning: Supervised Learning, Unsupervised Learning, Reinforcement Learning. | 05 |
| **Unit-4** | **Mathematics for ML:** Linear Algebra, matrix decomposition algorithm-SVD: Properties and applications, low rank Approximations, Feature Reduction/Dimensionality reduction, Principal components analysis (Eigen values, Eigen vectors, Orthogonality. | 05 |
| **Unit-5** | **Optimization:** Unconstrained and Constrained optimization, Numerical optimization techniques for constrained and unconstrained optimization: Newton‟s method, Steepest descent method. Naïve Bayes Classifier, K-Nearest Neighbor algorithm Clustering, Distance measures. | 05 |
| **Unit-6** | **Regression:** Introduction to Regression, Linear Regression with one variable, Relationship between attributes using Covariance and Correlation, Gradient decent for Linear regression. introduction to Support Vector Machine, Measure of performance, Error analysis. | 05 |
| | **Total** | 30 |

**Text Books:**


1. Elaine Rich, Kevin Knight, Nair : Artificial Intelligence (Third Edition) [Mc Graw Hill]
2. Stuart Russell & Peter Norvig : Artificial Intelligence: A Modern Approach (Pearson -4th Ed.)
3. Mitchell Tom : Machine Learning. McGraw Hill, 1997.


**Reference Books:**


1. Nils Nilson: “Principles of Artificial Intelligence”. (Addison-Wesley)

2. R. J. Winston: “Artificial Intelligence”. (Wiley)

3. R. O. Duda, P. E. Hart, D. G. Stork (2000), Pattern Classification, Wiley-Blackwell, 2nd Edition.

4. Shalev-Shwartz,S., Ben-David,S., (2014), Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press.

# B.Tech. Final Year AY 2023-24 (For Branch EXTC)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **7SE04PE6C** | **Printed Electronics** | 02 | 00 | 00 | 02 |

**Pre-Requisite**:

1. Introduction to Print Processes
2. Printing Digital Electronics
3. Basic Communication Systems
4. Electrical Measurement & Measuring Instrument.

**Course Objectives:**

1. Understand the main Graphic and Electronic Printing and know about the basic electronics components.
2. Learn the materials used in Printed electronics fabrication, different printing methods.
3. Know application areas, advancements and future trends in Printed Electronics.

**Course Outcomes:**

After successfully completing the course, students will be able to-

1. Explain the potential of printing in manufacturing electronics.
2. Classify different materials which are used in Printed Electronics fabrication.
3. Analyze basic electronics knowledge required for Printed Electronics.
4. Explore various printing methods for manufacturing Printed Electronics.
5. Explore different applications of Printed Electronics.
6. Know the opportunities and advancements in Printed Electronics.

| Unit No. | Content | No. of Lectures Required |
|---|---|---|
| **Unit-1** | **Introduction to Printed Electronics:** Basic concepts of printed electronics, Use of conventional printing methods in printing electronics, PE Technology and Its Benefits, Market for printed electronics. | **05** |
| **Unit-2** | **Materials in Printed Electronics:** Materials properties/synthesis of printable semiconductors, Inorganic materials, Organic materials & Conductive polymers used in Printed Electronics, **Substrates:** Thin Glass R2R Coated and Non-coated PET, PEN, fabrics, Inks, chemicals used, Substrate treatments, Ink and substrate interaction. | **05** |
| **Unit-3** | **Printable Passive and Active Components:** Processing issues for organic and printable semiconductors, **Passive components:** Resistors, Capacitors, Inductors, Diodes, Interface components such as: Switches, Plugs, Sockets, Panel controls, **Active components:** Transistors – Bipolar, Field effect Integrated circuits Optoelectronic components: LED, LCD, Logic gates. | **05** |
| **Unit-4** | **Printing Processes and Printed Electronics:** Subtractive manufacturing, Clean-room requirements, Sintering, Masking, Coating, etc., Impact Printing Processes, Offset, Screen, Gravure, Flexography, and Non-impact printing processes Inkjet Printing for production of PE. | **05** |
| **Unit-5** | **Printed Electronics Applications:** Area of Applications, Method of application, and benefits. Smart sensors, Carbon nano materials based FETs, and transparent, wearable electronic devices. | **05** |
| **Unit-6** | **Advances and Future Trends in Printed Electronics:** Various advanced technologies used in printed electronics production, Future market, and future products of printed electronics, OLEDs, Variable Sensors, Solar Cells. | **05** |
| | **Total** | **30** |

**Text Books:**


1. Katsuaki Suganuma, 2014, Introduction to Printed Electronics, Springer.
2. H. Kipphan ,2001, Handbook of Print media, Vetagbzlin, Heidelberg


**Reference Books:**


1. Hast, J., Jansson, E., Suhonen, R., Hakola, L., Tuomikoski, M., Vilkman, M., & Kopola, H. (2017). Printed electronics solutions-based processes with flexible glass. Flexible Glass: Enabling Thin, Lightweight, and Flexible Electronics.
2. Andrew Darlow,2008, Inkjet printing Tips and Techniques, Cengage Learning
3. C. Durbeck Folsheer (Ed.) (1998), Output hard copy devices, Academic Press Inc.
4. Kleper, M. L. (2004). Printed electronics and the automatic identification of objects. Sewickley: Graphic Arts Technical Foundation.

# B.Tech. Final Year AY 2023-24 (For Branch EXTC)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **7SE06** | Cryptography and Network Security Lab | 00 | 00 | 02 | 01 |

**Course Learning Objectives:**

Upon successful completion of this course, students should be able to:

1. Explain the objectives of information security.

2. Explain the importance and application of each of confidentiality, integrity, authentication and availability

3. Understand various cryptographic algorithms

4. Understand the basic categories of threats to computers and networks

5. Describe public-key cryptosystem

6. Describe the enhancements made to IPv4 by IPsec

**Course Outcomes:**

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

1. Able to understand the concepts of a particular practical subject. (e.g.: Able to Understand various algorithms used for cryptography)

2. Able to Implement the Algorithms using available resources in the Lab. (e.g.: Python3 is used to implement various Algorithms)

3. Able to express finding and outcomes of experiments in journal and viva-Voce. (e.g.: Able to analyse and express the outcomes of Algorithms using Python Language in journal and viva-Voce.)

**List of Experiment: (Perform any 8 experiments from a given list)**

| Sr. No. | Aim |
|---|---|
| **1.** | One Bit Error Detection Using Parity Bit Check. 0 for EVEN Parity and 1 for ODD P+DATA should be transmitted as signal use DATA as 1001101 P could be 0 or 1 |
| **2 A.** | Encryption: - Convert Plain Text into Cipher Text by using Ceaser Cipher (P+K) Mod26 and store Encrypted data in file for transmission |
| **2 B.** | Decryption: - Receive the Encrypted\| transmitted file. Convert Cipher text into plain Text. |
| **3.** | Generate unique 6-digit CAPTCHA which \|could be a combination of 0-9 digits, lowercase a-z letters and Uppercase A-Z letters. Also Generate 8digit OPT number for the Authentication of Net Banking Login. |
| **4 A.** | Generate and Share a common PassKey to Encrypt the message and transmit the Encrypted file (M⊕Pkey = E). |
| **4 B.** | Receive the Encrypted files use the Common PassKey to get back Original Message (E⊕Pkey = M). |
| **5 A.** | Use the Block Cipher Technique to Encrypt the message. Block size can be 64Bit or 128Bit (BLOCK[M] key = BLOCK[E]). |
| **5 B.** | Use the Block Cipher Technique to Decrypt the message. Block size can be 64Bit or 128Bit (BLOCK[E] key = BLOCK[M]). |
| **6 A.** | Use the RC4 Stream Cipher to Encrypt the message. |
| **6 B.** | Use the RC4 Stream Cipher to Decrypt the message. |
| **7.** | For the Peer entity authentication Use Hash function (MD5) and create a secure Login System with Password Protection. |
| **8.** | For the Data Origin authentication Use Hash function (SHA1) to find original Download files and sources. |
| **9.** | Generate Public Key and Private Key using RSA Algorithm. |
| **10.** | Create a Chat Box like what‟s app where message will Encrypt after sending and receiver can decrypt the message back. |

# B.Tech. Final Year AY 2023-24 (For Branch EXTC)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **7SE07** | VLSI Design Lab | 00 | 00 | 02 | 01 |

**Course Pre-Requisite**:

1. Electronic devices & circuits(3SE02)
2. Digital system design(3SE03)

**Course Learning Objectives:**

1. To develop the ability to design, implement, and analyze CMOS-based digital circuits through schematic entry, layout design, physical verification, and timing analysis using EDA tools.
2. To acquire practical skills in VLSI/ASIC design methodologies, including silicon layout development, simulation, parametric analysis, and verification of combinational and sequential digital circuits.
3. To apply Hardware Description Language (Verilog) for modeling, synthesis, and functional verification of digital systems using appropriate simulation tools.

**Course Outcomes:**

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

1. Able to use knowledge of concerned area so as to Design ,Program and combinational and sequential digital circuits.
2. Able to use software and FPGA platform for conduction of experiments.
3. Able to interpret results ,formulate findings, draw suitable conclusion and answer questions related to the given experiments

**List of Experiments:**

Minimum 8-10 Experiments should be conducted based on 7SE02 VLSI Design syllabus.

# B.Tech. Final Year AY 2023-24 (For Branch EXTC)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **7SE08** | Research Methodology | **00** | **00** | **04** | **02** |

**Course Objectives**

1. To understand the fundamentals and significance of research methodology in Electronics and Telecommunication Engineering.
2. To develop skills in identifying research problems, conducting literature reviews, and formulating hypotheses.
3. To apply appropriate research design, data collection, statistical analysis, and visualization techniques for EXTC applications.
4. To develop technical writing, presentation, publication ethics, and research documentation skills using modern research tools.

**Course Outcomes**

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

1. Design and conduct research studies related to Electronics and Telecommunication Engineering using appropriate methodologies and tools.
2. Analyze, interpret, and validate research data using statistical techniques, hypothesis testing, and visualization methods.
3. Prepare and present technical reports, research papers, and presentations while following ethical research and publication standards.

## List of Experiments/ Practicals

8 Practicals are to be performed and a Major project

| Sr. No. | List of Practical |
|---|---|
| 1 | To identify a research problem in EXTC domains and formulate clear research objectives. |
| 2 | To conduct a structured literature review of research papers in EXTC and identify research gaps. |
| 3 | To study and verify research publications using DOI and ISSN, and analyze journal authenticity and indexing. |
| 4 | To design an experimental or simulation-based research methodology for EXTC applications and formulate testable hypotheses. |
| 5 | To collect and organize data from EXTC systems and apply appropriate sampling techniques. |
| 6 | To analyze and visualize EXTC experimental data using statistical tools and graphical methods. |
| 7 | To validate EXTC system performance using statistical hypothesis testing methods. |
| 8 | To prepare and present a structured research report based on an EXTC problem. |
| 9 | To use reference management tools for organizing and citing research papers effectively. |
| 10 | To understand research ethics, avoid plagiarism, and follow publication standards in EXTC research. |

**Text Book:** *Research Methodology: Methods and Techniques* by **C.R. Kothari**, 2nd Edition, New Age International Publishers.

**Reference Books:**


1. Ranjit Kumar, "Research Methodology: A Step by Step Guide for Beginners", SAGE Publications Ltd., 2011.
2. Wayne Goddard, Stuart Melville, "Research Methodology: An Introduction", JUTA and Company Ltd, 2004.
3. S.D. Sharma , "Operational Research", Kedar Nath Ram Nath & Co.,1972

# B.Tech. Final Year AY 2023-24 (VII Sem. EXTC)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 7SEH1 | Biomedical Signal Processing | 03 | 00 | 00 | 03 |

**Course Pre-requisite**: 6SE04PE3B Biomedical Electronics, 5SE03 Digital Signal Processing

**Course Objectives:**

1. Understand the sources of bio potential, various biomedical signals like ECG, EEG, EMG.
2. Understand the Sources, Types & Characteristics of Different Noises and Artifacts Present in Biomedical Signals.
3. Design Time Domain and Frequency Domain Filters for Noise and Artifact Removal from Biomedical signals.

**Course Outcomes:**

After successful completion of this course, students will be able to,

1. Understand the Sources, Types & Characteristics of biomedical signals like ECG, EEG, EMG
2. Analyse different Noises and Artifacts Present in Biomedical Signals and their effects on signals
3. Describe the Time, frequency domain methods to perform filtering on biomedical signals.
4. Understand the event detection methods used in analysing the ECG and EEG signal.
5. Analysis of Nonstationary Signals such as heart murmurs using Short-Time Fourier Transform.
6. Understands the applications of Application of Adaptive Filters in noise cancellation from ECG and EEG Signals

| Unit | Content | No. of Lectures Required |
|---|---|---|
| **Unit-1** | **Introduction to Biomedical Signal Processing:** Origin of bioelectric signals, resting potential, action potential, biomedical signal acquisition system, types of bio-signals: ECG, EEG, EMG | **06** |
| **Unit-2** | **Difficulties in Biomedical Signal Analysis** : Noise, artifacts, Physiological Interference, Difficulties in Biomedical Signal Analysis, Statistical parameters: Mean, std deviation, MSE, RMS. Noises and artifacts Present in ECG, EEG | **06** |
| **Unit-3** | **Filtering for Removal of artifacts:** Time domain filtering: Moving Average Filter, Derivative-based operator, Frequency Domain Filtering: Notch Filter, Optimal Filtering: The Weiner Filter. | **06** |
| **Unit-4** | **Event Detection in Biomedical Signals:** Example events (viz. P, QRS and T wave in ECG), Derivative based Approaches for QRS Detection: Pan Tompkins Algorithm for QRS Detection, Dicrotic Notch Detection Correlation Analysis of EEG Signal | **06** |
| **Unit-5** | **Analysis of Nonstationary Signals**: Heart Sounds and Murmurs, Characterization of Nonstationary Signals and Dynamic Systems, Short-Time Fourier Transform | **06** |
| **Unit-6** | **Application of Adaptive Filter**: Adaptive filter for Noise Cancellation in ECG signal, EEG Signals. Applications: ECG disease detection, EEG disorder analysis, Introduction to wearable health systems | **06** |
| | **Total** | **36** |

**Text Books:**


1. R M Rangayyan “Biomedical Signal Analysis: A case Based Approach”, IEEE Press, John Wiley & Sons. Inc, 2002
2. Willis J. Tompkins “ Biomedical Digital Signal Processing”, EEE, PHI, 2004

D C Reddy “Biomedical Signal Processing: Principles and Techniques”, Tata McGraw-Hill Publishing Co. Ltd, 2005

# B.Tech. Final Year AY 2023-24 (For Branch EXTC)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 8SE01 | Satellite Communication | 03 | 00 | 00 | 03 |

**Course Pre-Requisite:**

1. Electromagnetic Waves (3SE04)
2. Analog and Digital Communication (4SE02)

**Course Learning Objectives:**

1. To understand the frequency bands used in satellite communication
2. To know the basics of orbital mechanism, the types of satellite orbits and orbital aspects of Satellite communication.
3. To understand the various typical phenomenon in satellite communication along with different satellite channel parameters.
4. To understand the working of different satellite subsystems and various services of satellite.

**Course Outcomes:**

After completion of this course the student shall be able to:

At the end of this course students will demonstrate the ability to

7. Visualize the architecture of satellite systems as a means of high speed, high range communication system.
8. State various aspects related to satellite systems such as orbital equations, sub-systems in a satellite.
9. Solve numerical problems related to orbital motion and design of link budget for the given parameters and conditions.
10. Learnadvancedtechniquesandregulatoryaspectsofsatellitecommunication.
11. Understand role of satellite in various applications.
12. Understand the working of VSAT and GPS.

| Unit No. | Content | No. of Lectures Required |
|---|---|---|
| **Unit-1** | **Introduction to Satellite Communication:** Architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication. Geo stationary and non-Geo- stationary orbits, satellite types – LEO, MEO, GEO, HEO, concepts of Solar day and Sidereal day. | **07** |
| **Unit-2** | **Orbital Mechanics:** Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity, look angle determination of a satellite. | **07** |
| **Unit-3** | **Typical Phenomena in Satellite Communication** : Solar Eclipse on satellite, its effects, remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift, space launch vehicles. | **07** |
| **Unit-4** | **Satellite Link Design:** Basic transmission theory, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N, System design example. | **07** |
| **Unit-5** | **Satellite sub-systems:** Study of Architecture and Roles of various sub-systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC & M), Attitude and orbit control system (AOCS), Communication sub-system, power sub systems etc. | **07** |
| **Unit-6** | **Satellite Navigation and Global Positioning System (GPS):** Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers and codes, Satellite signal acquisition, GPS Navigation Message, GPS signal levels, GPS receiver operation. | **07** |
| | Total | **42** |

**Text Books:**


1. Timothy Pratt Charles W. Bostian, Jeremy E.Allnutt: Satellite Communications: Wiley India. 2nd Edition, 2002
2. Tri T. Ha: Digital Satellite Communications: Tata McGraw Hill,2009


**Reference Books:**


1. Dennis Roddy: Satellite Communication: 4th Edition, McGraw Hill, 2009

# B.Tech. Final Year AY 2023-24 (For Branch EXTC)

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 8SE02 | Mobile Communication Networks | 03 | 00 | 00 | 03 |

**Pre-requisites:**

1. 4SE02 - Analog and Digital Communication

**Course Learning Objectives:**

CLO 1: To apprehend the evolution of Mobile communication and cellular concept.

CLO 2: To study role of equalization and Diversity techniques in Mobile communication.

CLO 3: To understand the concepts of multiple access techniques in mobile communication.

**Course Outcomes:** After completion of this course the student will be able to:

CO 1: Explain basic concept of Cellular systems and standards

CO 2: Demonstrate knowledge of Signal propagation model

CO 3: Compare different multiple access techniques in mobile communication.

CO 4: Explain the concept of Equalization techniques

CO 5: Explain the concept of Diversity techniques

CO 6: Compare different Mobile Communication Systems.

| Unit No. | Content | No. of Lectures Required |
|---|---|---|
| **1** | **Cellular concepts:** Evolution of Mobile Radio Communication Systems, IG, 2G, 2.5G, and 3G Wireless Cellular Networks and Standards, Cell structure, frequency reuse, cell splitting and sectoring. Channel assignment, concept of handoff. | **07** |
| **2** | **Signal propagation:** Mobile Radio Propagation: Large Scale Path Loss, Free Space Propagation Model, Reflection, Ground Reflection (Two-Ray) Model, Diffraction, Scattering, Small Scale Fading and Multipath Propagation. Types of Small-Scale Fading. | **07** |
| **3** | **Multiple access techniques:** FDMA, TDMA, CDMA, SDMA, Introduction of OFDM techniques. | **07** |
| **4** | **Equalization:** fundamental of Equalization, Linear and Non Linear Equalization Linear and Adaptive, Algorithms for adaptive equalization, Fractionally Spaced Equalizers. | **07** |
| **5** | **Diversity:** Diversity Techniques, Types of Diversity, Diversity receiver"s selection and MRC receivers, RAKE receiver, Frequency diversity. | **06** |
| **6** | **Mobile Systems:** GSM, GPRS, CDMA 2000 and WCDMA, LTE, Introduction to Cognitive Radio, Introduction to 5G. | **06** |
| | Total | **40** |

**Text Books:**


1. T. S. Rappaport, "Wireless Communications Principles and Practice", 2nd edition, PHI, 2002.

2. William C Y. Lee, "Mobile Cellular Telecommunications Analog and Digital Systems", 2nd edition, TMH, 1995.

3. V. K. Garg, J.E. Wilkes, Principle and Application of GSM, Pearson Education, 5th edition, 2008,


**Reference Books:**


1. D. Tse and P. Viswanath, Fundamentals of Wireless Communication, Cambridge Univ. Press, 2005.

2. A Goldsmith, Wireless Communications, Cambridge Univ. Press, 2005.

3. A. Kumar, D. Manjunath, and J. Kuri, Wireless Networking, Morgan Kaufmann, 2008.

# B.Tech. Final Year AY 2023-24 (For Branch EXTC )

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| 8SEH | VLSI Testing & Verification | 03 | 00 | 00 | 03 |

**Course Pre-Requisite** :

1. VLSI Design (7SE02)
2. Digital system design(3SE03)

**Course Learning Objectives:**

1. Explain the fundamentals of VLSI testing and verification, including testing methodologies, verification processes.
2. Analyze chip testing procedures, test equipment, fault models, and fault detection techniques used for identifying.
3. Apply combinational Automatic Test Pattern Generation (ATPG) techniques for structural testing of digital circuits.
4. Study verification tools and Built-In Self-Test (BIST) techniques for validating VLSI designs.

**Course Outcomes:**

After completion of this course the student shall be able to :

1. Understand the basic concept of Testing and Verification.
2. Explain various test process and equipment.
3. Comprehend various types of Fault and its modelling.
4. Demonstrate the Combinational Circuit Test Pattern Generation.
5. Discuss various tools used for verification.
6. Understand the Built-In Self-Test process.

| Unit No. | Content | No. of Lectures Required |
|---|---|---|
| Unit - 1 | **Introduction of Testing and Verification**: Roll of Testing, Digital and Analog VLSI Testing, VLSI Technology Trends Effecting Testing, Verification Importance, Cost of Verification. Testing Versus Verification. | 06 |
| Unit - 2 | **Test Process and Equipment**: How to Test Chips? Types Of Testing, Automatic Test Equipment, Electrical Parametric Testing. | 06 |
| Unit - 3 | **Fault Modelling**: Defects, Errors, And Faults, Functional Versus Structural Testing, Levels of Fault Models, A Glossary of Fault Models, Single Stuck-At Fault. | 06 |
| Unit - 4 | **Combinational ATPG**: Structural vs. functional test, Definition of ATPG, Exhaustive algorithm, Random pattern generation, Boolean difference symbolic method, Path sensitization method. | 06 |
| Unit - 5 | **Verification Tools:** Linting Tools, Simulators, Third-Party Models, Waveform Viewers, Code Coverage, Verification Languages, Revision Control, Issue Tracking, Metrics. | 06 |
| Unit - 6 | **Built-In Self-Test**: Motivation, BIST definitions, BIST process, BIST pattern generation, BIST response compaction, Aliasing definition | 06 |
| | **Total** | **36** |

**Text Books:**


1. **M.L.Bushnell, V.D.Agrawal** "Essentials of Electronic testing for Digital. Memory and Mixed Signal VLSI Circuits", Kluwer Academic Publishers, New York, Boston, Dordrecht, London, Moscow, 2002.
2. **Jayaram Bhasker** "A VHDL Primer" , P T R Prentice Hall Englewood Cliffs, New Jersey.


**Reference Books:**


1. **Janick Bergeron**, "Writing test benches functional verification of HDL models" Kluwer Academic Publishers, New York, Boston, Dordrecht, London, Moscow, 2002.