**AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY, PAIYANOOR, CHENNAI**

AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY

( An Constituent College of Vinayaka Mission's Research Foundation )

**&**

**VINAYAKA MISSION'S KIRUPANANDA VARIYAR ENGINEERING COLLEGE, SALEM**

**(Constituent Colleges of Vinayaka Mission's Research Foundation, Deemed to be University, Salem, Tamil Nadu, India)**

**(AICTE APPROVED AND NAAC ACCREDITED)**

VINAYAKA MISSION'S KIRUPANANDA VARIYAR ENGINEERING COLLEGE

## Faculty of Engineering and Technology

# REGULATIONS 2017

# Programme:

# B.E / B.Tech - MECHATRONICS

### Full Time (4 Years)

### STRUCTURED CHOICE BASED CREDIT SYSTEM (SCBCS)

### CURRICULUM AND SYLLABUS

### (Semester I to VIII)

# PROGRAMME OUTCOMES

Engineering Graduates will be able to:

| | |
|---|---|
| PO1 | Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. |
| PO2 | Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. |
| PO3 | Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. |
| PO4 | Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. |
| PO5 | Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations. |
| PO6 | The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice. |
| PO7 | Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. |
| PO8 | Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. |
| PO9 | Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. |
| PO10 | Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. |
| PO11 | Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. |
| PO12 | Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. |

# PROGRAMME SPECIFIC OUTCOMES (PSOS)

Graduating Students of Mechatronics Engineering programme will be able to:

| | |
|---|---|
| PSO1 | Have a strong foundation in science and focus in mechanical, electronics, control, software and computer engineering, and a solid command of the newest technologies. |
| PSO2 | Be able to design, analyze, and test "intelligent" products and processes that incorporate appropriate computing tools , sensors, and actuators. |
| PSO3 | Be able to work efficiently in multidisciplinary teams. |

# PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

| | |
|---|---|
| PEO1 | The Programme will prepare graduates to synergistically integrate mechanical engineering with electronic and intelligent computer control in the design and manufacture of industrial products and processes. |
| PEO2 | The Programme will prepare graduates with strong team skills to solve multidisciplinary problems using Mechatronics approach. |
| PEO3 | The Programme will prepare graduates with an understanding of their ethical and social responsibility. |

# Credit Requirement for the Course Categories

| Sl. No. | Category of Courses | Credits to be earned Min – Max. |
|---|---|---|
| 01 | **A. Foundation Courses (FC)** | **54 - 81** |
| | i. Humanities and Sciences (English and Management Courses) | 12 – 21 |
| | ii. Basic Sciences (Maths, Physics and Chemistry Courses) | 24 – 33 |
| | iii. Engineering Sciences (Basic Engineering Courses) | 18 - 27 |
| 02 | **B. Core courses (CC) relevant to the chosen Programme of study.** | **81** |
| 03 | **C. Elective Courses (EC)** | **18 - 24** |
| | i. Programme Specific (Class Room or Online) | 12 – 15 |
| | ii. Open Elective (Class Room or Online) | 6 - 9 |
| 04 | **D. Project + Internship + Industry Electives (P + I + I)** | **18** |
| | i. Project | 9 |
| | ii. Internship | 3 |
| | iii. Industry Supported Courses | 6 |
| 05 | **E. Employability Enhancement Courses + Co - Curricular Courses + Extra Curricular Courses | **9 - 18** |
| | i. Employability Enhancement Courses (Personality Development Training, Participation in Seminars, Professional Practices, Summer Project, Case Study etc.) | 3 - 6 |
| | ii. Co - Curricular Courses (NCC, NSS, Sports, Games, Drills and Physical Exercises) | 3 - 6 |
| | iii. Extra Curricular Courses | 3 - 6 |
| **Minimum Credits to be earned** | | **180** |

**** - Mandatory, Credits would be mentioned in Mark sheets but not included for CGPA Calculations. For overall CGPA calculations, a student has to earn minimum 171 credits in Categories A to D.**

# CURRICULUM

**B.E / B.Tech. - MECHATRONICS**

# SEMESTER
# I TO VIII

# B.E / B.TECH. – MECHATRONICS - SEMESTER I TO VIII

## CATEGORY A – FOUNDATION COURSES - HSS, BS AND ES COURSES - CREDITS (54-81)

### (i) HUMANITIES AND SCIENCES (ENGLISH AND MANAGEMENT SUBJECTS) - CREDITS (12 - 21)

| SL. NO | CODE | COURSE | OFFERING DEPT. | CATEGORY | L | T | P | C | PREREQUISITE |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 17EGHS01 | TECHNICAL ENGLISH | ENGLISH | FC(HSS) | 3 | 0 | 0 | 3 | NIL |
| 2. | 17EGHS02 | BUSINESS ENGLISH | ENGLISH | FC(HSS) | 3 | 0 | 0 | 3 | NIL |
| 3. | 17EGHS81 | ENGLISH LANGUAGE LAB | ENGLISH | FC(HSS) | 0 | 0 | 4 | 2 | NIL |
| 4. | 17YMHS82 | YOGA & MEDITATION | PHYSICAL EDUCATION | FC(HSS) | 0 | 0 | 4 | 2 | NIL |
| 5. | 17MBHS 07 | PROFESSIONAL ETHICS AND HUMAN VALUES | MANAGEMENT | FC(HSS) | 3 | 0 | 0 | 3 | NIL |
| 6. | 17MB HS 02 | FINANCE AND ACCOUNTING FOR ENGINEERS | MANAGEMENT | FC(HSS) | 3 | 0 | 0 | 3 | NIL |

### (ii) BASIC SCIENCES (MATHS, PHYSICS AND CHEMISTRY SUBJECTS) - CREDITS (24 - 33)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 17MABS01 | ENGINEERING MATHEMATICS | MATHEMATICS | FC(BS) | 2 | 2 | 0 | 3 | NIL |
| 2. | 17MABS06 | DIFFERENTIAL EQUATIONS AND TRANSFORMS | MATHEMATICS | FC(BS) | 2 | 2 | 0 | 3 | ENGINEERING MATHEMATICS |
| 3. | 17MABS10 | PARTIAL DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA | MATHEMATICS | FC(BS) | 2 | 2 | 0 | 3 | DIFFERENTIAL EQUATIONS AND TRANSFORMS |
| 4. | 17MABS16 | NUMERICAL METHODS | MATHEMATICS | FC(BS) | 2 | 2 | 0 | 3 | ENGINEERING MATHEMATICS |
| 5. | 17PCBS02 | PHYSICAL SCIENCES | PHYSICS & CHEMISTRY | FC(BS) | 4 | 0 | 0 | 4 | NIL |
| 6. | 17PHBS05 | SMART MATERIALS | PHYSICS | FC(BS) | 3 | 0 | 0 | 3 | NIL |
| 7. | 17CHBS01 | ENVIRONMENTAL SCIENCE AND ENGINEERING | CHEMISTRY | FC(BS) | 3 | 0 | 0 | 3 | NIL |
| 8. | 17PCBS81 | PHYSICAL SCIENCES LAB | PHYSICS & CHEMISTRY | FC(BS) | 0 | 0 | 4 | 2 | NIL |

### (iii) ENGINEERING SCIENCES (BASIC ENGINEERING COURSES) - CREDITS (18 - 27)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 17CSES01 | ESSENTIALS OF COMPUTING (Theory + Practice) | CSE | FC(ES) | 2 | 0 | 2 | **3** | NIL |
| 2. | 17CMES02 | BASICS OF CIVIL AND MECHANICAL ENGINEERING | CIVIL & MECHANICAL | FC(ES) | 4 | 0 | 0 | **4** | NIL |
| 3. | 17EEES03 | BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING | EEE & ECE | FC(ES) | 4 | 0 | 0 | **4** | NIL |
| 4. | 17CSES05 | PROGRAMMING IN PYTHON | CSE | FC(ES) | 3 | 0 | 0 | **3** | NIL |
| 5. | 17CMES81 | ENGINEERING SKILLS PRACTICE LAB<br>A. BASIC CIVIL ENGINEERING<br>B. BASIC MECHANICAL ENGINEERING | CIVIL & MECHANICAL | FC(ES) | 0 | 0 | 4 | **2** | NIL |
| 6. | 17EEES82 | ENGINEERING SKILLS PRACTICE LAB<br>A. BASIC ELECTRICAL ENGINEERING<br>B. BASIC ELECTRONICS ENGINEERING | EEE & ECE | FC(ES) | 0 | 0 | 4 | **2** | NIL |
| 7. | 17CSES83 | PROGRAMMING IN PYTHON LAB | CSE | FC(ES) | 0 | 0 | 4 | **2** | NIL |
| 8. | 17MEES84 | ENGINEERING GRAPHICS (Theory + Practice) | MECHANICAL | FC(ES) | 1 | 0 | 4 | **3** | NIL |

| CATEGORY B – CORE COURSES RELEVANT TO THE PROGRAMME - CREDITS (81) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **SL. NO** | **CODE** | **COURSE** | **OFFERING DEPT.** | **CATEGORY** | **L** | **T** | **P** | **C** | **PREREQUISITE** |
| 1 | 17EECC01 | ELECTRIC CIRCUIT ANALYSIS | EEE | CC | 3 | 0 | 0 | 3 | BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING |
| 2 | 17MECC06 | KINEMATICS OF MACHINES | MECHANICAL | CC | 3 | 0 | 0 | 3 | NIL |
| 3 | 17ECCC01 | SEMICONDUCTOR DEVICES | ECE | CC | 3 | 0 | 0 | 3 | NIL |
| 4 | 17CVCC32 | FLUID MECHANICS AND STRENGTH OF MATERIALS | CIVIL | CC | 3 | 0 | 0 | 3 | NIL |
| 5 | 17MECC03 | ENGINEERING MECHANICS | MECHANICAL | CC | 3 | 0 | 0 | 3 | NIL |
| 6 | 17MECC08 | DYNAMICS OF MACHINES | MECHANICAL | CC | 3 | 0 | 0 | 3 | KINEMATICS OF MACHINES |
| 7 | 17ECCC05 | DIGITAL LOGIC CIRCUIT & DESIGN | ECE | CC | 3 | 0 | 0 | 3 | BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING |
| 8 | 17MECC18 | MANUFACTURING ENGINEERING | MECHANICAL | CC | 3 | 0 | 0 | 3 | NIL |
| 9 | 17MECC09 | DESIGN OF MACHINE ELEMENTS | MECHANICAL | CC | 3 | 0 | 0 | 3 | STRENGTH OF MATERIALS |
| 10 | 17EECC16 | POWER ELECTRONICS AND DRIVES | EEE | CC | 3 | 0 | 0 | 3 | NIL |
| 11 | 17ECCC10 | LINEAR INTEGRATED CIRCUITS | ECE | CC | 3 | 0 | 0 | 3 | SEMICONDUCTOR DEVICES |
| 12 | 17ECCC23 | SENSORS AND ELECTRONIC MEASUREMENTS | ECE | CC | 3 | 0 | 0 | 3 | NIL |
| 13 | 17ECCC07 | MICROCONTROLLERS & ITS APPLICATIONS | ECE | CC | 3 | 0 | 0 | 3 | NIL |
| 14 | 17EECC08 | CONTROL SYSTEMS | EEE | CC | 3 | 0 | 0 | 3 | BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING |
| 15 | 17MTCC01 | PROGRAMMABLE LOGIC CONTROLLERS(THEORY & PRACTICE) | MECHATRONICS | CC | 2 | 0 | 2 | 3 | NIL |
| 16 | 17ECEC20 | ROBOTICS AND AUTOMATION | ECE | CC | 3 | 0 | 0 | 3 | NIL |
| 17 | 17MECC12 | COMPUTER INTEGRATED MANUFACTURING | MECHANICAL | CC | 3 | 0 | 0 | 3 | NIL |
| 18 | 17MECC15 | FINITE ELEMENT ANALYSIS | MECHANICAL | CC | 3 | 0 | 0 | 3 | STRENGTH OF MATERIALS |
| 19 | 17MEEC01 | HYDRAULICS AND PNEUMATIC SYSTEMS | MECHANICAL | CC | 3 | 0 | 0 | 3 | NIL |
| 20 | 17EECC81 | ELECTRIC CIRCUITS LAB | EEE | CC | 0 | 0 | 4 | 2 | NIL |
| 21 | 17CVCC92 | FLUID MECHANICS AND STRENGTH OF MATERIALS LAB | CIVIL | CC | 0 | 0 | 4 | 2 | NIL |
| 22 | 17ECCC81 | SEMICONDUCTOR DEVICES LAB | ECE | CC | 0 | 0 | 4 | 2 | NIL |
| 23 | 17ECCC82 | DIGITAL LOGIC CIRCUIT & DESIGN LAB | ECE | CC | 0 | 0 | 4 | 2 | NIL |
| 24 | 17MECC92 | DYNAMICS LAB | MECHANICAL | CC | 0 | 0 | 4 | 2 | NIL |
| 25 | 17EECC87 | CONTROL SYSTEMS LAB | EEE | CC | 0 | 0 | 4 | 2 | NIL |
| 26 | 17ECCC96 | SENSORS AND ELECTRONIC MEASUREMENTS LAB | ECE | CC | 0 | 0 | 4 | 2 | NIL |
| 27 | 17ECCC95 | MICROCONTROLLERS LAB | ECE | CC | 0 | 0 | 4 | 2 | NIL |
| 28 | 17MTCC81 | PROGRAMMABLE LOGIC CONTROLLERS LAB | MECHATRONICS | CC | 0 | 0 | 4 | 2 | NIL |
| 29 | 17MECC88 | COMPUTER INTEGRATED MANUFACTURING LAB | MECHANICAL | CC | 0 | 0 | 4 | 2 | NIL |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 30 | 17MTCC82 | ROBOTICS LAB | MECHATRONICS | CC | 0 | 0 | 4 | 2 | NIL |
| 31 | 17MECC93 | HYDRAULICS AND PNEUMATIC SYSTEMS LAB | MECHANICAL | CC | 0 | 0 | 4 | 2 | NIL |

## B.E / B.TECH. – MECHATRONICS - SEMESTER I TO VIII
## DETAILS OF ELECTIVE COURSES FOR DEGREE WITH SPECIALISATION

### CATEGORY C – ELECTIVE COURSES - CREDITS (18 - 24)

### (i) PROGRAMME SPECIFIC (CLASS ROOM OR ONLINE) - CREDITS (12 - 15)

| SL. NO | CODE | COURSE | OFFERING DEPT. | CATEGORY | L | T | P | C | PREREQUISITE |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 17MTEC01 | DESIGN OF MECHATRONICS SYSTEMS | MECHATRONICS | EC -PS | 3 | 0 | 0 | 3 | NIL |
| 2. | 17EEEC07 | INTELLIGENT CONTROLLERS | EEE | EC -PS | 3 | 0 | 0 | 3 | CONTROL SYSTEM |
| 3. | 17EEEC23 | PRINCIPLES OF AUTOMATIC CONTROL | EEE | EC -PS | 3 | 0 | 0 | 3 | NIL |
| 4. | 17ECEC25 | MICRO ELECTRO MECHANICAL SYSTEMS | ECE | EC -PS | 3 | 0 | 0 | 3 | NIL |
| 5. | 17ECEC26 | AVIONICS | ECE | EC -PS | 3 | 0 | 0 | 3 | NIL |
| 6. | 17MESE10 | DESIGN FOR MANUFACTURING & ASSEMBLY | MECHANICAL | EC -PS | 3 | 0 | 0 | 3 | NIL |
| 7. | 17ECCC24 | INTRODUCTION TO VLSI DESIGN | ECE | EC -PS | 3 | 0 | 0 | 3 | DIGITAL LOGIC CIRCUIT & DESIGN |
| 8 | 17ECCC15 | ANALOG AND DIGITAL COMMUNICATION | ECE | EC -PS | 3 | 0 | 0 | 3 | NIL |
| 9 | 17EEPI03 | VIRTUAL INSTRUMENTATION | EEE | EC -PS | 3 | 0 | 0 | 3 | NIL |
| 10 | 17ECEC27 | NANO ELECTRONICS | ECE | EC -PS | 3 | 0 | 0 | 3 | SMART MATERIALS |
| 11 | 17MTEC02 | LOW COST AUTOMATION | MECHATRONICS | EC -PS | 3 | 0 | 0 | 3 | ROBOTICS AND AUTOMATION |
| 12 | 17MESE16 | INDUSTRIAL TRIBOLOGY | MECHANICAL | EC -PS | 3 | 0 | 0 | 3 | NIL |
| 13 | 17ECEC21 | ADVANCED ROBOTICS | ECE | EC -PS | 3 | 0 | 0 | 3 | NIL |
| 14 | 17MESE17 | MODERN MANUFACTURING METHODS | MECHANICAL | EC -PS | 3 | 0 | 0 | 3 | NIL |
| 15 | 17PHBS06 | ENERGY PHYSICS | PHYSICS | EC -PS | 3 | 0 | 0 | 3 | NIL |
| 16 | 17CSES06 | PROGRAMMING IN C | CSE | EC -PS | 3 | 0 | 0 | 3 | NIL |
| 17 | 17ECSE04 | EMBEDDED SYSTEM DESIGN | ECE | EC -PS | 3 | 0 | 0 | 3 | NIL |
| 18 | 17EEEC01 | ADVANCED CONTROL SYSTEM | EEE | EC -PS | 3 | 0 | 0 | 3 | CONTROL SYSTEMS |
| 19 | 17MESE42 | DESIGN FOR QUALITY | MECHANICAL | EC -PS | 3 | 0 | 0 | 3 | NIL |
| 20 | 17MEEC13 | INDUSTRIAL SAFETY | MECHANICAL | EC -PS | 3 | 0 | 0 | 3 | NIL |

### (ii) OPEN ELECTIVE (CLASS ROOM OR ONLINE) - CREDITS (6 - 9)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 17BMCC04 | BIOMEDICAL INSTRUMENTATION & MEASUREMENTS. | BME | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 2. | 17MESE32 | COMPOSITE MATERIALS | MECHANICAL | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 3. | 17MESE08 | PRODUCT DESIGN & DEVELOPMENT | MECHANICAL | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 4. | 17MESE20 | RAPID PROTOTYPING AND TOOLING | MECHANICAL | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 5. | 17MESE22 | AUTOMOTIVE INFOTRONICS | MECHANICAL | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 6. | 17EEEC21 | NON CONVENTIONAL ENERGY SOURCES | EEE | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 7. | 17EECC15 | ELECTRICAL TECHNOLOGY | EEE | EC-OE | 3 | 0 | 0 | 3 | Basic of Electrical & Electronics Engineering |
| 8. | 17CSCC16 | CLOUD COMPUTING | CSE | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 9. | 17CSCC09 | JAVA PROGRAMMING | CSE | EC-OE | 3 | 0 | 0 | 3 | NIL |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 10. | 17CVEC08 | REMOTE SENSING TECHNIQUES AND APPLICATIONS | CIVIL | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 11. | 17CVEC18 | WIND ENGINEERING | CIVIL | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 12. | 17CSPI10 | MOBILE APPLICATION DEVELOPMENT | CSE | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 13. | 17CSEC34 | WEB DESIGN AND MANAGEMENT | CSE | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 14. | 17ATCC04 | AUTOMOTIVE ELECTRICAL AND ELECTRONIC SYSTEMS | AUTO | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 15. | 17CSEC09 | ETHICAL HACKING | CSE | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 16. | 17CSEC11 | GREEN COMPUTING | CSE | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 17. | 17CSEC32 | VIRTUAL REALITY | CSE | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 18. | 17CSCC01 | DATA STRUCTURES | CSE | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 19. | 17CSCC02 | OBJECT ORIENTED PROGRAMMING | CSE | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 20. | 17CSCC03 | DATABASE MANAGEMENT SYSTEM | CSE | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 21. | 17CSEC06 | CRYPTOGRAPHY AND NETWORK SECURITY | CSE | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 22. | 17BMEC09 | DESIGN OF MEDICAL DEVICES | BME | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 23. | 17BMEC02 | BIOTELEMETRY | BME | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 24. | 17BMEC21 | MEDICAL SIMULATION IN LIFE SUPPORTING DEVICES | BME | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 25. | 17BMSE07 | MEDICAL RADIATION SAFETY ENGINEERING | BME | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 26. | 17ATEC13 | COMPUTER SIMULATION OF IC ENGINE PROCESSOR | AUTOMOBILE | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 27. | 17ATEC14 | COMPUTER CONTROLLED VEHICLE SYSTEMS | AUTOMOBILE | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 28. | 17MESE18 | METAL FORMING AND JOINING PROCESS | MECHANICAL | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 29. | 17MESE19 | PROCESS PLANNING AND COST ESTIMATION | MECHANICAL | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 30. | 17CVEC07 | DISASTER MITIGATION AND MANAGEMENT | CIVIL | EC-OE | 3 | 0 | 0 | 3 | NIL |
| 31. | 17SACC10 | ENERGY CONSERVATION AND MANAGEMENT | EEE | EC-OE | 3 | 0 | 0 | 3 | NIL |

| B.E / B.TECH. – MECHATRONICS - SEMESTER I TO VIII | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **CATEGORY D – PROJECT + INTERNSHIP + INDUSTRY ELECTIVES (P + I + I)- CREDITS (18)** | | | | | | | | | |
| **(i) PROJECT- CREDITS (9)** | | | | | | | | | |
| **(i) INTERNSHIP + MINI PROJECT + INDUSTRY ELECTIVES - CREDITS (9)** | | | | | | | | | |
| **SL. NO** | **CODE** | **COURSE** | **OFFERING DEPT.** | **CATEGORY** | **L** | **T** | **P** | **C** | **PREREQUISITE** |
| 1. | 17MTPI01 | PROJECT WORK AND VIVA VOCE | MECHATRONICS | PI | 0 | 0 | 18 | 9 | NIL |
| 2. | 17MTPI02 | MINI PROJECT | MECHATRONICS | PI | 0 | 0 | 6 | 3 | NIL |
| 3. | 17CSPI04 | BUSINESS INTELLIGENCE AND ITS APPLICATIONS | CSE | PI | 3 | 0 | 0 | 3 | NIL |
| 4. | 17MEPI03 | NOISE VIBRATION AND HARSHNESS | MECHANICAL | PI | 2 | 1 | 0 | 3 | NIL |
| 5. | 17MEPI04 | NON DESTRUCTIVE TESTING | MECHANICAL | PI | 3 | 0 | 0 | 3 | NIL |
| 6. | 17EEPI04 | INTRODUCTION TO INDUSTRIAL INSTRUMENTATION | EEE | PI | 3 | 0 | 0 | 3 | NIL |
| 7. | 17CSPI07 | LEARNING IT ESSENTIALS BY DOING | CSE | PI | 3 | 0 | 0 | 3 | NIL |

## B.E/B.TECH. – MECHATRONICS - SEMESTER I TO VIII

**CATEGORY E – EMPLOYABILITY ENHANCEMENT COURSES, CO - CURRICULAR COURSES AND EXTRA CURRICULAR COURSES (EEC)** - CREDITS (9 - 18)**
**(** - MANDATORY, CREDITS WOULD BE MENTIONED IN MARK SHEETS BUT NOT INCLUDED FOR CGPA CALCULATIONS.)**

| S.No | CODE | COURSE | OFFERING DEPT. | CATEGORY | L | T | P | C | PREREQUISITE |
|---|---|---|---|---|---|---|---|---|---|
| **EMPLOYABILITY ENHANCEMENT COURSES (EEC)** | | | | | | | | | |
| 1 | 17APEE01 | PERSONALITY SKILLS DEVELOPMENT - I | MATHS | EE | 2 WEEKS OF TRAINING | | | 1 | NIL |
| 2 | 17APEE02 | PERSONALITY SKILLS DEVELOPMENT - II | ENGLISH & MANAGEMENT | EE | 2 WEEKS OF TRAINING | | | 1 | NIL |
| 3 | 17MTEE01 | TRAINING ON PLC (HANDS ON TRAINING) | MECHATRONICS | EE | 0 | 0 | 4 | 2 | NIL |
| **CO - CURRICULAR COURSES** | | | | | | | | | |
| 1 | 17APEE03 | NCC | NCC | EE | 2 WEEKS OF TRAINING IN NCC CAMP | | | 1 | NIL |
| 2 | 17APEE04 | NSS | NSS | EE | 2 WEEKS OF SOCIAL SERVICE IN NSS CAMP | | | 1 | NIL |
| 3 | 17APEE05 | SPORTS AND GAMES (INTER –UNIVERSITY LEVEL) | PHYSICAL EDUCATION | EE | | | | 1 | NIL |
| 4 | 17APEE06 | SPORTS AND GAMES (INTRA-UNIVERSITY LEVEL) | PHYSICAL EDUCATION | EE | | | | 2 | NIL |
| 5 | 17APEE07 | SPORTS AND GAMES (STATE AND NATIONAL LEVELS) | PHYSICAL EDUCATION | EE | | | | 2 | NIL |
| **EXTRA CURRICULAR COURSES** | | | | | | | | | |
| 1. | 17MTEE02 | EXTRA CURRICULAR COURSE - I | MECHATRONICS | EE | 15 HOURS | | | 1 | NIL |
| 2. | 17MTEE03 | EXTRA CURRICULAR COURSE - II | MECHATRONICS | EE | 15 HOURS | | | 1 | NIL |
| 3. | 17MTEE04 | EXTRA CURRICULAR COURSE - III | MECHATRONICS | EE | 15 HOURS | | | 1 | NIL |
| 4. | 17MTEE05 | EXTRA CURRICULAR COURSE - IV | MECHATRONICS | EE | 15 HOURS | | | 1 | NIL |

| 17EGHS01 | TECHNICAL ENGLISH | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | HSS | 3 | 0 | 0 | 3 |

**PREAMBLE**

Technical English is a life skill course necessary for all students of Engineering and Technology. It aims at developing communication skills in English, essential for understanding and expressing the ideas of different professional context. The outcome of the course is to help the students acquire the language skills of Listening, Speaking, Reading and Writing competency in English language and thereby making the students competent and employable in the globalised scenario.

**PREREQUISITE: NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To enable students to develop LSRW skills in English. (Listening, Speaking, Reading, and Writing.) |
| 2 | To make them to become effective communicators |
| 3 | To ensure that learners use Electronic media materials for developing language |
| 4 | To aid the students with employability skills. |
| 5 | To motivate students continuously to use English language |
| 6 | To develop the students communication skills in formal and informal situations |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Listen, remember and respond to others in different scenario | Remember |
| CO2. Understand and speak fluently and correctly with correct pronunciation in different situation. | Understand |
| CO3. To make the students experts in professional writing | Apply |
| CO4. . To make the students in proficient technical communicator | Apply |
| CO5. To make the students good communicators at the work place and to be theoretically strong. | Apply |
| CO6 To make the students recognize the role of technical writing in their careers in business, technical and scientific field | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | | | **L** | **L** | **M** | **M** | **M** | | **S** | | **S** | **S** | | **S** |
| CO2 | | | | | | | **L** | | | **S** | | **S** | **M** | | **S** |
| CO3 | | | | **L** | | | | **L** | | | | **L** | **M** | **M** | |
| CO4 | **L** | | | | | **M** | | **L** | **M** | **S** | **L** | **S** | **S** | **M** | **S** |
| CO5 | **S** | **M** | **L** | | | | | **M** | | **S** | | **S** | **S** | | **S** |
| CO6 | **M** | | **L** | **S** | | | | | | | | **S** | **M** | | **S** |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**SELF INTRODUCTION**

Self introduction - Simulations using E Materials - Whatsapp, Face book, Hiker, Twitter- Effective Communication with Minimum Words - Interpretation of Images and Films - Identify the different Parts of Speech- Word formation with Prefixes and suffixes -Common Errors in English - Scientific Vocabulary (definition and meaning) - Listening Skills- Passive and Active listening, Listening to Native Speakers - Characteristics of a good listener.

**STRESS**

Articles - Phonetics (Vowels, Consonants and Diphthongs) - Pronunciation Guidelines -Listening to Indian speakers from different regions, intrusion of mother tongue - Homophones – Homonyms - Note taking and Note making - Difference between Spoken and Written English- Use of appropriate language - Listening and Responding to Video Lectures (Green India, environment, social talks) - Extempore.

**READING SKILLS**

Tense forms- Verbal and Non verbal Communication - Describing objects - Process Description- Speaking Practice - Paragraph Writing on any given topic (My favourite place, games / Hobbies / School life, etc.) -Types of paragraphs - Telephone Etiquettes - Telephonic conversation with dialogue.

**CORPORATE COMMUNICATION**

Impersonal Passive Voice - Conditional Sentences - Technical and Non technical Report Writing (Attend a technical seminar and submit a report) - News Letters and Editing - Skimming- Scanning - How to Improve Reading Speed - Designing Invitations and Poster Preparation.

**CRITICAL READING**

Sentence Pattern (SVOCA) - Statement of Comparison - Transcoding (Flow Chart, Bar Chart and Pie Chart) - Informal letters - Resume Writing- Difference between Bio data, Resume and Curriculum Vitae.

**TEXT BOOK**

1. English for Engineers- Faculty of English – VMKV Engineering College, Salem and AVIT, Chennai

**REFERENCE BOOKS**


1. 1. English for Effective Communication, Department of English, VMKV & AVIT, SCM Publishers, 2009.
2. Practical English Usage- Michael Swan (III edition), Oxford University Press
3. Grammar Builder- I, II, III, and Cambridge University Press.

4 Pickett and Laster. Technical English: Writing, Reading and Speaking, New York: Harper and Row Publications, 2002.


**Course Designers:**


| S.No. | Name of the Faculty | Mail ID |
|---|---|---|
| 1. | Dr.P.Saradha / Associate Professor - English | saradhap@vmkvec.edu.in |
| 2 | Mr. S.K.Prem Kishor/Assistant Professor-English | prem.english@avit.ac.in |

| 17EGHS02 | BUSINESS ENGLISH | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | HSS | 3 | 0 | 0 | 3 |

**PREAMBLE**

Language is one of the most valued possessions of men. It acts as a repository of wisdom. Among all other languages English, the international language plays a vital role as a propeller for the advancement of knowledge in different fields and as a telescope to view the dream of the future.

**PREREQUISITE: NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To impart and enhance corporate communication. |
| 2 | To enable learners to develop presentation skills |
| 3 | To build confidence in learners to use English in Business context |
| 4 | To make them experts in professional writing |
| 5 | To assist students understand the role of thinking in all forms of communication |
| 6 | To equip students with employability and job searching skills |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Communicate with a range of formal and informal context | Understand |
| CO2. Students will undergo in activities, demonstrating interaction skills and consider how own communication is adjusted in different scenario | Apply |
| CO3. Strengthening of oral and written skills in the business context | Apply |
| CO4. Create interest among the students about a topic by exploring thoughts and ideas | Apply |
| CO5. Make the students to start with pleasing note and make them to give different ideas | Apply |
| CO6. Make them in better performance in the art of communication | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | **M** | | **L** | | **L** | **S** | **S** | | **M** | **S** | | **S** | **S** | | |
| CO2 | | **M** | **S** | **M** | | **M** | **M** | | **L** | **S** | | **S** | **M** | | |
| CO3 | **L** | **M** | | | | **M** | | **L** | | **S** | **L** | **M** | | **M** | |
| CO4 | | **L** | **M** | **M** | | | **L** | **M** | **M** | **S** | **L** | **M** | **M** | | **M** |
| CO5 | | | | **M** | | | | **M** | **L** | **S** | | **L** | | | |
| CO6 | | **L** | | **M** | | **L** | **L** | | | **S** | | **S** | **M** | **M** | **S** |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**SUBJECT AND VERB AGREEMENT:** Subject and Verb Agreement (concord) - Preposition and Relative Pronoun - Cause and effect - Phrasal Verbs-Idioms and phrases-Listening Comprehension -Listening to Audio Files and Answering Questions-Framing Questions-Negotiation Skills-Presentation Skills and Debating Skills.

**STRESS:** Stress (Word Stress and Sentence Stress) Intonation- Difference between British and American English Vocabulary-Indianism-Compound Words (including Technical Terminology).

**READING SKILLS:** Reading Skills-Understanding Ideas and making Inferences-Group Discussion-Types of Interviews – FAQs – E - Mail Netiquette - Sample E – mails - Watching Documentary Films and Responding to Questions.

**CORPORATE COMMUNICATION:** Corporate Communication -Recommendation-Instruction-Check List- Circulars-Inter Office Memo- Minutes of Meeting and Writing Agenda - Discourse Markers - Rearranging Jumbled Sentences - Technical Articles - Project Proposals-Making Presentations on given Topics -Preparing Power Point Presentations

**CRITICAL READING:** Critical Reading-Book Review-Finding Key Information and Shifting Facts from Opinions-Business Letters (Calling for Quotation, Placing Orders and Complaint Letters) - Expansion of an Idea-Creative Writing.

**TEXTBOOK**

1. English for Effective Communication - Faculty of English – VMKV Engineering College, Salem and AVIT, Chennai

**REFERENCE BOOKS**

1. Grammar Builder – I, II, III – Cambridge University Press.
2. Technical English – Writing, Reading and Speaking – Pickett and Lester, Harper and Row

**Course Designers:**



| S.No | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
| 1 | Dr.P.Saradha | Associate Professor | English | saradhap@vmkvec.edu.in |
| 2 | Mr.S.K.Prem Kishor | Assistant Professor | English | Prem.english@avit.ac.in |

| 17EGHS81 | ENGLISH LANGUAGE LAB | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | HSS | 0 | 0 | 4 | 2 |

**PREAMBLE**

English Language Laboratory provides technological support to students. It acts as a platform for learning, practicing and producing language skills through interactive lessons and communicative mode of teaching.

**PREREQUISITE: NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To understand communication nuisances in the corporate sector. |
| 2 | To understand the role of mother tongue in second language learning and to avoid interference of mother tongue. |
| 3 | To communicate effectively through different activities |
| 4 | To understand and apply the telephone etiquette |
| 5 | Case study to understand the practical aspects of communication |
| 6 | To improve the oral skills of the students |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Give best performance in group discussion and interview | Understand |
| CO2. Best performance in the art of conversation and public speaking. | Apply |
| CO3. Give better job opportunities in corporate companies | Apply |
| CO4. Better understanding of nuances of English language through audio-visual experience and group activities | Apply |
| CO5. Speaking skills with clarity and confidence which in turn enhances their employability skills | Apply |
| CO6. Acquire strategic competence to use both spoken and written language in a wide range of communication strategies | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | S | M | S | | L | | | S | S | M | | | | S |
| CO2 | M | | | | | | | | M | S | | M | S | M | S |
| CO3 | M | | | | | | | | | S | | M | S | S | M |
| CO4 | M | | | | | | | | | M | | | M | | M |
| CO5 | M | | | S | | | | | | M | | | S | M | S |
| CO6 | | M | M | | | | | | | M | | | S | M | S |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**MODULE I:** Ice Breaker, Grouping, Listening- ( Hearing and listening)- Active Listening- Passive Listening – Listening to a song and understanding- (fill in the blanks) Telephone Conversation

**MODULE II:** Influence of mother tongue, videos, understanding nuances of English language (video) puzzle to solve, Activity.

**MODULE III:** Why is English important, Communication skills, TED (video) Communication in different scenario – a case study, ingredients of success, Activity – chart, speak the design, feedback on progress, Group wise, Individual.

**MODULE IV:** Telephone Etiquette, Dining Etiquette, Meeting Etiquette.

**MODULE V:** Case study of Etiquette in different scenario.

**Course Designers:**

| S.No | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
| 1 | Dr.P.Saradha | Associate Professor | English | saradhap@vmkvec.edu.in |
| 2 | Mr.S.K.Prem Kishor | Assistant Professor | English | Prem.english@avit.ac.in |

| 17YMHS82 | YOGA & MEDITATION | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | FC(HS) | 0 | 0 | 4 | 2 |

**PREAMBLE**

Yoga is a physical, mental and spiritual practice or discipline which originated in ancient India and is followed in all over the world. Yoga is a discipline to improve or develop one's inherent power in a balanced manner. The University has been celebrating International Yoga day every year on 21st June. The University has developed Yoga to provide physical, mental and spiritual practices to the employees, students of the university.

**PREREQUISITE - NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To understand the fundamental concepts of yogic practices |
| 2 | To study the selected yogic practices and its impact on selected systems in the human body. |
| 3 | Learned the Principles of Practicing Asana, Pranayama and Meditation. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

CO1. Understanding the purpose of learning of yogic practices.

CO2. Knowledge of the interconnections between the body, the breath, the mind and the emotions in the context of maintaining resilience and well-being

CO3. Understanding the principles of practicing asana, pranayama and meditation

CO4. Knowledge of health and disease relevant to the practice of the yoga therapy.

CO5. Creating awareness about international yoga day.

**SYLLABUS**

1. Starting Prayer.
2. Surya Namaskar.
3. Asanas-Padmasana,Vajrasana, Tadasana, Ardhakati chakrasana ,Uthana Padasana, Ustrasana,Makarasana,Paschimottanasana, Halasana, Savasana
4. Pranayama-Nadishuddhi,Kapalabhati,Sitkari, Sitali
5. Meditation-Deep Relaxation.
6. Mudra-Chin Mudra,Chinmaya Mudra.
7. Closing Prayer.

**TEXTBOOKS**

1. Iyengar B.K.S (2001), Yoga the path to holistic health, Dorling: Kindersley.
2. Mariayyah.P (2000) Suriyanamaskar, Perunthurai: Jaya Publishing House.

**REFERENCE BOOKS**

1. Saraswati, Niranjanananda (2010) Prana and pranayama. Mungaer.
2. Iyengar B.K.S (2003), The art of yoga, New Delhi. Harper Collins publishers.

**COURSE DESIGNERS**

| S.No. | Name of the Faculty | Designation | Department | Mail Id |
|---|---|---|---|---|
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| 2. | Mr.N.Jayaraman | Assistant Professor | Physical Education | narayanajayaram82@gmail.com |

| 17MBHS07 | PROFESSIONAL ETHICSAND HUMAN VALUES | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | HSS | 3 | 0 | 0 | 3 |

**PREAMBLE:** Ethics is a system of moral principles governing the appropriate conduct of a person or a group. Good Ethics is a fundamental requirement of any profession. Regardless of profession, ethics is an important part of work. The success depend on how the workers and their dealing with the situations ethically or unethically. Professional ethics are as important as personal ethics. Professional ethics encompass the personal and corporate standards of behavior expected by professional. Human values are the features that guide people to take into account the human element when one interacts with other human. They have many positive characters and positive feelings that create bonds of humanity between people and thus have value for all human beings and have the effect of bonding, comforting, reassuring and procuring serenity. They build space for a drive, a movement towards one another, which leads to peace.

**PREREQUISITE:** Not Required

**COURSE OBJECTIVES:**

1. To understand the basic concept of Human Values and Ethics.
2. To analyse the common ethical practice in the engineering professionals.
3. To Practice various code of ethics in Engineering.
4. To apply the rights, legal, ethical issues.
5. To practice ethical responsibilities of a professional engineer.

**COURSE OUTCOMES:**

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

| | |
|---|---|
| CO1: Understand the moral values that ought to be practiced in engineering profession | Understand |
| CO2: Analyse the role of ethics in the field of engineering. | Analyse |
| CO3: Practice the code of ethics and Industrial standards | Apply |
| CO4: Assess the Safety, Quality Management and Risk analysis | Evaluate |
| CO5: Apply the skills and knowledge to handle the contemporary issues. | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | - | - | - | - | M | - | L | M | M | L | M | - | - | L |
| CO2 | M | - | - | - | - | S | L | M | L | M | L | M | - | - | L |
| CO3 | M | - | M | L | L | M | - | M | - | - | M | M | L | L | M |
| CO4 | M | M | M | - | M | L | - | M | L | L | L | M | L | M | M |
| CO5 | M | M | M | L | L | - | - | M | L | M | M | M | M | M | M |

**S- Strong; M-Medium; L-Low**

**SYLLABUS:**

**Introduction to Human Values**

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy –Self-Confidence–Discrimination -Character – Challenges in the work place -Spirituality –and stress management.

**Overview of Engineering Ethics**

Senses of 'Engineering Ethics' – Variety of moral issues – Moral Dilemmas- moral autonomy - Kohlberg'stheory-Gilligan'stheory-consensusandcontroversy-Profession – Types of Profession- Models of professional roles – Theories about right action – Self- Respect- Self-interest – Customs and Religion – Uses

of Ethical Theories–Religion - Case study: Choice of the theory

**Engineering as Social Experimentation**

Engineering as Experimentation – Engineering Projects VS. Standard Experiments - Engineers as responsible Experimenters – Codes of Ethics – anticorruption-A Balanced Outlook on Law.

**SAFETY, RESPONSIBILITIES AND RIGHTS**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination

**GLOBAL ISSUES**

Transnational and MNC corporations-Environmentalethics-Computerethics-Weaponsdevelopment and Ethical - stand for Engineers in creation-Engineers as managers-Consulting engineers-Engineers as expertwitnessesandadvisorsEthical Responsibilities of a Professional Engineer as an Expert Witness -Moral Leadership –Code of Conduct – Corporate Social Responsibility **Case Studies**

**TEXT BOOK:**


1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
3. R.S. Nagarajan, A Text Book on Professional Ethics and Human Values, New Age International (P) Limited, Publishers,2006


**REFERENCES:**


1. CharlesD.Fleddermann,"EngineeringEthics",PearsonEducation/PrenticeHall,NewJersey, 2004
2. CharlesEHarris,MichaelS.ProtchardandMichaelJRabins,"EngineeringEthics–Concepts and Cases",WadsworthThompsonLeatning, United States,2000
3. John R Boatright, "Ethicsandthe ConductofBusiness", PearsonEducation,NewDelhi,2003.
4. EdmundGSeebauerandRobertLBarry,"FundamentalsofEthicsforScientistsandEngineers", Oxford Press, 2000
5. R.Subramanian,"ProfessionalEthics",Oxford University Press ,Reprint ,2015.


**COURSE DESIGNERS:**


| S.No | Name of the Faculty | Designation | Department | mail id |
|---|---|---|---|---|
| 1 | Dr. P. Marishkumar | Associate Professor | Management Studies | marishkumarp@vmkvec.edu.in |
| 2 | T. Thangaraja | Assistant Professor | Management Studies | thangaraja@avit.ac.in |

| 17MBHS02 | FINANCE AND ACCOUNTING FOR ENGINEERS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | HSS | 3 | 0 | 0 | 3 |

**PREAMBLE:** Engineers are in a position to do Decision Making during every activity in the industry. The activities ranging from Operation to Non-Operation during the routine functions of the organization. Especially, Finance and Accounting also becomes the part of responsibility of every engineer to do data analysis activities. His interpretation through data analysis and reporting in every transaction helps the organization to do decision making to run the organization effectively and efficiently. Finance and Accounting Practices enable the engineers to handle the resources to do cost and Financial decisions with optimum resources for the betterment of the organization.

**PREREQUISITE:** Not Required

**COURSE OBJECTIVES:**

1. To understand the concepts and conventions to prepare Income Statement, and Balance Sheet.
2. To apply the various methods to claim depreciation and
3. To practice fundamental investment decision through capital budgeting techniques.
4. To analyse cost-volume profit analysis for decision making and analyse standard costing techniques.
5. To estimate the working capital requirements for day-to-day activities and handling inventories with economic ordering quantities.

**COURSE OUTCOMES:**

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

| | |
|---|---|
| CO1: Understand the importance of recording, book keeping and reporting of the business transaction. | Understand |
| CO2: Identify and Apply suitable method for charging depreciation on fixed assets. | Apply |
| CO3: Analyse the various methods of capital budgeting techniques for investment decision. | Apply |
| CO4: Justify the scope of cost-volume-profit analysis, standard costing, and marginal costing techniques for decision making. | Analyse |
| CO5: Estimation of working capital requirements of the organization. | Evaluate |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| Cos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | - | - | M | L | S | M | - | S | - | M | M | L | M | L | M |
| CO2 | L | - | - | L | M | - | L | L | - | - | L | M | L | L | - |
| CO3 | - | M | - | M | L | - | - | L | S | M | - | L | - | L | M |
| CO4 | L | L | - | S | - | - | L | - | - | L | M | L | M | L | M |
| CO5 | L | - | L | S | L | - | - | M | M | L | - | L | M | M | - |

**S- Strong; M-Medium; L-Low**

**SYLLABUS:**

**Introduction:** Business Environment – Forms of business – Book Keeping and Accounting – Accounting Concepts and Conventions – Journal – Subsidiary books - Ledger – Trial Balance – Final Accounts

**Deprecation:** Meaning – Causes - Methods of Calculating Depreciation: Straight Line Method, Diminishing Balance Method and Annuity Method.

**Capital Budgeting Decisions:** Meaning – Nature & Importance of Investment Decisions – Types - Evaluation Techniques – Non-Discounting Cash Flow Techniques: Pay Back Period – Accounting Rate of Return – Discounting Cash Flow Techniques: NPV – IRR - Profitability Index.

**Costing Accounting:** Concepts - Elements of Cost - Preparation of Cost Sheet - Types of Costs – Marginal Cost - Breakeven Analysis - Cost Volume Profit Relationship - Applications of Standard and marginal Costing Techniques.

**Working Capital Management:** – Types of Working Capital – Operating Cycle – Determinants of Working Capital - Receivables Management –ACP, Aging schedule –Inventory Management – Need for holding inventories – Objectives – Inventory Management Techniques: EOQ & Reorder point – ABC Analysis - Cash Management – Motives for holding cash.

**Text Book**


1. Kesavan, C. Elenchezhian, and T. Sunder Selwyan, "Engineering Economics and Financial Accounting", Firewall Media, 2005.
2. Kasi Reddy .M and Saraswathi .S, "Managerial Economics and Financial Accounting", PHI Learning Pvt., Ltd. 2007.


**Reference Book**


1. Periyasamy .P, "A Textbook of Financial, Cost and Management Accounting", Himalaya Publishing House, 2010.
2. Palanivelu V.R., "Accounting for Managers", Lakshmi Publications, 2005.
1. Mark S Bettner, Susan Haka, Jan Williams, Joseph V Carcello, "Financial and Management Accounting", Mc-Graw-Hill Education, 2017


**COURSE DESIGNERS:**


| S.No | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
| 1 | M.Manickam | Associate Professor | Management Studies | manickam@vmkec.edu.in |
| 2 | Dr. Rajeshkumar | Assistant Professor | Management Studies | Rajesh.mba@avit.ac.in |

| Subject Code | Subject Title | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| **17MABS01** | **ENGINEERING MATHEMATICS** | BS | 2 | 2 | 0 | 3 |

**PREAMBLE**

The driving force in Engineering Mathematics is the rapid growth of technology and is designed to provide the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

**PREREQUISITE --**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To identify the characteristics of a linear system with Eigen values and Eigen vectors. |
| 2 | To improve their ability in solving geometrical applications of differential calculus |
| 3 | To find a maximum or minimum value for a function of several variables subject to a given constraint. |
| 4 | To understand the integration techniques for evaluating surface and volume integrals. |
| 5 | Incorporate the knowledge of vector calculus to support their concurrent and subsequent engineering studies |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1.** Able to understand the system of linear equations arising in all engineering fields using matrix methods. | Understand |
| **CO2.** Determine the evolute and envelope for a given family of curves | Apply |
| **CO3.** Apply differentiation to solve maxima and minima problems. | Apply |
| **CO4.** Compute the area and volume of plane using integration | Apply |
| **CO5.** Evaluate the surface and volume integral using Green's, Stokes and Gauss Divergence theorems | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | M | M | M | -- | -- | -- | -- | -- | -- | M | S | M | M |
| CO2 | S | M | M | M | M | -- | -- | -- | -- | -- | -- | M | S | M | M |
| CO3 | S | M | M | M | M | -- | -- | -- | -- | -- | -- | M | S | M | M |
| CO4 | S | M | M | M | M | -- | -- | -- | -- | -- | -- | M | S | M | M |
| CO5 | S | M | M | M | M | -- | -- | -- | -- | -- | -- | M | S | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**MATRICES:** Characteristic equation – Eigen values and eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors (Without proof) – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form.

**DIFFERENTIAL CALCULUS:** Curvature – Cartesian and Parametric Co-ordinates – Centre and radius of curvature – Circle of curvature – Evolute.

**FUNCTIONS OF SEVERAL VARIABLES:** Partial Derivatives – Total Differentiation – Maxima and Minima constrained Maxima and Minima by Lagrangian Multiplier Method.

**MULTIPLE INTEGRALS:** Double integration – change of order of integration – Cartesian and polar coordinates – Area as a double integral – Triple integration.

**VECTOR CALCULUS:** Directional derivatives – Gradient, Divergence and Curl – Irrotational and solenoidal – vector fields – vector integration – Green's theorem, Gauss divergence theorem and Stoke's theorem (excluding proof).

**TEXT BOOKS:**


1. "Engineering Mathematics I & II", Department of Mathematics, VMKVEC (Salem) & AVIT (Chennai), (2017).
2. Dr.A.Singaravelu, "Engineering Mathematics I & II", 23rd Edition, Meenakshi Agency, Chennai (2016).


**REFERENCES:**


1. Veerarajan T., "Engineering Mathematics", Tata McGraw Hill Education Pvt, New Delhi (2011).
2. Grewal B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi (2012).
3. Kreyszig E., "Advanced Engineering Mathematics", 8th Edition, John Wiley and Sons (Asia) Pvt. Ltd., Singapore (2012).
4. Kandasamy P, Thilagavathy K, and Gunavathy K., "Engineering Mathematics", Volumes I & II (10th Edition).


**COURSE DESIGNERS**


| S.No | Name of the Faculty | Designation | Name of the College | Mail ID |
|---|---|---|---|---|
| 1 | Dr.G.Selvam | Asso.Prof | VMKVEC | selvam@vmkvec.edu.in |
| 2 | Ms.S.Gayathri | Asst.Prof.Grade I | AVIT | gayathri@avit.ac.in |

| Subject Code | Subject Title | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| **17MABS 06** | **DIFFERENTIAL EQUATIONS AND TRANSFORMS** | BS | 2 | 2 | 0 | 3 |

**PREAMBLE**

Ordinary Differential Equation is used in contrast with the term partial differential equation which may be with respect to more than one independent variable. A real time naturally available signal is in the form of time domain. However, the analysis of a signal is far more convenient in the frequency domain with the help of Transformations. Transform techniques are very important tool in the analysis of signals.

**PREREQUISITE**

Engineering Mathematics (17MABS01)

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To learn ordinary differential equations with constant and variable coefficients |
| 2 | To learn Laplace transform and its Inverse method to solve differential Equations and integral transforms |
| 3 | To derive a Fourier series of a given periodic function by evaluating Fourier coefficients |
| 4 | To calculate the Fourier transform of periodic functions |
| 5 | To learn about Z- transforms and its applications |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1.** Solve differential equations with constant and variable coefficients and Simultaneous first order linear equations with constant coefficients | Apply |
| **CO2.** Use the Laplace Transform technique to solve ordinary differential equations. | Apply |
| **CO3.** To apply Fourier series methods to solve boundary value problems for linear ODEs. | Apply |
| **CO4.** To use the Fourier transform as the tool to connect the time domain and frequency domain in signal processing. | Apply |
| **CO5.** To gain the knowledge in Z Transform to the Analysis of Digital Filters and Discrete Signal. | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | S | M | M | M | -- | -- | -- | -- | -- | -- | M | S | M | M |
| CO2 | S | S | M | M | M | -- | -- | -- | -- | -- | -- | M | S | M | M |
| CO3 | S | S | M | M | M | -- | -- | -- | -- | -- | -- | M | S | M | M |
| CO4 | S | S | M | M | M | -- | -- | -- | -- | -- | -- | M | S | M | M |
| CO5 | S | S | M | M | M | -- | -- | -- | -- | -- | -- | M | S | M | M |

**S- Strong; M-Medium; L-Low**

**SYLLABUS**

**ORDINARY DIFFERENTIAL EQUATIONS:** Solutions of second and third order linear ordinary differential equation with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

**LAPLACE TRANSFORMS:** Laplace transform – transform of elementary functions – basic properties – derivatives and integrals of transforms – transforms of derivatives and integrals – initial and final value theorems – Transform of periodic functions-Inverse Laplace transform – Convolution theorem – -Solution of linear ODE of second order with constant coefficients.

**FOURIER SERIES:** Dirichlet's conditions - General Fourier series - Half-range Sine and Cosine series - Parseval's identity - Harmonic Analysis.

**FOURIER TRANSFORMS:** Fourier transform pairs - Fourier Sine and Cosine transforms – Properties - Transforms of simple functions - Convolution theorem - Parseval's identity.

**Z – TRANSFORMS:** Z-Transform – Elementary Properties – Inverse Z-Transform – Convolution Theorem – Formation of Difference Equations – Solution of first and second order Difference Equations using Z-Transform.

**TEXT BOOKS:**


1. Engineering mathematics I & II ", by Department of Mathematics, VMKVEC (Salem) & AVIT (Chennai), (2017).
2. Dr.A.Singaravelu, "Engineering Mathematics I & II", 23rd Edition, Meenakshi Agency, Chennai (2016).
3. Dr.A.Singaravelu, "Transforms and Partial differential Equations", 18th Edition, Meenakshi Agency, Chennai (2013).


**REFERENCES:**


1. Grewal, B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi (2012).
2. Kreyszig, E., "Advanced Engineering Mathematics", 8th Edition, John Wiley and Sons (Asia) Pvt Ltd., Singapore (2012).
3. Veerarajan, T., "Engineering Mathematics I,II and III", Tata McGraw Hill Publishing Co., New Delhi (2011).


**COURSE DESIGNERS**

| S.No | Name of the Faculty | Designation | Name of the College | Mail ID |
|---|---|---|---|---|
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| 17MABS10 | PARTIAL DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | BS | 2 | 2 | 0 | 3 |

**PREAMBLE**

Partial differential equations are applied in many Engineering field like Electromagnetic field, Electronics circuit and fiber optics. It can be solved by various mathematical techniques. The general theory of mathematical systems involving addition and scalar multiplication has the applications to many areas of communication systems. Linear Algebra is used in analog and digital communication system.

**PREREQUISITE**

Differential Equations and Transforms (17MABS06)

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To be familiar with applications of partial differential equations |
| 2 | To formulate and solve partial differential equations. |
| 3 | To understand the concepts of vector space, linear transformations and diagonalization |
| 4 | To apply the concept of inner product spaces in orthogonalization. |
| 5 | To compute the linear transformations and find matrices of general linear transformations. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1.** Understand the basic concepts of linear, non-linear partial differential equations related to Engineering Field | Understand |
| **CO2.** Solve partial differential equations arising in engineering problems like wave equations and heat flow equation by Fourier series. | Apply |
| **CO3.** Use computational techniques and algebraic skills to compute the dimension of row space and column space for the given vector space. | Apply |
| **CO4.** Apply the concept of inner product space in various linear system related problems. | Apply |
| **CO5.** Form orthogonal basis and use them to solve engineering problems. | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | -- | M | M | -- | -- | -- | -- | -- | -- | M | S | M | M |
| CO2 | S | S | -- | M | M | -- | -- | -- | -- | -- | -- | M | S | M | M |
| CO3 | S | S | -- | M | M | -- | -- | -- | -- | -- | -- | M | S | M | M |
| CO4 | S | S | -- | M | M | -- | -- | -- | -- | -- | -- | M | S | M | M |
| CO5 | S | S | -- | M | M | -- | -- | -- | -- | -- | -- | M | S | M | M |

**S- Strong; M-Medium; L-Low**

**SYLLABUS**

**PARTIAL DIFFERENTIAL EQUATIONS:** Formation - Solutions of standard types f(p,q) = 0 , Clairaut's form, f(z,p,q) = 0 , f(p,x) = g(q,y) of first order equations - Lagrange's Linear equation - Linear partial differential equations of second and higher order with constant coefficients.

**BOUNDARY VALUE PROBLEMS:** Classification of second order linear partial differential equations - Solutions of one - dimensional wave equation, one-dimensional heat equation - Steady state solution of two-dimensional heat equation - Fourier series solutions in Cartesian coordinates.

**VECTOR SPACE AND SUBSPACE:** Introduction to vector space and subspace, Linear independent and dependent, spanning set, Basis and dimension, Row space and column space.

**INNER PRODUCT SPACES:** Inner products, inner product spaces- Cauchy-Schwarz inequality, Linear functional and adjoints, unitary operations and normal operators- spectral theorem.

**ORTHOGONALITY AND LINEAR TRANSFORMATION:** Introduction to orthogonality, Least square approximation, Orthogonal basis and Gram Schmidt orthogonalisation, Linear transformation and its matrix representation.

**TEXT BOOKS:**


1. Grewal, B.S., "Higher Engineering Mathematics", 35th Edition, Khanna Publishers, Delhi, 2012.
2. Kennath M. Hoffman and Ray Kunze, "Linear Algebra", 2nd Edition, Pearson India Publishing, New Delhi, 2015.
3. M.Artin, "Algebra", Prentice Hall of India Pvt. Ltd., New Delhi, 2005.


**REFERENCES:**


1. A.Singaravelu, "Transforms and Partial Differential Equations", Meenakshi Agencies, Chennai, 2015.
2. Kreyszig, E., "Advanced Engineering Mathematics" (8th Edition), John Wiley and Sons, (Asia) Pvt. Ltd., Singapore, 2000.
3. Dr.Gunadhar Paria, "Linear Algebra", New Central Book Agency (P) Ltd, 2009.


**COURSE DESIGNERS**


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|---|---|---|---|---|
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| 17MABS16 | NUMERICAL METHODS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | BS | 2 | 2 | 0 | 3 |

**PREAMBLE**

This course aims at developing the ability to formulate an engineering problem in a mathematical form appropriate for subsequent computational treatment and to choose an appropriate numerical approach. An under graduate of Engineering student needs to know sufficient numerical methods and techniques for solving engineering problems such as static or steady state problems, vibration or stability problems and initial value or transient problems etc.

**PREREQUISITE**

1.Engineering Mathematics (17MABS01)

2.Differential Equations and Transforms (17MABS06)

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To familiar with numerical solution of equations |
| 2 | To be get exposed to finite differences and interpolation |
| 3 | To be thorough with the numerical Differentiation and integration |
| 4 | To find numerical solutions of ordinary differential equations |
| 5 | To find numerical solutions of partial differential equations |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1.** Solve the system of linear algebraic equations and single non linear equations arising in the field of Engineering. | Apply |
| **CO2.** Apply methods to find intermediate numerical value & polynomial of numerical data. | Apply |
| **CO3**. Apply methods to find integration, derivatives of one and two variable functions. | Apply |
| **CO4**. Solve the initial value problems using single step and multistep methods. | Apply |
| **CO5**. Solve the boundary value problems using finite difference methods. | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | S | M | M | M | -- | -- | -- | -- | -- | -- | M | S | M | M |
| CO2 | S | S | M | M | M | -- | -- | -- | -- | -- | -- | M | S | M | M |
| CO3 | S | S | M | M | M | -- | -- | -- | -- | -- | -- | M | S | M | M |
| CO4 | S | S | S | S | M | -- | -- | -- | -- | -- | -- | M | S | M | M |
| CO5 | S | S | S | S | M | -- | -- | -- | -- | -- | -- | M | S | M | M |

**S- Strong; M-Medium; L-Low**

**SYLLABUS**

**SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS**: Method of false position, Newton-Raphson method for single variable, Solutions of a linear system by Gaussian, Gauss-Jordan, Jacobian and Gauss- Seidel methods. Inverse of a matrix by Gauss-Jordan method. Eigen value of a matrix by Power Method.

**INTERPOLATION AND APPROXIMATION:** Interpolation with Newton's divided differences, Lagrange's polynomial, Newton forward and backward differences, central difference Formula (Stirling's and Bessel's).

**NUMERICAL DIFFERENTIATION AND INTEGRATION:** Numerical differentiation with interpolation polynomials, Numerical integration by Trapezoidal and Simpson's (both 1/3rd and 3/8th) rules. Romberg's rule, Two and Three point Gaussian quadrature formula. Double integrals using Trapezoidal and Simpson's rule.

**INITIAL VALUE PROBLEMS OF ODE:** Single Step Methods - Taylor Series, Euler and Modified Euler, Runge-Kutta method of fourth order -first and second order differential equations. Multistep Methods - Milne and Adam's-Bash forth predictor and corrector methods.

**BOUNDARY VALUE PROBLEMS FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS:** Finite difference solution for the second order ordinary differential equations, Finite difference solution for one dimensional heat equation (both implicit and explicit). One dimensional wave equation and two dimensional Laplace and Poisson equations.

**TEXT BOOKS:**


1. S.K Gupta, "Numerical Methods for Engineers", New Age International Pvt. Ltd. Publishers, 2015.
2. S. R. K. Iyengar, R. K. Jain, Mahinder Kumar Jain, "Numerical methods for Scientific and Engineering Computations", New Age International publishers , 6th Edition, 2012.
3. T. Veerarajan, T.Ramachandran, "Numerical Methods with Programs in C and C++", Tata McGraw-Hill (2004).


**REFERENCES:**


1. Joe D. Hoffman , Steven Frankel, "Numerical Methods for Engineers and Scientists", 3 rd Edition, 2015,Tata Mc-Graw Hill.(New York).
2. Steven C. Chapra, Raymond P. Canale, "Numerical Methods for Engineers", MC Graw Hill Higher Education, 2010.


**COURSE DESIGNERS**


| S.No | Name of the Faculty | Designation | Name of the college | Mail ID |
|---|---|---|---|---|
| 1 | Dr. S.Punitha | Associate Professor | VMKVEC | punitha@vmkvec.edu.in |
| 2 | Dr.A.K.Bhuvaneswari | Asst.Prof. grade II | AVIT | bhuvaneswari@avit.ac.in |

| 17PCBS02 | PHYSICAL SCIENCES<br>PART A - ENGINEERING PHYSICS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | BS | 2 | 0 | 0 | 2 |

**PREAMBLE**

Engineering Physics is the study of advanced physics concepts and their applications in various technological and engineering domains. Understanding the concepts of laser, types of lasers, thepropagation of light through fibers, applications of optical fibers in communication and different types of non-destructive techniques will help an engineer to analyze, design and to fabricate various conceptual based devices.

**PREREQUISITE : NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To recall the properties of laser and to explain principles of laser |
| 2 | To assess the applications of laser |
| 3 | To detail the principles of fiber optics |
| 4 | To study the applications of fiber optics |
| 5 | To explain various techniques used in Non-destructive testing |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Understand the principles laser, fiber optics and non-destructive testing | Understand |
| CO2. Understand the construction of laser, fiber optic and Non-Destructive testing equipments | Understand |
| CO3. Demonstrate the working of laser, fiber optic and Non-Destructive testing based components and devices | Apply |
| CO4. Interpret the potential applications of laser, fiber optics and Non-Destructive testing in various fields. | Apply |
| CO5. Differentiate the working modes of various types of laser, fiber optic and Non-Destructive testing based devices. | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | - | M | - | - | - | - | - | - | - | - | M | M | - | - |
| CO2 | S | - | L | - | - | - | - | - | - | - | - | M | M | - | - |
| CO3 | S | - | - | M | - | - | M | - | - | - | - | M | M | - | - |
| CO4 | S | M | - | M | M | S | M | - | - | - | - | M | S | - | - |
| CO5 | S | M | M | - | - | - | - | - | - | - | - | M | M | - | - |

S- Strong; M-Medium; L-Low

## SYLLABUS

**UNIT-I**

**LASERS:** Laser characteristics - Stimulated Emission – Population Inversion - Einstein coefficients – Lasing action – Types of Laser – Nd:YAG laser, CO2 laser, GaAs laser – Applications of Laser – Holography – construction and reconstruction of a hologram

**UNIT-II**

**FIBRE OPTICS:** Principle and propagation of light in optical fibers – numerical aperture and acceptance angle – types of optical fibers (material, refractive index, mode) – Applications: Fiber optic communication system – fiber optic displacement sensor and pressure sensor.

**UNIT-III**

**NON-DESTRUCTIVE TESTING:** Introduction – Types of NDT - Liquid penetrant method – characteristics of penetrant and developer - ultrasonic flaw detector – X-ray Radiography: displacement method – X-ray Fluoroscopy.

**TEXT BOOK**

1. Engineering Physics, compiled by Department of Physics, Vinayaka Mission's Research Foundation (Deemed to be University), Salem.

2. P.K. Palanisamy, Engineering Physics, Scientific Publishers, 2011.

3. Dr.M. N. Avadhanulu, Engineering Physics, S.Chand & Co, 2010.

**REFERENCE BOOKS**

1. Beiser, Arthur, Concepts of Modern Physics, 5th Ed., McGraw-Hill, 2009.

2. Halliday.D, Resnick.R, Walker.J, Fundamentals of Physics, Wiley & sons, 2013.

3. Gaur R. K. and Gupta S. L., Engineering Physics, DhanpatRai publishers, New Delhi, 2001.

4. Avadhanulu.M.N., Arun Murthy.T.V.S, Engineering Physics Vol. I, S.Chand, 2014.

5. Rajendran. V, Engineering Physics, Tata McGraw Hill Publication and Co., New Delhi, 2009.

6. Baldev Raj et al. Practical Non-Destructive Testing, Narosa Publications, 2017.

**COURSE DESIGNERS**


| S.No. | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
| 1 | Dr. C. SENTHIL KUMAR | PROFESSOR | PHYSICS | senthilkumarc@vmkvec.edu.in |
| 2 | Dr. R. SETHUPATHI | ASSOCIATE PROFESSSOR | PHYSICS | sethupathi@vmkvec.edu.in |
| 3 | Dr. G. SURESH | ASSOCIATE PROFESSSOR | PHYSICS | suresh.physics@avit.ac.in |
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| 17PCBS02 | PHYSICAL SCIENCES<br>PART B -ENGINEERING CHEMISTRY<br>Semester I (Common to All Branches) | Category | L | T | P | C |
|---|---|---|---|---|---|---|
| | | BS | 2 | 0 | 0 | 2 |

**Preamble**

Objective of this course is to present a better understanding of basic concepts of chemistry and its applications on different engineering domains. It also imparts knowledge on fundamentals of Electrochemistry, Energy storage technologies, properties of water and its treatment methods, classification of fuels, Non conventional sources of Energy and various advanced Engineering materials.

**Prerequisite**

Not required

**Course Objectives**

| | |
|---|---|
| 1 | To impart basic knowledge in Chemistry so that the student will understand the engineering concept |
| 2 | To familiar with electrochemistry and Battery and fuel Cells |
| 3 | To lay foundation for practical applications of water softening methods and its treatment methods in engineering aspects. |
| 4 | To inculcate the knowledge of fuels and advanced material. |

**Course Outcomes**

After the successful completion of the course, learner will be able to

| | | |
|---|---|---|
| CO1. | Describe the electrochemistry, batteries and working principle of energy storage devices | Understand |
| CO2. | Estimate the hardness of water | Apply |
| CO3. | Identify suitable water treatment methods | Analyze |
| CO4. | Outline the important features of fuels and advanced materials | Analyze |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO6. | S | M | - | M | - | S | S | S | - | - | L | M | S | - | M |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO7. | S | S | M | - | - | M | M | M | - | - | - | M | - | - | - |
| CO8. | S | S | M | - | - | M | S | M | - | - | - | M | - | | - |
| CO9. | S | - | - | - | L | L | M | L | - | - | - | S | M | M | M |

S- Strong; M-Medium; L-Low

## SYLLABUS

**Electrochemistry, Batteries and Fuel cells**

Electrode potential - Nernst equation – Electrodes (SHE, Calomel and Glass) - cells - EMF measurement.

Primary battery (Daniel and dry cell) – secondary battery (lead Acid storage battery and Nickel-Cadmium battery) – Fuel cell ($H_2$-$O_2$ fuel cell)

**Water Technology and Corrosion**

Sources of water – impurities – Hardness and its determination (problems to be avoided) – boiler troubles – water softening (Zeolite & Demineralisation) – Domestic water treatment – Desalination (Electrodialysis & Reverse Osmosis).

**Fuels And Chemistry of Advanced Materials**

Classification of Fuels (Solid, Liquid, Gaseous, Nuclear and Bio fuels) – Calorific Value of a fuel –Non Petroleum Fuels –Non conventional sources of Energy – combustion.

Basics and Applications:-Organic electronic material, shape memory alloys, polymers (PVC, Teflon, Bakelite)

## TEXT BOOKS

1. Engineering Chemistry by prepared by Vinayaka Mission's Research Foundation, Salem.

## REFERENCE BOOKS


1. A text book of Engineering Chemistry by S.S. Dara, S.Chand & company Ltd., New Delhi
2. Engineering Chemistry by Jain & Jain, 15th edition Dhanpatrai Publishing Company (P) Ltd., New Delhi
3. A text book of Engineering Chemistry by Shashi Chawla, Edition 2012 Dhanpatrai & Co., New Delhi.
4. Engineering Chemistry by Dr. A. Ravikrishnan, Sri Krishna Publications, Chennai.

**Course Designers:**

| S. No | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
| 1. | Dr. V. Anbazhagan | Professor | Chemistry | anbu80@gmail.com |
| 2. | Mr. A. Gilbert Sunderraj | Assistant Professor | Chemistry | asmgill80@gmail.com |
| 3. | Dr. R. Nagalakshmi | Professor | Chemistry | nagalakshmi.chemistry@avit.ac.in |
| 4. | Dr.K.Sanghamitra | Associate Professor | Chemistry | sanghamitra.chemistry@avit.ac.in |

| 17PHBS05 | SMART MATERIALS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | Basic Sciences | 3 | 0 | 0 | 3 |

**PREAMBLE**

Smart Materials gives an outlook about various types of materials having potential application in Engineering and Technology. In particular, Students learn about Smart Materials and their applications, Properties of Crystalline Materials & Nanomaterials, Characteristics of Magnetic materials. They also get a clear picture about superconducting materials.

**PREREQUISITE**

**NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To explain the fundamental properties and classification of smart materials, crystalline materials, Nano materials, Magnetic materials and Super conducting materials. |
| 2 | To paraphrase the basic crystalline structure and its properties. |
| 3 | To illustrate the synthesis and fabrication of Nano materials. |
| 4 | To predict the application of smart materials, crystalline materials, Nano materials, Magnetic materials and Super conducting materials. |
| 5 | To analyze the various parameters of crystalline materials. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Restate the properties of various materials. | Understand |
| CO2. Summarize the various structures of materials. | Understand |
| CO3. Predict the applications of various materials to designing equipments. | Apply |
| CO4. Illustrate the properties of materials to designing equipments. | Apply |
| CO5. Calculate the crystalline parameters of the materials. | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | S | S | M | S | | | | M | | | S | S | | |
| CO2 | S | M | S | M | S | | | | M | | | M | M | | |
| CO3 | S | S | S | S | S | | | | S | | | M | M | M | |
| CO4 | S | M | S | M | S | | | | M | | | M | S | M | |
| CO5 | M | S | S | M | M | | | | S | | | M | | | |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**SMART MATERIALS:** Shape Memory Alloys (SMA) – Characteristics and properties of SMA, Application, advantages and disadvantages of SMA. Metallic glasses – Preparation, properties and applications.

**CRYSTALLINE MATERIALS:** Unit cell – Bravais lattice – Miller indices – Calculation of number of atoms per unit cell – atomic radius – coordination number – packing factor for SC, BCC, FCC, HCP structures.

**NANO MATERIALS:** Nanophase materials – Top-down approach - Mechanical Grinding - Lithography - Bottom-up

approach – Sol-gel method – Carbon nanotubes – Fabrication – applications.

**MAGNETIC MATERIALS:** Basic concepts – Classification of magnetic materials – Domain theory – Hysteresis – Soft and Hard magnetic materials.

**SUPERCONDUCTING MATERIALS:** Superconducting phenomena – properties of superconductors – Meissner effect – isotope effect – Type I and Type II superconductors – High Tc Superconductors – Applications of superconductors.

**TEXT BOOK:**

Mani P, Engineering Physics II, Dhanam Publications, 2018.

**REFERENCES:**

1. Pillai S.O., Solid State Physics, New Age International (P) Ltd., publishers, 2018.

2. Senthilkumar G. Engineering Physics II. VRB Publishers, 2018.

**COURSE DESIGNERS**


| S.No. | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
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| 3 | Dr .G. LATHA | Professor | Physics | latha.physics@avit.ac.in |
| 4 | Dr. R. N. VISWANATH | Professor | Physics | viswanath.physics@avit.ac.in |

| 17CHBS01 | Environmental Science & Engineering (Common to All Branches) | Category | L | T | P | C |
|---|---|---|---|---|---|---|
| | | BS | 3 | 0 | 0 | 3 |

**Preamble**

**Environmental science and Engineering** is an interdisciplinary field that integrates physical, chemical, biological, information sciences and provides the basic knowledge of structure and function of ecosystem and better understanding of natural resources, biodiversity and their conservation practices. The course helps to create a concern for our environment that will generate pro-environmental action, including activities we can do in our daily life to protect it. Furthermore, it deals the social issues and ethics to develop quality engineer in our country.

**Prerequisite**

Not required

**Course Objectives**

| | |
|---|---|
| 1 | Applying Science and Engineering knowledge to protect environment |
| 2 | To provide comprehensive insight in natural resources and protect natural resources |
| 3 | To create awareness on the various pollutions and their impact. |
| 4 | To educate the ways and means to manage natural calamities |
| 5 | To impart fundamental knowledge on human welfare measures |

**Course Outcomes:**

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

| | | |
|---|---|---|
| CO1. | Comprehend the impact of engineering solutions in a global and societal context | Understand |
| CO2. | Illustrate the contemporary issues that results in environmental degradation and would attempt to provide solutions to overcome those problems | Understand |
| CO3. | Illustrate the importance of ecosystem and biodiversity | Apply |
| CO4. | Practice to improve the environment and sustainablity | Apply |
| CO5. | Conclude the importance of conservation of resources. | Analyze |
| CO6. | Estimate the important role of IT in healthy environment for future generations | Analyze |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | S | M | - | - | - | M | S | S | M | M | - | S | S | M | M |
| CO2. | S | - | - | - | - | S | S | S | - | - | - | S | S | M | M |
| CO3. | S | - | - | - | - | M | S | M | L | - | - | S | S | M | M |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO4. | S | - | - | - | - | M | S | S | M | M | - | S | - | M | S |
| CO5. | S | - | - | - | - | M | S | S | M | M | - | S | - | M | S |
| CO6. | S | - | - | - | - | M | S | S | M | M | - | S | M | M | S |

S- Strong; M-Medium; L-Low

## SYLLABUS

| |
|---|
| **ENVIRONMENT AND NATURAL RESOURCES** |
| Environment - Definition, scope & importance - Public awareness- Forest resources, mineral resources , water resources, food resources , energy resources (uses, over -exploitation & adverse effects in each case) - Scope & role of environmental engineers in conservation of natural resources - Sustainability development. |
| **ECOSYSTEMS AND BIO – DIVERSITY** |
| Ecosystem - Definition, structure and function - Energy flow -Ecological succession - food chain, food web, ecological pyramids- Introduction, types, characteristics, structure and function of forest, grassland, desert and Aquatic ecosystems - Bio - Diversity :values and uses, hotspots, threats and conservation. |
| **ENVIRONMENTAL POLLUTION** |
| Pollution - Definition, man made impacts and control measures of air, water and land pollution - Water quality standards & characterization - Importance of sanitation -Nuclear hazards – Hazardous waste management : Solid waste, waste water and biomedical waste - Prevention of pollution and role of individual – Disasters management : Floods, earthquake, cyclone and land slides - Clean technology options. |
| **SOCIAL ISSUES AND ENVIRONMENT** |
| Urban problems related to energy - Water conservation – Resettlement and rehabilitation of people - Environmental ethics - Climate change - Global warming - Acid rain - Ozone depletion-Waste land reclamation, Environment Protection Act for air, water, wild life and forests - Pollution Control Board. |
| **HUMAN POPULATION AND ENVIRONMENT** |
| Population growth - Population explosion - Family welfare programme - Environment & human health - Human rights – Value education - Women and child welfare, Role of information technology in environment and human health. |
| **TEXTBOOK** |
| 1. Environmental Science and Engineering by Dr.A. Ravikrishnan, Sri Krishna Publications, Chennai. |
| **REFERENCES** |

1. Wager K.D. "Environmental Management", W.B. Saunders Co. Philadelphia, USA, 1998.
2. Bharucha Erach "The Biodiversity of India" Mapin Publishing Pvt Ltd, Ahmedabad, India
3. Trivedi R.K. “Handbook of Environmental Laws", Rules, Guidelines, Compliances and tandards Vol I & II, Enviro media.
4. Dr. J. Meenambal, Environmental Science and Engineering, MJP Publication, Chennai
5. Gilbert M. Masters : Introduction to Environmental Engineering and Science, Pearson Education Pvt Ltd., II Edition, ISBN 81-297-0277-0, 2004

**Course Designers:**



| S. No | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
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| 2. | Mr. A. Gilbert Sunderraj | Assistant Professor | Chemistry | asmgill80@gmail.com |
| 3. | Dr. R. Nagalakshmi | Professor | Chemistry | nagalakshmi.chemistry@avit.ac.in |
| 4. | Dr.K.Sanghamitra | Associate Professor | Chemistry | sanghamitra.chemistry@avit.ac.in |

| 17PCBS81 | PHYSICAL SCIENCES LAB: PART A – REAL AND VIRTUAL LAB IN PHYSICS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | BS | 0 | 0 | 2 | 1 |

**PREAMBLE**

In this laboratory, experiments are based on the calculation of physical parameters like young's modulus, rigidity modulus, viscosity of water, wavelength of spectral lines, thermal conductivity and band gap. Some of the experiments involve the determination of the dimension of objects like the size of a microparticle and thickness of a thin wire. In addition to the above real lab experiments, students gain hands-on experience in virtual laboratory.

**PREREQUISITE**

**NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To impart basic skills in taking reading with precision of physics experiments |
| 2 | To inculcate the habit of handling equipments appropriately |
| 3 | To gain the knowledge of practicing experiments through virtual laboratory. |
| 4 | To know the importance of units |
| 5 | To obtain results with accuracy |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Recognize the importance of units while performing the experiments, calculating the physical parameters and obtaining results | Understand |
| CO2. Operate the equipments with precision | Apply |
| CO3. Practice to handle the equipments in a systematic manner | Apply |
| CO4. Demonstrate the experiments through virtual laboratory | Apply |
| CO5. Calculate the result with accuracy | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | S | | | | | | | | | | | | | |
| CO2 | S | S | M | M | S | | | | M | | | M | M | | |
| CO3 | S | | | | | | | | | | | | | | |
| CO4 | S | S | M | M | S | | | | | | | S | M | | |
| CO5 | S | S | | | | | | | | | | | | | |

S- Strong; M-Medium; L-Low

**SYLLABUS**

1. Young's modulus of a bar - Non-uniform bending
2. Rigidity modulus of a wire - Torsional Pendulum
3. Viscosity of a liquid - Poiseuille's method
4. Velocity of ultrasonic waves in liquids - Ultrasonic Interferometer
5. Particle size determination using Laser
6. Wavelength of spectral lines – grating – Spectrometer
7. Thickness of a wire - Air wedge Method
8. Thermal conductivity of a bad conductor - Lee's disc

9. Band gap determination of a thermistor - Post Office Box
10. Specific resistance of a wire – Potentiometer

**LAB MANUAL**

Physical Sciences Lab: Part A – Real And Virtual Lab In Physics Manual compiled by Department of Physics, Vinayaka Missions Research Foundation (Deemed to be University), Salem.

**COURSE DESIGNERS**

| S.No. | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
| 1 | Dr. C. SENTHIL KUMAR | PROFESSOR | PHYSICS | senthilkumarc@vmkvec.edu.in |
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| 3 | Dr. G. SURESH | ASSOCIATE PROFESSSOR | PHYSICS | suresh.physics@avit.ac.in |
| 4 | Dr. B.DHANALAKSHMI | ASSOCIATE PROFESSSOR | PHYSICS | dhanalakshmi.phy@avit.ac.in |

| | | | | | | |
|---|---|---|---|---|---|---|
| **17PCBS81** | **PHYSICAL SCIENCES**<br><br>**PART B - ENGINEERING CHEMISTRY LAB**<br><br>**Semester I (Common to All Branches)** | Category | L | T | P | C |
| | | BS | 0 | 0 | 2 | 1 |

**Preamble**

The main objective of this course is to develop the intellectual and psychomotor skills of the students by imparting knowledge in water technology and quantitative analysis.

**Prerequisite**

Not required

**Course Objectives**

| | |
|---|---|
| 1 | To impart basic skills in Chemistry so that the student will understand the engineering concept. |
| 2 | To inculcate the knowledge of water and electrochemistry. |
| 3 | To lay foundation for practical applications of chemistry in engineering aspects. |

**Course Outcomes**

After the successful completion of the course, learner will be able to

| | | |
|---|---|---|
| CO1. | Estimate the chemical properties of water | Apply |
| CO2. | Determine the presence of various elements in the water | Analyze |
| CO3. | Calculate the strength of acids, oxidizing and reducing agents | Analyze |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO6. | S | M | M | - | L | M | M | S | - | - | - | M | S | - | M |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO7. | S | M | M | - | L | M | M | L | - | - | - | M | - | M | - |
| CO8. | S | S | M | - | L | M | M | M | - | - | - | M | M | - | M |

S- Strong; M-Medium; L-Low

## SYLLABUS

1. Determination of Hardness by EDTA method
2. Estimation of Hydrochloric acid by conductometric method
3. Acid Base titration by pH method
4. Estimation of Ferrous ion by Potentiometric method
5. Determination of Dissolved oxygen by Winkler's method
6. Estimation of Sodium by Flame photometer
7. Estimation of Copper from Copper Ore Solution
8. Estimation of Iron by Spectrophotometer

## TEXT BOOKS

1. Laboratory Manual on Engineering Chemistry prepared by Vinayaka Mission's Research Foundation, Salem.

## REFERENCE BOOKS

1. Laboratory Manual on Engineering Chemistry, K. Bhasin S, Dhanpat Rai Publishing Co Pvt Ltd

**Course Designers:**

| S. No | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
| 1. | Dr. V. Anbazhagan | Professor | Chemistry | anbu80@gmail.com |
| 2. | Mr. A. Gilbert Sunderraj | Assistant Professor | Chemistry | asmgill80@gmail.com |
| 3. | Dr. R. Nagalakshmi | Professor | Chemistry | nagalakshmi.chemistry@avit.ac.in |
| 4. | Dr.K.Sanghamitra | Associate Professor | Chemistry | sanghamitra.chemistry@avit.ac.in |

| 17CSES01 | ESSENTIALS OF COMPUTING | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | ES | 3 | 0 | 0 | 3 |

**PREAMBLE**

This course aims to provide the fundamental concepts of Computer operations like hardware and software installation, and emphasizing principles application packages. Studying the fundamentals concepts of Algorithms, to resolve the real world application.

**PRERQUISITE** – Nil

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To provide basic knowledge of hardware and software components of computers. |
| 2 | To introduce and demonstrate various software application packages. |
| 3 | To study Problem solving Techniques and program development cycle. |
| 4 | To learn about various algorithm and identifying the algorithm efficiency. |
| 5 | To learn different algorithm for various application. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. To understand the Basic knowledge on hardware and software terminologies. | Understand |
| CO2. To Demonstrate the various Application Packages like MS-word, MS- Excel etc. | Apply |
| CO3.To Understand Program Devolvement Cycle and apply various Problem Solving Techniques. | Apply |
| CO4.To analyze the efficiency of Algorithms. | Analyze |
| CO5.To Implement of Algorithms for various concepts. | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | - | - | - | - | - | - | - | - | - | - | - | S | M | - |
| CO2 | S | M | M | - | M | - | - | - | - | - | - | M | S | M | M |
| CO3 | S | S | S | - | M | - | - | - | - | - | - | - | S | - | M |
| CO4 | S | S | S | - | S | - | - | - | - | - | - | - | S | M | M |
| CO5 | S | M | M | - | M | - | - | - | - | - | - | S | S | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**BASICS OF COMPUTER AND INFORMATION TECHNOLOGY:** Computer – Generations, Types of Computers, Block diagram of a computer – Components of a computer system –Hardware and software definitions – Categories of software – Booting – Installing and Uninstalling a Software –Software piracy – Software terminologies – Applications of Computer – Role of Information Technology – History of Internet – Internet Services.

**SOFTWARE APPLICATIONS:** Office Automation: Application Packages – Word processing (MS Word) – Spread sheet (MS Excel) – Presentation (MS PowerPoint).

**PROBLEM SOLVING METHODOLOGIES:** Problems Solving Techniques - Program Development Cycle – Algorithm Development – Flow chart generation –Programming Constructs (Sequential, Decision-Making, Iteration) – Types and generation of programming Languages.

**INTRODUCTION TO ALGORITHMS:** Implementation of Algorithms – program verification – The efficiency of algorithms – The analysis of algorithms.

**IMPLEMENTATION OF ALGORITHMS:** Fundamental Algorithms: Introduction – Exchanging the values of two variables – Counting – Summation of a set of Numbers – factorial computation – Generation of the Fibonacci sequence – Reversing the digits of an integer.

**TEXT BOOKS**:


1. "Essentials of Computer Science and Engineering", Department of Computer Sciences, VMKVEC, Salem, Anuradha Publishers, 2017.
2. Dromey.R.G, "How to Solve it by Computer", Prentice-Hall of India, 1996.


**REFERENCES:**


1. Aho.A.V., Hopcroft.J.E and Ullman.J.D, "The Design and Analysis of Computer Algorithms", Pearson Education, 2004.
2. Knuth D.E., "The Art of computer programming Vol 1: Fundamental Algorithms", 3rd Edition, Addison Wesley, 1997.


**COURSE DESIGNERS**


| S. No. | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
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| 17CMES02 | BASICS OF CIVIL AND MECHANICAL ENGINEERING<br>PART -A BASICS OF CIVIL ENGINEERING<br>(Common to All Branches) | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | ES | 2 | 0 | 0 | 2 |

**PREAMBLE**

The aim of the subject is to provide a fundamental knowledge of basic Civil Engineering

**PREREQUISITE-** NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To understand the basic concepts of surveying and construction materials. |
| 2 | To impart basic knowledge about building components. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. An ability to apply knowledge of mathematics, science, and engineering. | Apply |
| CO2. An ability to design and conduct experiments, as well as to analyze and interpret data . | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | L | - | M | S | - | - | - | - | - | - | M | - | L |
| CO2 | S | M | L | S | M | S | - | - | M | - | - | - | - | S | - |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**SURVEYING AND CIVIL ENGINEERING MATERIALS**

**SURVEYING:** Objects – types – classification – principles – measurements of distances – angles – levelling – determination of areas – illustrative examples.

**CIVIL ENGINEERING MATERIALS:** Bricks – stones – sand – cement – concrete – steel sections.

**BUILDING COMPONENTS AND STRUCTURES :**

**FOUNDATIONS:** Types, Bearing capacity – Requirement of good foundations.

**SUPERSTRUCTURE:** Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering – Mechanics – Internal and external forces – stress – strain – elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping.

**TEXT BOOKS:**

1. "Basic Civil and Mechanical Engineering", VMU, (2017). Company Ltd., New Delhi,2009

**REFERENCES:**

1.Ramamrutham S., "Basic Civil Engineering", Dhanpatrai Publishing Co. (P) Ltd., 2009.
2. Seetharaman S., "Basic Civil Engineering", Anuradha Agencies.

**COURSE DESIGNERS**

| S. No. | Name of the Faculty | Designation | Dept/ College | Mail ID |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 1 | S. Supriya | Assist. Professor | Civil / VMKVEC | jansupriyanair@gmail.com |
| 2 | Mrs.Pa.Suriya | Asst. Professor | Civil / AVIT | suriya@avit.ac.in |

| | | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| **17CMES02** | **BASICS OF CIVIL AND MECHANICAL ENGINEERING**<br>**PART - B BASICS OF MECHANICAL ENGINEERING**<br>**(Common to All Branches)** | **ES** | **2** | **0** | **0** | **2** |

**PREAMBLE**

Basic Mechanical Engineering gives the fundamental ideas in the areas of engineering design, manufacturing and Automobile engineering. An engineer needs to understand, the basic manufacturing techniques and working principle of an Automobile Engineering Components.

**PREREQUISITE**

NIL

**COURSE OBJECTIVE**

| | |
|---|---|
| 1 | To demonstrate the principles of casting and metal joining processes in manufacturing. |
| 2 | To describe and to apply the in depth knowledge in automotive engines and important components. |

**COURSE OUTCOMES:**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1.** Illustrate the application of casting and metal joining processes in manufacturing | Apply |
| **CO2.**Demonstrate the operation of automotive engines and important components | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | M | L | L | M | - | - | - | - | - | M | L | - | - |
| CO2 | S | M | L | L | L | M | - | - | - | - | - | M | L | - | - |

**S- Strong; M-Medium; L-Low**

**SYLLABUS**

**FOUNDRY AND WELDING**

Foundry: Introduction to Casting - Types, Pattern- Definition, Function. Foundry tools. Green Sand Moulding application.

Welding: Introduction to welding, Classification – Gas welding, Arc Welding, TIG, MIG, Plasma – Definitions. Arc Welding - Methods and Mechanisms – Applications.

**AUTOMOTIVE ENGINES AND COMPONENTS**

Introduction, Two stroke and four stroke cycle – Petrol and Diesel Engines - Construction and working,

Fundamentals of automotive components - Brakes, Clutches, Governor, Flywheel, Axles, Drives etc., Fuel supply systems, Exhaust emission and control.

**TEXT BOOKS**

| | |
|---|---|
| **1** | Basic Civil and Mechanical Engineering, School of Mechanical Engineering Sciences, VMU, Salem |

**REFERENCE BOOKS**

| | |
|---|---|
| **1** | K.Venugopal, Basic Mechanical Engineering, Anuradha Publications, Chennai |
| **2** | NR. Banapurmath, Basic Mechanical Engineering, Vikas Publications, Noida |
| **3** | TJ.Prabu, Basic Mechanical Engineering, SCITECH Publications, Chennai |

**COURSE DESIGNERS**

| **S.No** | **Faculty Name** | **Designation** | **Dept / College** | **Email id** |
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| **2** | T.Raja | Assistant Professor | Mech / VMKVEC | rajat@vmkvec.edu.in |

| 17EEES03 | BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING<br>A. BASIC ELECTRICAL ENGINEERING | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | FC(ES) | 2 | 0 | 0 | 2 |

**PREAMBLE**

It is a preliminary course which highlights the basic concepts and outline of Electrical engineering. The concepts discussed herein are projected to deliver explanation on basic electrical engineering for beginners of all engineering graduates.

**PREREQUISITE –** Nil

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To understand the electrical inventions, basic concepts of AC and DC circuits and basic laws of electrical engineering. |
| 2 | To gain knowledge about the working principle, construction, application of DC and AC machines and measuring instruments. |
| 3 | To understand the fundamentals of safety procedures, Earthing and Power system. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1: Explain the evolution of electricity, name of the inventors, electrical quantities and basic laws of electrical engineering. | Remember |
| CO2: Demonstrate Ohm's and Faraday's Law. | Apply |
| CO3: Understand the basic concepts of measuring instruments, electrical machineries and its applications. | Understand |
| CO4: Analyze the various types of electrical loads, power rating of electrical machineries and energy efficient equipment. | Analyze |
| CO5: Explain the electrical safety and protective devices. | Understand |
| CO6: Compare the various types electrical power generation systems by application of conventional and non-conventional sources. | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | L | -- | S | -- | -- | -- | -- | -- | -- | L | M | -- | -- |
| CO2 | S | M | S | S | -- | -- | -- | -- | M | - | -- | M | M | L | -- |
| CO3 | L | S | L | -- | S | -- | -- | -- | -- | L | -- | L | L | L | -- |
| CO4 | S | M | S | L | L | S | S | -- | -- | S | -- | L | M | L | -- |
| CO5 | L | M | S | M | -- | S | M | M | -- | S | -- | L | -- | -- | L |
| CO6 | S | L | S | L | M | S | S | -- | -- | M | -- | L | L | -- | L |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**HISTORY OF ELECTRICITY, QUANTITIES AND CIRCUITS**

Evolution of Electricity and Electrical inventions, Electrical quantities- Charge, Electric potential, voltage, current– DC & AC, power, energy, time period, frequency, phase, flux, flux density, RMS, Average, Peak, phasor & vector diagram. Electric Circuits - Passive components (RLC), Ohm's law, KCL, KVL, Faraday's law, Lenz's law. Electrical materials – Conducting and insulating materials.

**MEASURING INSTRUMENT AND ENERGY CALCULATION**

Measuring Instruments – Analog and Digital meters – Types and usage. AC and DC Machines & Equipment- Types, Specifications and applications.

Loads – Types of Loads- Power rating and Energy calculation – for a domestic load. Energy Efficient equipments – star ratings.

**ELECTRICAL SAFETY AND INTRODUCTION TO POWER SYSTEM**

Protection & Safety - Hazards of electricity - shock, burns, arc-blast, Thermal Radiation, explosions, fires, effects of electricity on the human body. Electrical safety practices, Protection devices.

Electric Power- Generation resources, Transmission types & Distribution system (levels of voltage, power ratings and statistics)- Simple layout of generation, transmission and distribution of power.

**TEXT BOOKS:**


1. Metha.V.K, Rohit Metha, "Basic Electrical Engineering", Fifth Edition, Chand. S&Co, 2012.
2. Kothari.D.P and Nagrath.I. J, "Basic Electrical Engineering", Second Edition, Tata McGraw-Hill, 2009.
3. R.K.Rajput , "Basic Electrical and Electronics Engineering", Second Edition, Laxmi Publication, 2012.
4. P. Selvam, R. Devarajan, A.Nagappan, T. Muthumanickam and T. Sheela"Basic Electrical and Electronics Engineering", First Edition, VMRFDU, Anuradha Agencies, 2017


**REFERENCE BOOKS:**


1. Smarajt Ghosh, "Fundamentals of Electrical & Electronics Engineering", Second Edition, PHI Learning, 2007.


**COURSE DESIGNERS**


| S.No. | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
| 1 | Dr. R. Devarajan | Professor | EEE/VMKVEC | devarajan@vmkvec.edu.in |
| 2 | Mr. R. Sathish | Assistant Professor | EEE/VMKVEC | sathish@vmkvec.edu.in |
| 3 | Ms. D. Saranya | Assistant Professor (Gr-II) | EEE/AVIT | dsaranya@avit.ac.in |
| 4 | Mr. S. Prakash | Assistant Professor (Gr-II) | EEE/AVIT | sprakash@avit.ac.in |

| 17EEES03 | BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING<br>B. BASIC ELECTRONICS ENGINEERING | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | FC(ES) | 2 | 0 | 0 | 2 |

**PREAMBLE**

The course aims to impart fundamental knowledge on electronics components, digital logics and communication engineering concepts. The course begins with classification of various active and passive components, diodes and transistors. It enables the student to design small digital logics like multiplexer, demultiplexer, encoder, decoder circuits, etc. It crafts the students to get expertise in modern communication systems.

**PRERQUISITE –** Nil

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To learn and identify various active and passive components and their working principles. |
| 2 | To understand the number conversion systems. |
| 3 | To learn the digital logic principles and realize adders, multiplexer, etc., |
| 4 | To understand the application oriented concepts in the communication systems. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Interpret working principle and application of various active and passive electronic components like resistors, capacitors, inductors, diodes and transistors. | Understand |
| CO2. Construct the rectifiers and regulators circuits and explore their operations. | Apply |
| CO3. Execute number system conversions and compute several digital logic operations. | Apply |
| CO4. Design adders, Multiplexer, De-Multiplexer, Encoder, Decoder circuits. | Apply |
| CO5. Apply the modern technologies in developing application oriented gadgets like the UHD, OLED, HDR. | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | M | -- | -- | -- | -- | -- | -- | M | -- | -- | -- | - | - | - |
| CO2 | S | M | M | M | -- | -- | M | -- | M | -- | -- | M | - | M | - |
| CO3 | S | M | M | -- | -- | -- | -- | -- | M | -- | -- | -- | S | - | - |
| CO4 | S | M | M | M | -- | -- | M | -- | M | -- | -- | M | M | - | - |
| CO5 | S | M | -- | -- | M | -- | M | -- | M | M | -- | M | - | - | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**SEMICONDUCTOR DEVICES**

Passive and Active Components - Resistors, Inductors, Capacitors, Characteristics of PN Junction Diode - Zener Diode and its Characteristics - Half wave and Full wave Rectifiers - Voltage Regulation. Bipolar Junction Transistor, JFET, MOSFET & UJT.

**DIGITAL FUNDAMENTALS**

Number Systems – Binary, Octal, Decimal and Hexa-Decimal – Conversion from one to another – Logic Gates – AND, OR, NOT, XOR, Universal Gates – Adders, Multiplexer, De Multiplexer, Encoder, Decoder – Memories

**COMMUNICATION AND ADVANCED GADGETS**

Modulation and Demodulation – AM, FM, PM – RADAR – Satellite Communication – Mobile Communication, LED, HD, UHD, OLED, HDR & Beyond, Smart Phones – Block diagrams Only.

**TEXT BOOKS:**


1. R.K. Rajput, "Basic Electrical and Electronics Engineering", Laxmi Publications, Second Edition, 2012.
2. Dr.P.Selvam, Dr.R.Devarajan, Dr.A.Nagappan, Dr.T.Muthumanickam and Dr.T.Sheela,"Basic Electrical and Electronics Engineering", Department of EEE & ECE, Faculty of Engineering & Technology, VMRFDU, Anuradha Agencies, 2018.
3. Edward Hughes, "Electrical and Electronics Technology", Pearson Education Limited, Ninth Edition, 2005.


**REFERENCES:**


1. John Kennedy, "Electronics Communication System", Tata McGraw Hill, 2003.


**COURSE DESIGNERS**


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| 3 | Mr.R.Karthikeyan | Assistant Professor (Gr-II) | ECE | rrmdkarthikeyan@avit.ac.in |
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| 17CSES05 | PROGRAMMING IN PYTHON | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| | | ES | 3 | 0 | 0 | 3 |

**PREAMBLE**

The purpose of this course is to introduce Python, a remarkably powerful dynamic programming language to write code for different operating systems along with application domain. Python has evolved on more popular and powerful open source programming tool

**PRERQUISITE**

NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To provide basic knowledge on Python programming concepts. |
| 2 | To introduce different methods in list, string, tuple, dictionary and sets. |
| 3 | To compute different programs using python control statements. |
| 4 | To learn about different functions in python. |
| 5 | To compute the exception handling functions, file concepts and CSV and JSON. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Learn python statements, comments and indentation, tokens, input and output methods using various example programs. | Understand |
| CO2. Apply the different methods involved in List, String, Tuples and Dictionary. | Apply |
| CO3. Design solutions for complex programs using decision making and looping statements. | Apply. |
| CO4.Apply the function programs with all the concepts like lambda, decorators and generators. | Apply. |
| CO5. Compute the exception handling programs, file concept programs and understand the concepts of CSV and JSON. | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | M | M | M | - | - | - | - | - | - | - | M | M | M |
| CO2 | S | M | M | M | M | - | - | - | - | - | - | - | S | M | M |
| CO3 | M | S | S | S | M | - | - | - | - | - | - | - | M | M | M |
| CO4 | S | S | S | S | M | - | - | - | - | - | - | - | S | S | M |
| CO5 | S | M | M | M | M | - | - | - | - | - | - | - | S | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**UNIT-1 INTRODUCTION**

Introduction to python-Advantages of python programming-Tokens-Variables-Input/output methods-Data types-Operators

**UNIT-2 DATA STRUCTURES**

Strings-Lists-Tuples-Dictionaries-Sets

**UNIT-3 CONTROL STATEMENTS**

Flow Control-Selection control Structure-if-if-else-if-elif-else-Nested if iterative control structures-while loop, for loop and range.

**UNIT-4 FUNCTIONS**

Declaration-Types of Arguments-Fixed arguments, variable arguments, keyword arguments and keyword variable arguments-Recursions-Anonymous functions: lambda- Decorators and Generators.

**UNIT-5 EXCEPTION HANDLING**

Exception Handling-Regular Expression-Calendars and clock files:File input/output operations-Dictionary operations-Reading and writing in structured files:CSV and JSON.

**TEXT BOOKS:**


1. Bill Lubanovic, "Introducing Python Modern Computing in Simple Packages", 1st Edition, O'Reilly Media, 2014.
2. Programming With Python Book ‘Himalaya Publishing House Pvt Ltd
3. “Dive Into Python” by Mark Pilgrim


**REFERENCES:**


1. Mark Lutz, “Learning Python”, 6th Edition, O'Reilly Media, 2014.
2. David Beazley, Brian K. Jones, "Python Cookbook", 3rd Edition, O'Reilly Media, 2015.
3. Mark Lutz, “Python Pocket Reference”, 6th Edition, O'Reilly Media, 2015.


**COURSE DESIGNERS**


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| 17CMES81 | ENGINEERING SKILLS PRACTICE LAB<br>PART A - BASIC CIVIL ENGINEERING<br><br>(Common to All Branches) | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | ES | 0 | 0 | 2 | 2 |

**PREAMBLE**

Engineering Skills Practice is a hands-on training practice to Mechanical, Civil and Mechatronics Engineering students. It deals with fitting, carpentry, sheet metal and related exercises. Also, it will induce the habit of selecting right tools, planning the job and its execution

**PREREQUISITE**

Nil

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To understand the basic concepts of surveying and construction materials. |
| 2 | To impart basic knowledge about building components. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1.**Prepare the different types of fitting. | Apply |
| **CO2**.Prepare the different types of joints using wooden material | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | L | L | L | L | L | L | L | L | L | L | L | - | S | - |
| CO2 | S | S | S | L | L | L | L | L | L | L | L | L | L | - | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**Buildings:**

1. Study of plumbing and carpentry components of residential and industrial buildings, Safety aspects.

**Plumbing Works:**

2. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
3. Study of pipe connections requirements for pumps and turbines.
4. Preparation of plumbing line sketches for water supply and sewage works.
5. Hands-on-exercise: Mixed pipe material connection – Pipe connections with different joining components.
6. Demonstration of plumbing requirements of high-rise buildings.

**Carpentry using Power Tools only:**

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

Hands-on-exercise: Wood work, joints by sawing, planning and cutting.

**TEXT BOOK**

1. Basic civil engineering Lab Manual by Department of Civil Engineering,VMRF.

**COURSE DESIGNERS**

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| 1 | M.Senthilkumar | Asst.Professor | Civil / VMKVEC | senthilkumar@vmkvec.edu.in |
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| 17CMES81 | ENGINEERING SKILLS PRACTICE LAB<br>B. BASIC MECHANICAL ENGINEERING | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | FC(ES) | 0 | 0 | 2 | 1 |

**Preamble**

Workshop is a hands-on training practice to Mechanical Engineering students. It deals with fitting, carpentry, foundry and welding related exercises. Also, it will induce the habit of selecting right tools, planning the job and its execution.

**Prerequisite –**NIL

**Course Objective**

| | |
|---|---|
| 1 | To perform the practice in different types of fitting processes. |
| 2 | To utilize the different type of joints using wooden materials. |
| 3 | To perform and acquire in depth knowledge in metal joining processes. |
| 4 | To demonstrate the pattern using foundry processes. |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO1. | Identify the different types of fitting using MS plate. | Apply |
| CO2. | Predict the different types of joints using wooden material | Apply |
| CO3. | Utilize the different types of joining process in metal by Arc Welding | Apply |
| CO4. | Make use of different types of green sand mould | Apply |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | L | L | L | - | - | - | - | - | - | - | L | - | - |
| CO2 | S | M | L | L | L | - | - | - | - | - | - | - | L | - | - |
| CO3 | S | M | L | L | L | - | - | - | - | - | - | - | L | - | - |
| CO4 | S | M | L | L | L | - | - | - | - | - | - | - | L | - | - |

**S- Strong; M-Medium; L-Low**

**Syllabus**

**LIST OF EXPERIMENTS**

Tee – Fitting
Vee – Fitting
Preparation of a mould for a single piece pattern
Preparation of a mould for a split piece pattern
Half- Lap Joint in Carpentry
Dove Tail Joint in Carpentry
Lap Joint – Welding
Butt Joint – Welding

**Text Books**

| | |
|---|---|
| **1** | **BASIC MECHANICAL ENGINEERING, LAB MANUAL** |

**Reference Books**

| | |
|---|---|
| **1** | K.Venugopal, Basic Mechanical Engineering, Anuradha Publications, Chennai |
| **2** | NR. Banapurmath, Basic Mechanical Engineering, Vikas Publications, Noida |

**Course Designers**

| S.No | Faculty Name | Designation | Department / Name of the College | Email id |
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| 17EEES82 | ENGINEERING SKILLS PRACTICE LAB<br>A. BASIC ELECTRICAL ENGINEERING | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | FC(ES) | 0 | 0 | 2 | 1 |

**PREAMBLE**

It is a laboratory course which familiarizes the basic electrical wiring, measurement of electrical quantities and various types of earthing methods.

**PRERQUISITE –** NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To learn the residential wiring and various types of electrical wiring. |
| 2 | To measure the various electrical quantities. |
| 3 | To know the necessity and types of earthing and measurement of earth resistance. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO 1: Implement the various types of electrical wiring. | Apply |
| CO 2: Measure the fundamental parameters of AC circuits. | Analyze |
| CO 3: Measure the earth resistance of various electrical machineries. | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | L | -- | S | -- | -- | -- | -- | -- | -- | L | M | L | -- |
| CO2 | S | M | S | S | -- | -- | -- | -- | M | -- | -- | M | M | L | -- |
| CO3 | L | S | L | -- | S | -- | -- | -- | -- | L | -- | L | M | L | -- |

S- Strong; M-Medium; L-Low

**LIST OF EXPERIMENTS**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring.
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

**REFERENCES**

1. Laboratory Reference Manual.

**COURSE DESIGNERS**

| S.No. | Name of the Faculty | Designation | Department | Mail ID |
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| 3 | Ms. D. Saranya | Assistant Professor (Gr-II) | EEE/AVIT | dsaranya@avit.ac.in |
| 4 | Mr. S. Prakash | Assistant Professor (Gr-II) | EEE/AVIT | sprakash@avit.ac.in |

| 17EEES82 | ENGINEERING SKILLS PRACTICES LAB<br>PART B - BASIC ELECTRONICS ENGINEERING | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | FC(ES) | 0 | 0 | 2 | 1 |

**PREAMBLE**

This course is to provide a practical knowledge in Basic Electronics Engineering. It starts with familiarization of electronic components and electronic equipments. It enables the students to construct and test simple electronic projects.

**PRERQUISITE –** Nil

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To familiarize the electronic components, basic electronic equipments and soldering techniques. |
| 2 | To study the characteristics of Diodes, BJT and FET. |
| 3 | To understand the principles of various digital logic gates. |
| 4 | To understand the concept of basic modulation techniques. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Construct experiments for PN and Zener diode characteristics | Understand |
| CO2. Demonstrate the fundamentals of soldering techniques. | Apply |
| CO3. Classify the characteristics of Diodes, BJT and FET. | Apply |
| CO4. Distinguish between amplitude and frequency modulation techniques. | Apply |
| CO5. Verify the truth tables of logic gates (AND, OR, NOT, NAND, NOR, XOR). | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | - | - | - | - | - | - | M | - | M | - | - | M | - |
| CO2 | M | M | M | - | - | - | - | - | M | - | M | - | M | - | - |
| CO3 | S | M | - | - | - | - | - | - | M | - | M | - | - | - | - |
| CO4 | S | M | - | - | - | - | - | - | M | - | M | - | M | - | M |
| CO5 | S | M | M | - | - | - | - | - | M | - | M | - | M | - | - |

S- Strong; M-Medium; L-Low

**LIST OF EXPERIMENTS**

1. Identifying Electronics Components.
2. Practicing of Soldering and Desoldering.
3. Characteristics of PN junction Diode.
4. Characteristics of Zener diode.
5. Input & Output characteristics of BJT.
6. Transfer characteristics of JFET.

7. Verification of Logic Gates.
8. Study of Amplitude Modulation.
9. Study of Frequency Modulation.

**COURSE DESIGNERS**

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| 17CSES83 | PROGRAMMING IN PYTHON LAB | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | ES | 0 | 0 | 4 | 2 |

**PREAMBLE**

This laboratory enables the students clearly understand the basic concepts of python, control statements and file commands in python.

**PRERQUISITE**

**NIL**

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Learn Syntax and Semantics and create Functions in Python | Understand |
| CO2. Handle Strings and Files in Python. | Understand |
| CO3. Design solutions for complex programs using decision making and looping statements. | Apply |
| CO4.Understand Lists, Dictionaries in Python. | Apply |
| CO5. Compute the exception handling programs | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | L | - | - | - | - | - | - | - | - | - | S | M | M |
| CO2 | S | M | L | - | - | - | - | - | - | - | - | - | S | M | - |
| CO3 | S | M | M | - | - | - | - | - | - | - | - | - | S | M | M |
| CO4 | S | M | M | - | - | - | - | - | - | - | - | - | S | M | - |
| CO5 | S | M | M | - | - | - | - | - | - | -- | - | - | S | M | M |

S- Strong; M-Medium; L-Low

**LIST OF EXPERIMENTS**

1. Write a program to sum of series of N natural numbers
2. Write a program to calculate simple interest.
3. Write a program to generate Fibonacci series using for loop
4. Write a program to calculate factorial using while loop
5. Write a program to find the greatest of three numbers using if condition
6. Write a program for finding the roots of a given quadratic equation using conditional control statements
7. Write a program to find the greatest of three numbers using conditional operator
8. Write a program to compute matrix multiplication using the concept of arrays
9. Write a program to implement recursive function
10. Write a program to read and write data using file concepts

**REFERENCES:**


1. Mark Lutz, “Learning Python”, 5th Edition, O'Reilly Media, 2013.
2. David Beazley, Brian K. Jones, "Python Cookbook", 3rd Edition, O'Reilly Media, 2013.
3. Mark Lutz, “Python Pocket Reference”, 5th Edition, O'Reilly Media, 2014.


**COURSE DESIGNERS**


| S.No. | Name of the Faculty | Designation | Department | Mail ID |
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| 17MEES84 | ENGINEERING GRAPHICS (Theory & Practice) | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | FC(ES) | 1 | 0 | 4 | 3 |

**Preamble**

Engineering Graphics is referred as language of engineers. An engineer needs to understand the physical geometry of any object through its orthographic or pictorial projections. The knowledge on engineering graphics is essential in proposing new product through drawings and interpreting data from existing drawings. This course deals with orthographic and pictorial projections, sectional views and development of surfaces.

**Prerequisite –** NIL

**Course Objective**

| | |
|---|---|
| 1 | To implement the orthographic projections of points, straight lines, plane surfaces and solids. |
| 2 | To construct the orthographic projections of sectioned solids and true shape of the sections. |
| 3 | To develop lateral surfaces of the uncut and cut solids. |
| 4 | To draw the pictorial projections (isometric and perspective) of simple solids. |
| 5 | To sketch by free hand the orthographic views from the given pictorial view. |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO1. | To Interpret the physical geometry of any object through its orthographic or pictorial projections | UNDERSTAND |
| CO2. | Apply in the form of drawing of the orthographic projections of points, straight lines, plane surfaces and solids. | Apply |
| CO3. | To establish in the form of drawing of the orthographic projections of sectioned solids and true shape of the sections. | Apply |
| CO4. | Develop lateral surfaces of the solid section and cut section of solids. | Apply |
| CO5. | Sketch the pictorial projections (isometric and perspective) of simple solids. | Apply |
| CO6. | To apply free hand sketch of the orthographic views from the given pictorial view. | Apply |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | S | L | S | L | - | - | - | - | - | - | - | L | - | |
| CO2 | S | S | L | S | L | - | - | - | - | - | - | - | L | - | |
| CO3 | S | S | L | S | L | - | - | - | - | - | - | - | L | - | |
| CO4 | S | M | L | S | S | - | - | - | - | - | - | - | L | - | |
| CO5 | S | S | L | S | L | - | - | - | - | - | - | - | L | - | |
| CO6 | S | S | L | S | L | - | - | - | - | - | - | - | L | - | |

**S- Strong; M-Medium; L-Low**

**Syllabus**

**PLANE CURVES AND FREE HAND SKETCHING**

Conics – Construction of ellipse– First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

**PROJECTION OF POINTS, LINES**

Projection of points, Projection of straight lines located in the first quadrant: inclined to both planes – Determination of true lengths and true inclinations – rotating line method only.

**PROJECTION OF SOLIDS**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to any one reference plane by change of position method.

**SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES**

Sectioning of above solids in simple vertical position by cutting planes inclined to any one reference plane and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and truncated solids like Prisms, pyramids, cylinders and cones.

**ISOMETRIC VIEW AND PERSPECTIVE PROJECTION**

| | | | | |
|---|---|---|---|---|
| Principles of isometric View – isometric scale – isometric view of simple solids- Introduction to Perspective projection | | | | |
| **Text Books** | | | | |
| **1** | Natarajan K V, "Engineering Graphics", Tata McGraw-Hill Publishing Company Ltd. New Delhi. | | | |
| **2** | K.Venugopal and V.Prabhu Raja, "Engineering Graphics", New Age International Private Limited. | | | |
| **3** | K.R.Gopalakrishna"Engineering Drawing" (Vol. I & II), Subhas Publications, 2014. | | | |
| **Reference Books** | | | | |
| **1** | N.D. Bhat and V.M. Panchal, Engineering Graphics, Charotar Publishers 2013 | | | |
| **2** | E. Finkelstein, "AutoCAD 2007 Bible", Wiley Publishing Inc., 2007 | | | |
| **3** | R.K. Dhawan, "A text book of Engineering Drawing", S. Chand Publishers, Delhi,2010. | | | |
| **4** | DhananjayA.Jolhe, "Engineering Drawing with an Introduction to AutoCAD", Tata McGraw Hill Publishing Company Limited, 2008. | | | |
| **5** | G.S. Phull and H.S.Sandhu, "Engineering Graphics", Wiley Publications, 2014. | | | |
| **Course Designers** | | | | |
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| 17EECC01 | **ELECTRIC CIRCUIT ANALYSIS** | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |

**PREAMBLE**

Electric circuit theory is the fundamental theory upon which all branches of electrical engineering are built. Many areas of electrical engineering, such as power, electric machines, control, electronics, communications, and instrumentation, are based on electric circuit theory. Therefore, the basic electric circuit theory course is the most important course for an electrical engineering student, and always an excellent starting point for a beginner in electrical engineering education. Circuit theory is also valuable to students specializing in other branches of the engineering because circuits are a good model for the study of energy systems in general, and because of the applied mathematics, physics, and topology involved.

**PREREQUISITE**

17EEES82- Basic of Electrical and Electronics Engineering, 17MABS01-Engineering Mathematics

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To understand basic circuit concepts. |
| 2 | To study networks and solution of DC and AC circuits. |
| 3 | To understand series and parallel resonance concepts and analysis of coupled circuits. |
| 4 | To study protection of balanced and unbalanced loads and measurement of power and power factor in three phase circuits. |
| 5 | To understand transient analysis of RL, RC and RLC circuits with DC and sinusoidal excitations. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | | |
|---|---|---|
| CO1 | Apply Kirchhoff's current and voltage law to simple circuits and Solve complex circuits using Mesh & Nodal Methods. | Apply |
| CO2 | Apply Network theorems to solve simple and complex linear circuits | Apply |
| CO3 | Solve the Series and Parallel resonance circuit, analyze the performance of single & double tuned circuits. | Analyze |
| CO4 | Explain three phase balanced and unbalanced star, delta network | Understand |
| CO5 | Develop the Transient response of RLC circuits using LaplaceTransform, | Analyze and create |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | S | S | S | L | M | L | - | M | S | M | M | S | - | M |
| CO2 | S | S | M | S | L | - | - | - | - | - | - | - | S | M | M |
| CO3 | S | M | - | S | S | - | M | - | M | L | L | M | S | - | - |
| CO4 | M | M | M | M | S | - | M | - | - | L | L | M | S | - | - |
| CO5 | M | M | M | M | S | - | M | - | M | L | L | M | S | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**BASIC CIRCUIT CONCEPTS**

Review of basic concepts- DC & AC circuits - R, L, and C elements phasor diagrams-Complex impedance - Real & Reactive power- Series & Parallel circuits– Formation of matrix equations and analysis of complex circuits using mesh- Current and nodal - Voltage methods.

**NETWORK THEOREMS AND TRANSFORMATIONS**

Voltage – Current – Source transformation. Star Delta transformation - Superposition theorem – Reciprocity theorem – Substitution theorem – Maximum Power Transfer theorems – Thevenin's theorem – Norton's theorem and Millman's theorem with applications.

**RESONANCE AND COUPLED CIRCUITS**

Series resonance and parallel resonance – Bandwidth and Q factor. Inductively coupled circuits –Co-efficient of coupling - Dot convention - Multi winding coupled circuits - Analysis of coupled circuits.

**THREE PHASE CIRCUITS**

Analysis of three phase 3 wire and 4 wire circuits with star and delta connected balanced and unbalanced loads-phasor diagram of Voltages and Currents – Measurement of power and power factor in three phase circuits by using single, two and three Watt meter method.

**TRANSIENT ANALYSIS**

Transient response – Natural response- forced response – DC response of RL, RC and RLC circuits – sinusoidal response of RL, RC, RLC circuits

**TEXT BOOKS**

1. Dr.S. Arumugam, Premkumar, Circuit Theory - Khanna publishers,1991

2. Sudhakar, A. and Shyam Mohan S.P.,'Circuits and Network Analysis and Synthesis', Tata McGraw-Hill Publishing C.Ltd., New Delhi, 2006..

3. A Nagoor Kani, Circuit Theory – Sriram publications -2016

**REFERENCES**

1. Prof. T. Nageswara Rao, "Electric circuit analysis" A.R.Publications.
2. Hyatt, W.H. Jr and Kemmerly, J.E., 'Engineering Circuits Analusis', McGraw-Hill International Editions, 2002.
3. Edminister, J.A., 'Theory and Problems of Electric Circuits', Schaum's outline series McGraw Hill Book

| | | | | |
|---|---|---|---|---|
| Company, 5th Edition, 2011. | | | | |
| **COURSE DESIGNERS** | | | | |
| S.No. | Name of the Faculty | Designation | Department | e-Mail ID |
| 1. | R. SATHISH | Assistant Professor | EEE/VMKVEC | sathish@vmkvec.edu.in |
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| 17MECC06 | KINEMATICS OF MACHINES | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |

**Preamble**

The students completing this course are expected to understand the role of the kinematics of machinery and its applications.

**Prerequisite :** Engineering Mechanics

**Course Objective**

| | |
|---|---|
| 1 | To demonstrate about various mechanisms. |
| 2 | Solve problems involving velocity and acceleration of various mechanisms. |
| 3 | Construct various motions of follower and cam profile |
| 4 | To study and apply various types of Gears. |
| 5 | To study and apply various types of Friction drives. |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO1. | Explain the principles of kinematic pairs, chains and their classification, DOF, inversions, equivalent chains and planar mechanisms. | Understand |
| CO2. | Determine the position, velocity and acceleration of planer mechanisms. | Apply |
| CO3. | Construct cams and followers for specified motion profiles. | Apply |
| CO4. | Construct gear tooth geometry by select the appropriate gears for the required applications. | Apply |
| CO5. | Discuss the friction and its effects in mechanical components | Apply |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O1 | PSO 2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | L | - | L | L | - | | | | | | - | - | - |
| CO2 | M | S | M | M | - | L | | | | | | | L | - | L |
| CO3 | S | M | L | - | L | L | | | | | | | M | - | M |
| CO4 | M | L | S | L | - | L | | | | | | | M | - | M |
| CO5 | S | M | L | - | - | L | | | | | | | L | - | L |

**S- Strong; M-Medium; L-Low**

**Syllabus**

**BASICS OF MECHANISM**

Rigid body, Mechanism and Machine, Kinematic Link, Kinematic Pair -Degree of Freedom - Mobility-Kutzbach criterion- Gruebler's Criterion for degrees of freedom - Grashoff's law-Kinematic Inversions of 4-bar chain and slider crank chains-Mechanical Advantage-Transmission angle-Description of common Mechanisms-Single - Double and offset slider mechanisms - Quick return mechanisms - Ratchets and escapements - Indexing Mechanisms - Rocking Mechanisms - Straight line generators.

**KINEMATICS OF LINKS**

Velocity analysis: Instantaneous centre method, Kennedy's theorem, Locating instantaneous centres, Relative velocity method for slider-crank mechanism, and crank and slotted lever mechanism.
Acceleration analysis: Klein's construction, slider crank mechanism, Coriolis acceleration component, Crank and slotted lever mechanism.

**KINEMATICS OF CAM**

Classifications - Displacement diagrams-parabolic- Simple harmonic and Cycloidal motions - Layout of plate cam profiles - Derivatives of Follower motion - High speed cams - circular arc and tangent cams - Standard cam motion.

**GEARS**

Gears and Gear trains: Classification, Terminology, Law of Gearing, Interferences, methods of avoiding interferences, path of contact, arc of contact. Simple gear train, compound gear train, reverted gear train, planetary/epicyclic gear train, Sun and planet gear.

**FRICTION**

Surface contacts-Sliding and Rolling friction - Friction drives – Friction in screw threads - Friction clutches - Belt and rope drives- Friction aspects in Brakes.

**Text Books**


| | |
|---|---|
| **1** | Rattan S.S, "Theory of Machines", Tata McGraw-Hill Publishing Company Ltd. New Delhi. |
| **2** | Khurmi.R.S. - Gupta, "Theory of Machines". S.Chand & Co., 2001 |
| **3** | Dr. Sadhu Singh, "Theory of Machines", Pearson Education |


**Reference Books**


| | |
|---|---|
| **1** | Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 2005 |
| **2** | Ghosh A and A.K.Mallick, "Theory of Mechanisms and Machines", Affiliated East-West Pvt.Ltd., New Delhi. |
| **3** | Shigley J.E and Vickes J.J, "Theory of Machines & Mechanism", McGraw Hill, 2000 |
| **4** | P L Ballaney, "Theory of Machines", Khanna Publisher |
| **5** | Kenneth J Waldron, "Kinematics, Dynamics and Design of Machinery", Gary L Kinzel Wiley Edition. |


**Course Designers**

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| 17ECCC01 | SEMICONDUCTOR DEVICES | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |

**PREAMBLE**

The course is designed to teach the physical principles and operational characteristics of semiconductor devices with emphasis on metal-oxide systems, bipolar, high-electron mobility, and field-effect transistors. Topics also include SCR, TFET, HEMT, Silicon Nano Wire tubes. The course provides advanced background in solid state electronic devices and is intended to help students to develop their basic analytical skills and continue advanced research in the varied branches of semiconductor devices.

**PRERQUISITE** NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To emphasis the physics of semiconductors and the working of semiconductor devices like PN and Zener diodes with their applications. |
| 2 | To impart knowledge on working principle, configuration, operational characteristics and limitation of BJTs. |
| 3 | To understand the construction and Characteristics of JFETs and MOSFETs. |
| 4 | To study the working principle and applications of discrete and integrated voltage regulators |
| 5 | To familiarize with several special semiconductor devices like SCR, MISFET, TFET, HEMT and Silicon Nano Wire tubes. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Explain the electron transport properties and operation of semiconductor devices like Diode and their relevant applications like HWR, FWR, Clipper and Clamper, etc., | Understand |
| CO2. Quantify the specification and characteristics of BJT in different configuration. | Apply |
| CO3. Demonstrate RMS and ripple factor values of RC filters in simple power supply and voltage regulators circuits | Apply |
| CO4. Relate the construction and characteristics of JFET and its families. | Apply |
| CO5. Examine the characteristics and applications of special devices like Shockley Diode, Unijunction Transistor, Phototransistors, MISFETs, MESFETs, etc., | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | M | - | - | - | - | - | - | M | - | - | M | M | M | - |
| CO2 | M | M | M | - | - | - | - | - | M | - | - | M | S | M | - |
| CO3 | M | M | M | - | - | - | M | - | M | - | - | M | S | M | - |
| CO4 | S | M | M | M | - | - | M | - | M | - | - | M | S | M | - |
| CO5 | S | M | - | M | - | - | - | - | M | - | - | M | S | M | - |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**SEMICONDUCTOR DIODES AND APPLICATIONS**

Introduction, Semiconductor Materials - Ge, Si, and GaAs, Covalent Bonding and Intrinsic Materials, Energy Levels, n-Type and p-Type Materials, Semiconductor Diode, Resistance Levels, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Reverse Recovery Time, Diode Specification Sheets, Semiconductor Diode Notation, Diode Testing, Zener Diodes, Light-Emitting Diodes, Sinusoidal Inputs; Half-Wave Rectifier, Full-Wave Rectifier, Clipper, Clamper, Zener Diode, Voltage-Multiplier Circuits, Practical Applications

**BIPOLAR JUNCTION TRANSISTORS**

Introduction, Transistor Construction, Transistor Operation, Common-Base Configuration, Common-Emitter Configuration, Common-Collector Configuration, Limits of Operation, Transistor Specification Sheet, Transistor Testing, Transistor Casing and Terminal Identification.\

**FIELD EFFECT TRANSISTORS**

Introduction, Construction and Characteristics of JFETs, Transfer Characteristics, Important Relationships, Depletion-Type MOSFET, Enhancement-Type MOSFET, MOSFET Handling.

**VOLTAGE REGULATORS**

Introduction, General Filter Considerations, Capacitor Filter, RC Filter, Discrete Transistor Voltage Regulation, IC Voltage Regulators.

**SPECIAL PURPOSE DEVICES**

Introduction, Silicon-Controlled Rectifier, Basic Silicon-Controlled Rectifier Operation, SCR Characteristics and Applications, Shockley Diode, Diac, Triac, Unijunction Transistor, Phototransistors, MISFETs, MESFETs, TFETs, HEMTs, Silicon Nano Wire Transistor.

**TEXT BOOK:**

1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education, 11th Edition, 2013.

**REFERENCE BOOKS:**

1. Jacob Millman, Christos C Halkias, Satyabrata Jit, "Electron Devices and Circuits", Tata McGraw Hill, 2010.
2. David A Bell, "Fundamentals of Electronic Devices and Circuits", Oxford Press, 2009.
3. B L Theraja, R S Sedha, "Principles of Electronic Devices and Circuits", S.Chand, 2004.

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| 17CVCC32 | FLUID MECHANICS AND STRENGTH OF MATERIALS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |

**Preamble**

The aim of the course is to understand the concepts of stress and strain and their uses, to understand the properties of fluid, Principles of fluid statics and dynamics.

**Prerequisite**

Nil

**Course Objectives**

1. To understand basic mechanical forces acting on rigid and deformable bodies.
2. To draw shear force and bending moment diagram for various types of beams.
3. To form deflection equations of beams and columns for different end conditions.
4. To understand fluid property and flow characteristics.
5. To understand flow dynamics and measurement.

**Course Outcomes**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Compute resultant, resolve several concurrent forces and also to apply equilibrium concepts, Compute simple stresses and strains | Apply |
| Co2. Practice shear force and bending moment computations and construct shear force and bending moment diagrams | Apply |
| Co4. Evaluation of beam deflection and slope | Apply |
| Co4. Determine the variation of pressure in fluid at rest and calculate the hydrostatic forces and point of application on a plane or curved surface. | Understand |
| CO5. Distinguish between various types of flows and derive the continuity equation for compressible and incompressible flow | Apply |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | S | M | M | L | L | - | - | - | - | - | - | L | M | - | L |
| 2 | S | S | M | L | L | - | - | - | - | - | - | - | L | - | L |
| 3 | S | M | S | L | L | - | - | - | - | - | - | - | M | | L |
| 4 | S | S | S | M | L | - | - | L | - | - | - | L | L | - | L |
| 5 | M | M | M | S | L | M | - | - | - | - | - | - | L | - | L |

S- Strong; M-Medium; L-Low

**Syllabus**

**STRESS- STRAIN AND DEFORMATION OF SOLIDS**

Properties of material, Concept of Stress and Strain, Hook's Law, Stress Strain Diagram for structural steel and Non-ferrous materials. Poisson's Ratio & principles of superposition, Total elongation of tapering bars of circular and rectangular cross-sections. Elongation due to self-weight, volumetric strain. Expression for Volumetric strain, Elastic constants, relationship among elastic constants, compound bars Rigid and Deformable bodies – Strength- Stiffness and Stability – Stresses; Tensile- Compressive and Shear – Elastic constants – Strain energy and unit strain energy – Strain energy in uniaxial loads.

**BEAMS - LOADS AND STRESSES**

Types of beams: Supports and Loads – Shear force and Bending Moment in beams – Cantilever- Simply supported and Overhanging beams – Stresses in beams – Theory of simple bending – Stress variation along the length and in the beam section – Shear stresses in beams.

**DEFLECTION OF BEAMS**

Elastic curve of Neutral axis of the beam under normal loads – Evaluation of beam deflection and slope: Double integration method- Macaulay Method- and Moment-area Method –Columns – End conditions – Equivalent length of a column – Euler equation – Slenderness ratio – Rankine formula for columns – Introduction to curved beams.

**FLUID PROPERTY AND FLOW CHARACTERISTICS**

Surface tension – Capillarity – Viscosity – Newton's law – Fluid pressure and pressure head - Fluid velocity – Uniform and steady flow – Reynolds number - Classification as laminar and turbulent flow – Continuity equation.

**FLOW DYNAMICS AND MEASUREMENT IN PIPE NETWORKS**

Euler's and Bernoulli's Equations – Manometer, Venturi meter and orifice meter - Pressure losses along the flow – Categorisation into minor losses - Flow through circular pipes – Statement of Darcy – Weisbach equation – Friction factor – Pipes in series and parallel - Hydraulic gradient

**Text Books**


1. R. K. Rajput, 'Strength of Materials (Mechanics of Solids)', S. Chand & Company Ltd., 2003.
2. R.K., Bansal, A text book on Fluid Mechanics & Hydraulic Mechanics,- M/s. Lakshmi Publications (P) Ltd, 2004.


**Reference Books**


1. Ryder G.H- "Strength of Materials"- Macmillan India Ltd.- Third Edition- 2007
2. K. L. Kumar, 'Engineering Fluid Mechanics', S. Chand & Company Ltd., 2002.


**Course Designers:**


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| 17MECC03 | ENGINEERING MECHANICS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 2 | 1 | 0 | 3 |

**Preamble**

This course provides the basic knowledge about the behaviour of the bodies which are under static and dynamic conditions.

**Prerequisite**

**NIL**

**Course Objective**

| | |
|---|---|
| 1 | To explain the basic laws of mechanics and forces |
| 2 | To relate the basic concepts and application of rigid bodies under equilibrium in two dimension |
| 3 | To solve the problems related to properties of surfaces and solids |
| 4 | To solve problems involving Friction and Rigid body dynamics. |
| 5 | To analyze the dynamics of particles problems. |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO1. | Identify the engineering problems using the concept of static equilibrium | Understand |
| CO2. | Solve problems of rigid bodies under equilibrium in two dimension | Apply |
| CO3. | Determine the Centroid, moment of inertia and mass moment of inertia of various sections. | Apply |
| CO4. | Solve frictional and rigid body application problems. | Apply |
| CO5. | Analyze engineering systems using the concept of dynamic equilibrium | Analyze |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | L | - | - | L | - | - | - | - | - | - | S | - | L |
| CO2 | S | s | M | M | - | M | - | - | - | - | - | - | S | - | L |
| CO3 | S | M | M | M | - | M | - | - | - | - | - | - | S | - | L |
| CO4 | S | S | M | M | - | L | - | - | - | - | - | - | S | - | L |
| CO5 | S | S | L | S | - | S | - | - | - | - | - | - | S | - | L |

**S- Strong; M-Medium; L-Low**

**SYLLABUS**

**BASICS & STATICS OF PARTICLES**

Introduction - Units and Dimensions - Laws of Mechanics - Lame's theorem. Parallelogram and triangular law of forces - Coplanar Forces - Resolution and Composition of forces - Equilibrium of a particle - Forces in space - Equilibrium of a particle in space - Equivalent systems of forces - Principle of transmissibility - Single equivalent force.

**EQUILIBRIUM OF RIGID BODIES**

Free body diagram - Types of supports and their reactions - requirements of stable equilibrium - Moments and Couples - Moment of a force about a point and about an axis - Vectorial representation of moments and couples - Scalar components of a moment - Varignon's theorem - Equilibrium of Rigid bodies in two dimension.

**PROPERTIES OF SURFACES AND SOLIDS**

Determination of Areas and Volumes - First moment of area - centroid of sections - Rectangle, circle, triangle from integration - T section, I section, Angle section, Hollow section by using standard formula - second and product moments of plane area - Rectangle, triangle, circle from integration - T section, I section, Angle section, Hollow section by using standard formula - Parallel axis theorem and perpendicular axis theorem - Polar moment of inertia - Principle moments of inertia of plane areas - Mass moment of inertia.

**FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS**

Frictional force - Laws of Coloumb friction - simple contact friction - Rolling resistance - Belt friction. Translation and Rotation of Rigid Bodies - Velocity and acceleration - General Plane motion.

**DYNAMICS OF PARTICLES**

Displacement, Velocity and acceleration, their relationship - Relative motion - Curvilinear motion - Newton's law - Work Energy equation of particles - Impulse and Momentum - Impact of elastic bodies.

**Text Books**


| | |
|---|---|
| **1** | Beer & Johnson, Vector Mechanics for Engineers. Vol. I Statics and Vol. II Dynamics, McGraw Hill International Edition, 1995. |
| **2** | Kottiswaran N, Engineering Mechanics-Statics & Dynamics, Sri Balaji Publications,2014. |
| **3** | Meriam, Engineering Mechanics, Vol. I Statics & Vol. II Dynamics 2/e, Wiley Intl., 1998. |


**Reference Books**


| | |
|---|---|
| **1** | Rajasekaran.S, and Sankara Subramanian G, “Engineering Mechanics”, Vikas Publishing Co. New Delhi. |
| **2** | Irving H. Shames and G.Krishna Mohana Rao, Engineering Mechanics - Statics & Dynamics, 4th Edition, Prentice Hall of India Pvt. Ltd., 1997. |
| **3** | K.L.Kumar, Engineering Mechanics III Edition, Tata McGraw Hill Publishing Co. Ltd., 1998 |

| Course Designers | | | | |
|---|---|---|---|---|
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| 17MECC08 | DYNAMICS OF MACHINES | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 2 | 1 | 0 | 3 |

**Preamble**

The student will undergo a sequential understanding of the concept of forces acting on different members, application of balancing masses, the different types of vibrations and the effect of governors and gyroscope couples in real time applications.

**Prerequisite :** KINEMATICS OF MACHINES

**Course Objective**

| | |
|---|---|
| 1 | To demonstrate the concepts of forces acting on machines and its members. |
| 2 | To learn about the application of balancing of masses. |
| 3 | To determine the concepts of free vibrations. |
| 4 | To Understand the concepts of forced vibrations. |
| 5 | To apply the knowledge of Governors and Gyroscopic forces in real time applications. |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO1. | Illustrate the concepts of forces acting on machines and its members | Understand |
| CO2. | Identify the application of balancing of masses | Understand |
| CO3. | Determine the concepts of free vibration | Apply |
| CO4. | Compute and gain the application of forced vibration | Apply |
| CO5. | To relate the knowledge of Governors and Gyroscopic forces with real time applications | Apply |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | S | L | L | - | - | - | - | - | - | - | - | M | L | - |
| CO2 | S | S | L | L | - | - | - | - | - | - | - | - | M | L | - |
| CO3 | S | S | M | L | - | - | - | - | - | - | - | - | M | L | - |
| CO4 | S | S | M | L | - | - | - | - | - | - | - | - | M | L | - |
| CO5 | S | S | S | S | - | - | - | - | - | - | - | - | M | L | - |

**S- Strong; M-Medium; L-Low**

**SYLLABUS**

**FORCE ANALYSIS**

Dynamic force analysis - Inertia force and Inertia torque - D'Alemberts principle - The principle of superposition - Dynamic Analysis in Reciprocating Engines – Gas Forces - Equivalent masses - Bearing loads - Crank shaft Torque - Turning moment diagrams - Fly wheels -Engine shaking Forces

**BALANCING**

Static and dynamic balancing - Balancing of rotating masses - Balancing a single cylinder Engine - Balancing Multi-cylinder Engines - Partial balancing in locomotive Engines - Balancing linkages - balancing machines.

**FREE VIBRATIONS**

Basic features of vibratory systems - idealized models - Basic elements and lumping of parameters - Degrees of freedom - Single degree of freedom - Free vibration - Equations of motion - natural frequency - Types of Damping - Damped vibration- critical speeds of simple shaft - Torsional vibration - Natural frequency of two and three rotor systems

**FORCED VIBRATIONS**

Response to periodic forcing – Harmonic Forcing - Forcing caused by unbalance - Support motion - Force transmissibility and amplitude transmissibility. - Vibration isolation.

**MECHANISMS FOR CONTROL**

**Governors**; Force analysis of Porter, Proel and spring controlled governors. Controlling force, stability, sensitiveness, effort and power of governors. Characteristics - Effect of friction.
**Gyroscopic Forces**: Gyroscopic couple, Effect of Gyroscopic couple on vehicle; Applications of Gyroscopic forces. - Ships and airplanes

**Text Books**

| | |
|---|---|
| **1** | Rattan S.S, "Theory of Machines", Tata McGraw-Hill Publishing Company Ltd. New Delhi. |
| **2** | Khurmi R.S. - Gupta, "Theory of Machines". S.Chand & Co., |

**Reference Books**

| | |
|---|---|
| **1** | Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, |
| **2** | Ghosh A and A.K.Mallick, "Theory of Mechanisms and Machines", Affiliated East-West Pvt. Ltd., New Delhi. |
| **3** | Shigley J.E and Vickes J.J, "Theory of Machines & Mechanism", McGraw Hill, |

**Course Designers**

| **S.No** | **Faculty Name** | **Designation** | **Department/ Name of the College** | **Email id** |
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| 17ECCC05 | DIGITAL LOGIC CIRCUITS & DESIGN | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |

**PREAMBLE**

One of the most important reasons for the unprecedented growth of Digital Electronics and systems is the advent of integrated circuits(ICs).Developments in the IC technology have made it possible to fabricate complex digital circuits such as microprocessors, memories and FPGAs etc. This course provides various methods and techniques suitable for a variety of digital system design applications.

**PREREQUISITE**

17EEES03 - Basics of Electrical and Electronics Engineering

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To understand the various number systems and their conversions. |
| 2 | To learn the Boolean expressions, Boolean postulates and Karnaugh map method to reduce the variables. |
| 3 | To impart the design knowledge of various combinational logic circuits and sequential circuits. |
| 4 | To understand the basics of hardware descriptive language. |
| 5 | To design the RTL for various logic circuits. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Explain the basic principles of digital system, Logic gates and Boolean laws. | Understand |
| CO2. Simplify Boolean expression using K-Map techniques. | Apply |
| CO3. Examine various Combinational circuits using logic gates. | Apply |
| CO4. Illustrate the operation of sequential circuits using Flip flops | Analyze |
| CO5.Analyze various digital circuits using HDL programming. | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | L | - | - | - | - | - | - | - | - | L | S | - | - |
| CO2 | S | M | M | L | L | - | - | - | - | - | - | L | S | - | - |
| CO3 | S | S | M | M | M | - | - | - | - | - | - | L | S | M | - |
| CO4 | S | S | M | M | M | - | - | - | - | - | - | L | S | M | - |
| CO5 | S | S | M | M | M | - | - | - | - | - | L | L | S | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**Basics of digital system:**

About Digital system, Analog versus Digital, Advantages of processing information in digital form, Number System-Binary,Octal,Decimal & Hexadecimal Number Systems & its Conversion, Complement Arithmetic, Signed Binary Numbers, Binary Codes, Binary Storage And Registers.

**Boolean Algebra, Logic Gates & Gate –Level Minimization:**

Introduction, Boolean Algebra, basic theorem & properties of Boolean Algebra, Boolean functions, canonical & standard forms, logical operations, logic gates, Integrated circuits, Map method-upto four variable K-maps, Product of Sums (POS) & Sum of Products (SOP) simplification, don't care conditions, NAND & NOR implementations, Exclusive-OR Function, Hardware Description Language(HDL).

**Combinational logic:**

Introduction, Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder, Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Code Converters, Encoders, Decoders, Multiplexers.

**Synchronous Sequential Logic, Register & Counters:**

Sequential circuits, storage elements: latches, flip flops, Analysis of clocked sequential circuits, Moore and Mealy circuits ,state diagram, state reduction & Assignment, design procedure, shift registers, ripple counters, synchronous counters.

**Design At The Register Transfer Level:**

Register Transfer Level Notation, Register Transfer Level In HDL, ASM, Sequential Binary Multiplier, Control Logic, HDL Description Of Binary Multiplier, Design With Multiplexers, Race Free Design, Latch Free Design.

**TEXT BOOKS :**


1. Morris Mano, “Digital Design (with an introduction to the verilog HDL)", Prentice-Hall of India.
2. John F. Wakerly, “Digital Design Principles & Practices”, 4th edition, Prentice-Hall, 2005.


**REFERENCE BOOKS:**


1. Stephen D. Brown, and Zvonko Vranesic, "Fundamentals of Digital Logic with Verilog Design, 2nd Edition," McGraw Hill, June, 2007.
2. William Kleitz, “Digital Electronics: A Practical Approach with VHDL”, Ninth Edition, Pearson, 2002.
3. Floyd T.L., “Digital Fundamentals ", Charles E. Merrill publishing Company, 1982.
4. Tokheim R.L., “Digital Electronics - Principles and Applications ", Tata McGraw Hill, 1999.
5. Jain R.P., “Modern Digital Electronics ", Tata McGraw Hill, 1999


**COURSE DESIGNERS**


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| 3 | Ms.R.Mohana Priya | Assistant Professor (Gr-II) | ECE | mohanapriya@avit.ac.in |

| 17MECC18 | MANUFACTURING ENGINEERING | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |

**Preamble**

This course provides deep knowledge about the various manufacturing processes, which are used in the manufacturing industry to produce mechanical components.

**Prerequisite : NIL**

**Course Objective**

| | |
|---|---|
| 1 | To understand the manufacturing process of conventional and special casting process of foundry technology. |
| 2 | To impart the knowledge of various types welding process in metal joining processes. |
| 3 | To know the working principles of the various unconventional, conventional machining operations and also metal forming processes. |
| 4 | To impart the basic knowledge and working principle of various forming and the moulding processes in plastics. |
| 5 | To impart the knowledge of various metal forming processes and manufacturing process of powder metallurgy. |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO1. | Explain the working principles of various metal casting processes and to identify the defects and interpret causes in the product of metal casting processes | understand |
| CO2. | Discuss the working principles of various metal joining processes and machines/equipments used and Select the suitable joining methods for fabrication/ assembly of products. | understand |
| CO3. | Examine the working principle of various conventional machine tools, work and unconventional manufacturing processes. | Apply |
| CO4. | Illustrate the types of plastics, working principle of various moulding process and the characteristics of the forming and shaping processes | Apply |
| CO5. | Apply the concepts of various metal forming and powder metallurgy. | Apply |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO 1 | PO2 | PO3 | PO4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | - | - | - | - | - | - | - | | | - | M | - | - |
| CO2 | S | M | - | - | - | - | - | - | - | - | | - | M | - | - |
| CO3 | S | M | L | - | - | - | - | - | - | - | | M | M | - | - |
| CO4 | S | L | L | - | - | - | - | - | - | - | | M | M | - | - |
| CO5 | S | L | L | - | - | - | - | - | - | - | | M | M | - | - |

**S- Strong; M-Medium; L-Low**

**SYLLABUS**

**Introduction to Casting technology**

Casting types, procedure to make sand mould, types of core making, moulding tools, machine moulding, special moulding processes– $CO_2$ moulding, shell moulding, investment moulding, permanent mould casting, pressure die casting, centrifugal casting, continuous casting and identify casting defects and remedies.

**Welding**

Classification of welding processes. Principles of Oxy-acetylene gas welding. A.C metal arc welding, Resistance welding, Submerged arc welding, tungsten inert gas welding, metal inert gas welding, plasma arc welding, thermit welding, electron beam welding, laser beam welding, and identify defects in welding process - Soldering and brazing.

**Machining**

General principles (with schematic diagrams only) of working and commonly performed operations in the following machines: Lathe, Shaper, Planner, Horizontal milling machine, Universal drilling machine, Cylindrical grinding machine, Capstan and Turret lathe. Basics of CNC machines. General principles and applications of the following processes: Abrasive jet machining, Ultrasonic machining, Electric discharge machining, Electro chemical machining, Plasma arc machining and Electron beam machining and Laser beam machining.

**Forming and shaping of plastics**

Types of plastics - Characteristics of the forming and shaping processes – moulding of thermoplastics– working principles and typical applications of- Injection moulding – Plunger and screw machines– Blow moulding – rotational moulding – film blowing – extrusion- typical industrial applications – Thermoforming – processing of thermo sets– working principles and typical applications- Compression moulding – Transfer moulding – Bonding of thermoplastics– Fusion and solvent methods – Induction and ultrasonic methods.

**Metal forming and powder metallurgy**

Principles and applications of the following processes: Forging, Rolling, Extrusion, Wire drawing and Spinning, Powder metallurgy – Principle steps involved advantages, disadvantages and limitations of powder metallurgy.

**Text Books**


| | |
|---|---|
| **1** | S.K.HajraChoudhury and A.K. HajraChoudhury, '**Elements of Work shop Technology**', Vol – I & II Manufacturing Processes, Media Promoters and Publishers Pvt. Ltd, 1986. |
| **2** | Mikell P.Groover, '**Fundamental of Modern Manufacturing**', Wiley India Edition, Third Edition, Reprint, 2012. |
| **3** | P.C. Sharma, '**A Text Book of Production Technology (Manufacturing Processes)**', S. Chand & Company Ltd., New Delhi, Seventh Reprint, 2012. |


**Reference Books**


| | |
|---|---|
| **1** | Serope Kalpajian, Steven R.Schmid, "Manufacturing Processes for Engineering Materials", 4/e, Pearson Education, Inc. 2007 |
| **2** | Jain. R.K.,and S.C. Gupta, "Production Technology", 16th Edition, Khanna Publishers, 2001 |
| **3** | E.Paul Degarmo, J.T.Black, and Ronald A. Konser, '**Materials and Processes in Manufacturing**', 5th Edition, Prentice Hall India Ltd., 1997. |


**Course Designers**

| **S.No** | **Faculty Name** | **Designation** | **Department/ Name of the College** | **Email id** |
|---|---|---|---|---|

| | | | | |
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| 17MECC09 | DESIGN OF MACHINE ELEMENTS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 2 | 1 | 0 | 3 |

**Preamble**

Design is essentially a decision-making process. Design is to formulate a plan to satisfy a particular need and to create something with a physical reality. Every Mechanical Engineer should learn the pre-defined set of processes involved in conversion of raw material into a product. The Core course on Design of Machine Elements exposes the basic concepts and techniques involved in machine design. The Course includes the study about various types of stresses, theories of failure and design of shafts, couplings, fasteners, weld joints, springs ,bearings and flywheel. At the outset, the design and techniques involved during designing stages will be focused.

**Prerequisite: Strength of Materials**

**Course Objective**

| | |
|---|---|
| 1 | To explain the various steps involved in the Design Process. |
| 2 | To categorize the various types of stresses and applications |
| 3 | To assess the principles involved in evaluating the shape and dimensions of a Component to satisfy functional and strength requirements. |
| 4 | To practice the use of standard procedures and data. |
| 5 | To design the various mechanical components for the given loading conditions. |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO1. | Assess the different types of stresses and Theories of failure for given set of values. | Understand |
| CO2. | Design shafts and couplings for a given values by using pre-defined data and procedures. | Apply |
| CO3. | Design the welded joints and fasteners for given set of conditions and type of joints using Pre-defined values. | Apply |
| CO4. | Design springs for given loading conditions as per the requirements. | Apply |
| CO5. | Design bearings and Flywheels for a given statement as per the requirements. | Apply |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 1 | PO 1 | PO 1 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | M | M | L | - | - | - | - | - | - | - | - | L | L | - |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO2 | S | S | S | M | - | - | - | - | - | - | - | - | L | L | - |
| CO3 | S | S | S | M | - | - | - | - | - | - | - | - | L | L | - |
| CO4 | S | S | S | M | - | - | - | - | - | - | - | - | L | L | - |
| CO5 | S | S | S | M | - | - | - | - | - | - | - | - | L | L | - |
| **S- Strong; M-Medium; L-Low** | | | | | | | | | | | | | | | |

| **Syllabus** | |
|---|---|
| **STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS** | |
| Introduction to the design process - factor influencing machine design- Direct- Bending and torsional stress equations -Calculation of principal stresses for various load combinations- Factor of safety - theories of failure – stress concentration – design for variable loading – Soderberg- Goodman and Gerber relations | |
| **DESIGN OF SHAFTS AND COUPLINGS** | |
| Design of solid and hollow shafts based on strength- rigidity and critical speed – Design of rigid and flexible couplings. | |
| **DESIGN OF FASTENERS AND WELDED JOINTS** | |
| Threaded fasteners - Design of bolted joints including eccentric loading – Design of welded Joints for pressure vessels and structures - Theory of bolted joints. | |
| **DESIGN OF SPRINGS** | |
| Design of helical- leaf- disc and torsional springs under constant loads and varying loads – Concentric torsion springs | |
| **DESIGN OF BEARINGS AND FLYWHEELS** | |
| Design of bearings – sliding contact and rolling contact types– Design of journal bearings calculation of bearing dimensions – Design of flywheels involving stresses in rim and arm. | |
| **Text Books** | |
| **1** | Design of Machine Elements-V.B.Bhandari |
| **2** | Mechaniacl Engineering Design: Joseph E Shigley and Charles R. Mischke |
| **Reference Books** | |
| **1** | Machine Design :Robert L.Norton, Pearson Education |

| | |
|---|---|
| **2** | Design Data Book, compiled by PSG College of Technology |
| **3** | Fundamentals of Machine component Design–Robert C.Juvinall, Wiley India Pvt.Ltd, |
| **4** | Engineering Design, G.E. Dieter. |

**Course Designers**

| **S.No** | **Faculty Name** | **Designation** | **Department / College** | **Email id** |
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| 17EECC16 | POWER ELECTRONICS AND DRIVES | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |

**PREAMBLE**

Power electronics deals with the processing and control of 'raw' electrical power from an electrical source such as an AC mains supply, a battery bank, a photovoltaic array, or a wind turbine into a form and quality suitable for a particular electrical load. It is an enabling technology with a very wide range of applications, such as a cell phone charger, a personal computer, a microwave oven, an MRI system, a hybrid electric car, or even the electrical grid. As can be noted, the power levels handled can vary from a few watts to several hundreds of megawatts. In this course, we will study the basic principles behind the power electronic circuits used in most such power processing applications. These circuits include power converters for DC to DC, DC to AC and AC to DC applications.

**PREREQUISITE-NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To get an overview of different types of power semiconductor devices and their switching characteristics. |
| 2 | To understand the operation, characteristics and performance parameters of controlled rectifiers. |
| 3 | To study the operation, switching techniques and basics topologies of DC-DC switching regulators. |
| 4 | To learn the different modulation techniques inverters and to understand harmonic reduction methods. |
| 5 | To study the operation of AC voltage controller. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1: The basic semiconductor physics to the properties of real power semiconductor devices and differentiate from low power devices. | Remember |
| CO2: The concepts of operation of AC-DC converters in steady state and transient state of both continuous and discontinuous modes. | Understand |
| CO3: Classify and design choppers for simple electrical application | Apply |
| CO4: Identify the proper gating sequence and control circuit in operating the single phase and three phase inverter circuits. | Analyze |
| CO5: Analyze the performance parameter, various techniques for analysis and design of AC voltage controller and also list the various control schemes in cycloconverter. | Analyze |
| CO6: Describe the concepts of electric machines. | Understand |
| CO7: Implement the power electronics concepts to AC & DC drives to made the effective control | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | **S** | **M** | **M** | **M** | **L** | L | - | L | L | L | L | L | L | S | - |
| CO2 | **S** | **S** | **M** | **M** | **L** | - | M | - | - | - | - | - | L | S | - |
| CO3 | **S** | **S** | | **M** | **L** | M | M- | - | - | - | - | - | L | S | - |
| CO4 | **S** | **S** | **S** | **M** | **S** | - | M | - | - | - | - | - | L | M | - |
| CO5 | **M** | **S** | - | **M** | **S** | - | M | - | - | - | - | - | M | M | - |
| CO6 | **M** | **S** | **M** | **S** | - | - | M | - | - | - | - | - | M | M | - |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO7 | **M** | **M** | **M** | **S** | **M** | M | - | - | - | - | - | - | M | M | - |

S- Strong; M-Medium; L-Low-

**POWER SEMI-CONDUCTOR DEVICES**

Overview of switching devices – Driver and snubber circuit of SCR TRIAC, GTO, IGBT, MOSFET – Computer simulation of PE circuits.

**RECTIFIERS & CHOPPERS**

Introduction-2 pulse / 3 pulse and 6 pulse converters – Dual converters. Basic Principles of Choppers - Stepdown and stepup chopper – Time ratio control and current limit control – Buck, Boost, Buck-Boost converters.

**INVERTERS & AC - AC CONVERTERS**

Single phase and three phase [$120^o$ & $180^o$ mode] inverters – PWM techniques – Sinusoidal PWM, Modified sinusoidal PWM and multiple PWM.

Single phase AC voltage controllers – Multistage sequence control – single phase and three phase cycloconverter.

**ELECTRICAL DRIVES**

Type of Electrical Drives – Selection & factors influencing the selection – heating and cooling curves – loading condition and classes of duty – determination of power rating – simple problems.

**SOLID STATE DRIVES (QUALITATIVE TREATMENT ONLY)**

Advantages of solid state drives – D.C. motor control using rectifiers and choppers – control of induction motor by V, V/f and slip power recovery scheme using inverters and A.C. power regulators.

**Total Hours : 45**

**TEXT BOOKS:**

1. Rashid M.H., "Power Electronics Circuits, Devices and Applications", Prentice Hall India, 3rd Edition, New Delhi, 2004.
2. G.K. Dubey “Fundamental Electrical Drives” second edition 2002, Narosa Publications, Second edition, 2002.

**REFERENCES:**

1. Cyril.W.Lander, "Power Electronics", McGraw Hill International, Third Edition, 1993.
2. P.S.Bimbra "Power Electronics", Khanna Publishers, third Edition 2003.
3. Philip T.Krein, "Elements of Power Electronics" Oxford University Press, 2004Edition.
4. N.K.De.,P.K.Sen “Electric Drives”, Prentice Hall, First edition 1999.
5. Pillai, S.K., “ A First course on Electrical Drives”, Wiley Eastern Ltd., New Delhi, 1982

**COURSE DESIGNERS**


| S.No. | Name of the Faculty | Designation | Department | Mail ID |
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| 17ECCC10 | LINEAR INTEGRATED CIRCUITS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |

**PREAMBLE**

Linear Integrated circuits enables the students to have an insight knowledge on fundamentals of various integrated circuits. The designed course makes the students to work on the various applications of the Integrated Circuits. This subject helps the students to design, model and develop amplifier circuits, comparators, regulators, filters, timer, D/A and A/D converters and PLL.

**PREREQUISITE**

17ECCC01 - Semiconductor Devices

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To Understand the basics of Integrated Circuits and its fabrication. |
| 2 | To get familiarized with operational amplifiers and its Characteristics. |
| 3 | To Construct various circuits using operational amplifier and analyze its performance. |
| 4 | To design and the working of waveform generators, regulators, filters and timers circuits. |
| 5 | To Understand the basic concepts of PLL. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Describe the Concepts of Fabrication of active and passive components | Understand |
| CO2. Interpret the Operational Amplifier with its characteristics. | Apply |
| CO3. Design and analyze the various applications of Operational Amplifier. | Analyze |
| CO4. Design and analyze wave generators and regulators. | Analyze |
| CO5. Designing and analyzing filters and Timer circuits. | Analyze |
| CO6. Analyze the various functional blocks of PLL. | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | L | - | - | - | - | - | - | - | - | M | S | M | - |
| CO2 | S | M | M | M | M | - | - | - | - | - | - | M | S | M | - |
| CO3 | S | S | M | M | M | - | - | - | - | - | - | M | S | M | - |
| CO4 | S | S | M | M | M | - | - | - | - | - | - | M | S | M | - |
| CO5 | S | S | M | M | M | - | - | - | - | - | - | M | S | M | - |
| CO6 | S | S | M | M | M | - | - | - | - | - | - | M | S | M | - |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**INTEGRATED CIRCUIT FABRICATION AND CHARACTERISTICS**

Integrated Circuit Technology –Basic Monolithic Integrated Circuits-Epitaxial Growth-Masking and Etching-Diffusion of Impurities-Transistors for monolithic circuits-Monolithic Diodes-Integrated Resistors-Integrated Capacitors and Inductors-Monolithic –Circuit Layout-Additional Isolation Methods-Large Scale and Medium Scale Integration.

**OPERATIONAL AMPLIFIER**

Basic operational Amplifier – Ideal Operational Amplifier - Operational Amplifier Internal Circuits – Examples of IC Op Amps – FET Operational Amplifiers – DC Characteristics – AC Characteristics – Analysis of Data Sheets of an Op Amp.

**OPERATIONAL AMPLIFIER APPLICATIONS**

Basic Op Amp Applications – Instrumentation Amplifiers – AC Amplifiers – V to I and I to V Converters – Op Amp Circuits Using Diodes – Sample and Hold Circuits – Log/Antilog Amplifiers – Adder/ Sub tractor – Multiplier and Divider – Differentiator and Integrator – Operational Transconductance Amplifier-Pspice Simulation Tools.

**COMPARATORS, REGULATORS, FILTERS AND TIMERS**

Comparators – Square, Triangular and Sawtooth wave Generators, Series Op Amp Regulators – IC Voltage Regulators – 723 General Purpose Regulators – RC Active Filters – Active Filters using OTA's, Timer – Description of Functional Diagram – Monostable and Astable Operation – Schmitt Trigger

**PLL, D/A AND A/D CONVERTERS**

PLL – Basic Principles – Phase Detectors/ Comparators – Voltage Controlled Oscillator – Low Pass Filter – Monolithic PLL – PLL Applications – Basic DAC Techniques – A–D Converters – DAC/ ADC Specifications.

**TEXT BOOKS:**

1. D. Roy Choudhury, Shail B. Jain, "Linear Integrated Circuits", New Age International Publishers, 5th Edition 2018.
2. Jacob Millman,Chirstos C.Halkias,"Integrated Electronics",Tata Mc-GRAW Hill, Edition,3rd Edition, 2010

**REFERENCE BOOKS:**

1. Robert F Coughlin, Fredrick F.Driscoll," Operational Amplifiers and Linerar Integrated Circuits", Phi Learning,6th Edition,2009.
2. Sergio Franco,"DesignwithOperational Amplifiers and Analog Integrated Circuits", Tata Mc-GRAW Hill ,4th Edition, 2016.

**COURSE DESIGNERS**



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| 17ECCC23 | SENSORS AND ELECTRONIC MEASUREMENTS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | PC | 3 | 0 | 0 | 3 |

**Preamble**

This course provides comprehensive idea about working principle, operation of various types of sensors are used for physical quantity measurement & Instrumentation, as well as application of measurement techniques to assess the quality of processes, components, systems.

**Prerequisite**

Nil

**Course Objective**

| | |
|---|---|
| 1 | To understand fundamentals of measurement systems. |
| 2 | To study principles, working, mathematical relation characteristics, advantages and limitations of various sensors |
| 3 | To study about various types of Electronic measurements |
| 4 | To understand basics of Digital Instruments |
| 5 | To impart knowledge on Data Acquisition & Interface Systems |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO1. | Learn the fundamentals of measurement systems, errors of measurement. | Understand |
| CO2. | Understand the various types of sensors and their working principles. | Understand |
| CO3. | Deserve the various types of electronic equipment's and their working principles. | Understand |
| CO4. | Understand the working principles of various types digital instruments. | Apply |
| CO5. | Understand the function of Data Acquisition system and various Interface Standards. | Apply |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O1 | PS O2 | PS O3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | - | L | - | M | | | | | | - | M | M | - | M |
| CO2 | S | - | M | - | M | | | L | | | - | M | L | M | - |
| CO3 | S | - | M | - | M | L | | | | | - | M | - | - | - |
| CO4 | S | - | M | - | S | | | | | | - | M | L | - | M |
| CO5 | S | - | M | - | M | | | | | | - | M | - | L | |

**S- Strong; M-Medium; L-Low**

| Syllabus | |
|---|---|
| **BASIC MEASUREMENT AND ELECTRONIC MEASUREMENT CONCEPTS** | |
| Basic block diagram stages of generalized measurement system, Static and dynamic characteristics, units and standards of measurements, error analysis, Zero order instrument, First order instrument, True RMS meters - Bridge measurements-Maxwell, Hay, Schering, Anderson bridge, cathode ray oscilloscope, Q meters- Vector meters | |
| **SENSORS AND PRINCIPLES** | |
| Resistive sensors, Potentiometer and Strain gauges, Inductive sensors- Self-inductance type, Mutual inductance type, LVDT, Capacitive sensors, Piezo electric sensors, Thermocouples, Thermistors, Radiation Pyrometry, Fiber optic temperature sensor, Photo electric sensors, Pressure and Flow sensors | |
| **ELECTRONIC MEASUREMENTS** | |
| Digital method of measuring frequency, period, phase difference, pulse width, time interval, total count, Function generator, Cathode Ray Oscilloscope, Digital storage oscilloscope- x-y chart, strip chart recorders, magnetic tape recorders, Logic Analyzers, Data Loggers Demonstration of CRO and DSO. | |
| **DIGITAL INSTRUMENTS** | |
| Analog to digital converters, Digital to analog converters, digital voltmeter, multimeters, frequency counters- measurement of frequency and time interval- extension of frequency range- measurement errors. | |
| **DATA ACQUISITION, INTERFACE SYSTEMS AND FIBER OPTIC MEASUREMENTS** | |
| Elements of data acquisition system, interfacing of transducers, computer-controlled instrumentation, RS232C, RS422, RS 485 buses, British standard interface (BS 4421), CAN bus, $I^2C$ Bus, Modbus, Ethernet, fiber optic measurement for power and system loss, optical time domain reflectometer | |
| **Text Books** | |
| **1** | Albert D.Helfrick and William D.Cooper- Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall of India, 2003. |
| **2** | Rangam C.S.Sarma, G.R.Mani, V.S.V "instrumentation-device, s and systems", Tata McGraw Hill publishing company LTD.1997 |
| **3** | SAWHNEY, A.K " A course in Electrical and Electronic measurements and instrumentation", Dhanpat Rai & sons, 1995 |
| **Reference Books** | |
| **1** | Joseph J. Carr, Elements of Electronics Instrumentation and Measurement, Pearson education, 2003 |
| **2** | Doeblin E.O Measurements systems, Tata McGraw Hill 1995 |
| **3** | D.A. Bell, Electronic Instrumentation and Measurements, Prentice Hall of India,2002 |
| **4** | Clyde F.Coombs, Electronic Instrument Handbook, McGraw Hill Professional, third Edition, 1999. |

| COURSE DESIGNERS | | | | |
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| 17ECCC07 | MICROCONTROLLERS & ITS APPLICATIONS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |

**PREAMBLE**

Microcontroller is used as the main controller in most of the embedded systems nowadays. Due to the development in VLSI technology, microcontrollers evolve which function similar to microprocessors but they have most of the peripherals built on-chip. This course makes the students to be familiar with the architecture and programming of Microcontrollers. This course also introduces the architecture and hardware features of PIC 16F877 and ARM7 (LPC2148) microcontrollers.

**PREREQUISITE - Nil**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To learn the concepts of microprocessors and knowledge of interfacing devices. |
| 2 | To study the Architecture of 8051 microcontroller |
| 3 | To develop skill in simple program writing of microcontroller |
| 4 | To study the interfacing and applications of microcontroller |
| 5 | To study the advanced microcontrollers. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Explain the concept of microprocessor and interfacing devices. | Understand |
| CO2. Explain the architecture and function of 8051 microcontroller | Apply |
| CO3. Design and implement programs on 8051 Microcontroller | Analyze |
| CO4. Design and implement applications using 8051 Microcontroller | Analyze |
| CO5. Illustrate various applications using advanced Microcontrollers. | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | S | M | - | M | - | - | - | - | - | - | M | S | S | S |
| CO2 | S | S | S | - | M | - | - | - | - | - | - | M | S | M | M |
| CO3 | S | M | M | - | M | M | - | - | - | - | - | M | S | S | M |
| CO4 | S | S | M | - | M | M | - | - | - | - | - | M | S | S | S |
| CO5 | S | M | S | - | M | M | - | - | - | - | - | M | S | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**INTEL 8086 MICROPROCESSOR & I/O INTERFACING**

Introduction to 8086 - Architecture of 8086 - Register organization – Signal Description of 8086 - Addressing modes – Data Transfer Instruction – Arithmetic Instruction - Branching Instruction - Program Transfer Instruction – simple programs- Programmable Peripheral Interface 8255 – Programmable Communication Interface 8251 USART – Programmable Interrupt Controller 8259A – Direct Memory Access Controller 8257- Programmable Interval Timer 8253 – Keyboard/Display Controller 8279.

**INTEL 8051 MICROCONTROLLER**

Introduction to 8 bit microcontroller – architecture of 8051- Signal descriptions of 8051- Role of PC and DPTR- Flags and PSW- CPU registers- Internal RAM & ROM- Special Function Register-Counter & Timers- Serial Communication.

**ASSEMBLY LANGUAGE PROGRAM OF INTEL 8051**

Interrupt- Addressing Mode- Data Transfer Instruction- Arithmetic Instruction- Logical Instruction- Jump Loop & Call Instruction- I/O Port Programming.

**INTERFACING AND APPLICATION OF INTEL 8051**

LCD Interfacing - A/D and D/A Interfacing- Sensor Interfacing- Relays and Optoisolators- Stepper Motor Interfacing- DC Motor Interfacing.

**ADVANCED MICROCONTROLLERS**

PIC 16F877 microcontroller – Architecture On chip ADC, $I^2C$ – SPI – Watchdog timer – ARM7 (LPC2148) microcontroller – Architecture and applications.

**TEXTBOOKS:**


1. Muhammad Ali Mazidi and Janica Gilli Mazidi, The 8051 microcontroller and embedded systems, Pearson Education, 5th Indian reprint, 2003.
2. Frank D. Petruzella. “Programmable Logic Controllers”, McGraw–Hill Book, Company, 1989


**REFERENCE BOOKS:**


1. B.P. Singh, Microprocessors and Microcontrollers, Galcotia Publications (P) Ltd, First edition, New Delhi, 1997.
2. Embedded Controller Hand book, Intel Corporation, USA.
3. Microcontroller Hand Book, INTEL, 1984.
4. Ajay V.Deshmukh, “Microcontrollers- Theory and applications”, Tata McGraw-Hill, publisher,2005.


**COURSE DESIGNERS**


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| 3 | Mr.G.Sureshkumar | Assistant Professor | ECE | sureshkumar@vmkvec.edu.in |

| 17EECC08 | **CONTROL SYSTEMS** | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |

**PREAMBLE**

This course shall introduce the analysis and regulation of the output behaviors of dynamical systems subject to input signals. The course focuses primarily on using Laplace and frequency-domain techniques. The course will be useful for students from major streams of engineering to build foundations of time/frequency analysis of systems as well as the feedback control of such systems. At the end of this course, one should possess in-depth knowledge of concepts from classical control theory, understand the concept of transfer function and use it for obtaining system response, analyze dynamic systems for their stability and performance, and design controllers (such as Proportional-Integral-Derivative) based on stability and performance requirements.

**PREREQUISITE**

17EEES03 – Basics of Electrical and Electronics Engineering

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | Understand the feedback and feed-forward control; apply block diagram representations of control systems. |
| 2 | To find time response of given control system model, various controllers design and simulation using MATLAB. |
| 3 | To understand the frequency domain analysis, use of frequency response methods for open loop and closed loop control systems. |
| 4 | To analyze the stability of closed and open loop systems using various methods and to design compensators, |
| 5 | To develop and analyze the state space models. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | | |
|---|---|---|
| CO1 | Find Transfer function of systems. | Understand |
| CO2 | Find the time response of given control system model and to design a controller. | Create |
| CO3 | Find the frequency response of control system model using frequency response plots. | Analyze |
| CO4 | Analyze the stability of the control system and design the suitable compensators. | Create |
| CO5 | Apply state space techniques to model control systems. | Evaluate |

| MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | S | S | L | S | M | - | - | - | - | - | M | M | S | M | - |
| CO2 | S | M | - | M | S | - | - | M | - | - | - | M | S | M | S |
| CO3 | S | M | - | M | S | - | - | - | - | - | - | M | S | M | - |
| CO4 | S | M | - | M | S | - | M | - | - | - | M | M | S | M | S |
| CO5 | S | M | - | M | S | L | L | - | M | - | M | M | S | M | - |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**INTRODUCTION TO CONTROL SYSTEMS**

Basic elements in control systems – Open and closed loop systems – Mechanical Translational and Rotational Systems, Electrical analogy – Transfer function – Block diagram reduction techniques – Signal flow graphs.

**TIME RESPONSE ANALYSIS**

Time response – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – Effects of P, PI, PID modes of feedback control. Design and Simulation of time domain analysis using MATLAB.

**FREQUENCY DOMAIN ANALYSIS**

Frequency response analysis, ,Frequency domain specifications, Correlation between time and frequency responses, Minimum phase, Non minimum phase and all pass transfer functions, Bode Plot, Polar Plot, Constant M and N circles, Nichols chart, Design and Simulation of frequency domain analysis using MATLAB.

**STABILITY ANALYSIS AND COMPENSATOR DESIGN**

Concepts of stability, Necessary conditions for Stability, Routh stability criterion, Relative stability analysis, Introduction to Root-Locus Techniques, Construction of root loci, Nyquist stability criterion. Lag, Lead and Lag-Lead networks, Compensator design using Bode plots & Root Locus.

**STATE VARIABLE ANALYSIS, AND APPLICATION OF CONTROL SYSTEMS**

Introduction to State variable analysis: Introduction, Concept of State, State variables & State model, State model for Linear Continuous & Discrete time systems. Synchros – AC servomotors- DC Servo motors -Stepper motors- Tacho generator.

**TEXT BOOKS**


1. K. Ogata, “Modern Control Engineering”, 4th Edition, Pearson Education, New Delhi, 2003.
2. I.J. Nagrath & M. Gopal, “Control Systems Engineering”, New Age International Publishers, 2003.
3. C.J.Chesmond. “Basic Control System Technology”, Viva low priced student edition, 1998.
4. R.C.Dorf and R.H.Bishop, “Modern Control Systems”, Addison-Wesley, 1995 (MATLAB Reference).

5. M. Gopal, "Control Systems: Principles and Design", 3rd Edition, McGraw, Hill, 2008
6. Nise N.S , " Control Systems Engineering", 6th Edition , Wiley India , 2016.

**REFERENCES**

1.Benjamin C Kuo, "Automatic Control system", Prentice Hall of India Private Ltd., New Delhi, 2009.
2. R.C. Dorf and R.H. Bishop, "Modern Control Systems", 12th Edition, Prentice, Hall, 2010.
3. http://www.mathworks.com/access/helpdesk/help/toolbox/control/
4. Control Systems - N. K. Sinha, New Age International (P) Limited Publishers.
5. S.N.Sivanandam, S.N.Deepa, Control System Engineering using Mat Lab, 2nd Edition, Vikas Publishing, 2012.

**COURSE DESIGNERS**


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| 17MTCC01 | PROGRAMMABLE LOGIC CONTROLLERS (THEORY & PRACTICE) | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 2 | 0 | 2 | 3 |

**PREAMBLE**

Programmable Logic Controllers is the applied science of automatic control for multi-axis manipulators and is a large subset of the field of "Mechatronics" (Mechanical, Electronic and Software engineering for product or systems development, particularly for motion control applications) Mode of operation and programming of a Programmable Logic Controller (PLC), Characteristics of a PLC (synchronous, asynchronous), Analysis of the process schematic Statement of the interlocking functions and the safety requirements Creating of a control system function chart. Selection of the necessary hardware units, Programming, Simulation, Start-up procedure, testing.

**PREREQUISITE -**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To Understand the PLC used in automatic control systems I / O and indicate their advantages and limitations. |
| 2 | To apply the control programming the devices and modes of operation. |
| 3 | To apply a Electromagnetic Control Relays, Manually Operated Switches. |
| 4 | To design Timer and counter circuit. |
| 5 | To apply and develop a programmable control device for point-to-point applications |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Describe the working of the Programmable Logic Controllers operations | Understand |
| CO2. Apply the programming in ladder diagram design | Apply |
| CO3. Develop the design in timer and counter circuits. | Apply |
| CO4. Generate a Data Transfer Operations and Data Compare Instructions | Analyze |
| CO5. Develop a PLC program for point-to-point applications such as pick and place, Palletizing, sorting and inspection of work-parts. | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | L | L | - | - | - | - | - | - | - | - | - | S | - | - |
| CO2 | S | L | M | - | L | - | - | - | - | - | - | - | S | - | - |
| CO3 | S | L | M | - | - | M | - | - | - | - | - | M | S | M | - |
| CO4 | S | S | L | - | M | - | - | - | - | - | - | M | S | M | - |
| CO5 | S | S | S | M | S | M | S | L | S | S | M | M | S | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**INTRODUCTION TO PLC:**

Introduction, Parts of a PLC, Principles of Operation, Modifying the Operation, PLCs versus Computers, PLC Size and Application. The I/O Section, Discrete I/O Modules, Analog I/O Modules, Special I/O Modules, I/O Specifications, The Central Processing Unit (CPU), Memory Design, Memory Types, Programming Terminal Devices.

**PLC PROGRAMMING LANGUAGES :**

Processor Memory Organization, Program Scan, PLC Programming Languages, Relay-Type Instructions, Instruction Addressing, Branch Instructions, Internal Relay Instructions, Programming Examine If Closed and Examine If Open Instructions, Entering the Ladder Diagram, Modes of Operation. Electromagnetic Control Relays, Contactors, Motor Starters, Manually Operated Switches, Mechanically Operated Switches, Sensors, Output Control Devices, Seal-In Circuits, Latching Relays, Converting Relay Schematics into PLC Ladder Programs, Writing a Ladder Logic Program Directly from a Narrative Description.

**TIMERS AND COUNTERS** :

Mechanical Timing Relays, Timer Instructions, On-Delay Timer Instruction, Off-Delay Timer Instruction, Retentive Timer, Cascading Timers. Counter Instructions, Up-Counter, Down-Counter, Cascading Counters, Incremental Encoder-Counter Applications, Combining Counter and Timer Functions.

**PLC INSTRUCTIONS** :

Data Manipulation, Data Transfer Operations, Data Compare Instructions, Data Manipulation Programs, Numerical Data I/O Interfaces, Closed-Loop Control. Math Instructions, Addition Instruction, Subtraction Instruction, Multiplication Instruction, Division Instruction, Other Word-Level Math Instructions, File Arithmetic Operations.

**PLC AUTOMATION :**

Types of Processes, Structure of Control Systems, On/Off Control, PID Control, Motion Control, Data Communications, Supervisory Control and Data Acquisition (SCADA).

**PLC PRACTICE :**

Hydrometer rotation with Timer & speed control**,** ON / OFF Control using PID , Simulation of basic PLC programs using PLC simulator.

**TEXTBOOKS**

1. Frank D.Petruzella,"Programmable Logic Controllers", McGraw-Hill Companies, Third edition,March2004

2. Charles H. Roth, Jr "Fundamentals of Logic Design ", Fourth Edition, Jaico Publishing house, 1999.

**COURSE DESIGNERS**



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| 17ECEC20 | ROBOTICS AND AUTOMATION | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC(PS) | 3 | 0 | 0 | 3 |

**PREAMBLE**

Robotics is the applied science of motion control for multi-axis manipulators and is a large subset of the field of "Mechatronics" (Mechanical, Electronic and Software engineering for product or systems development, particularly for motion control applications). Robotics, sensors, actuators and controller technologies are continuously improving and evolving synergistically. In the 20th century, engineers have mastered almost all forms of motion control and have proven that robots and machines can perform almost any job that is considered too heavy, too tiring, too boring or too dangerous and harmful for human beings. This course supports the students to design and develop multi-DOF manipulator and wheeled mobile robot.

**PREREQUISITE -** Nil

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To Understand the actuators used in robotic manipulators and indicate their advantages and limitations. |
| 2 | To apply the forward kinematic model of multi-degree of freedom to develop a robot arm and wheeled robot |
| 3 | To apply a static force and dynamic model of two degrees of freedom to develop robot arm |
| 4 | To apply a step by step procedure for the generation a cubic polynomial trajectory for a joint with specified kinematic constraints |
| 5 | To apply and develop a program for point-to-point applications |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Describe the working of the subsystems of robotic manipulator and wheeled mobile robot | Understand |
| CO2. Demonstrate the forward kinematic model of multi-degree of freedom (DOF) manipulator and inverse kinematic model of two and three degrees of freedom planar robot arm and wheeled robot | Apply |
| CO3. Exhibit the static force and dynamic model of two degrees of freedom planar robot arm | Apply |
| CO4. Organize a trajectory in joint space using polynomial and trigonometric functions with given kinematic constraints of multi-degree of freedom (DOF) manipulator | Analyze |
| CO5. Experiment a offline robot program for point-to-point applications such as pick and place, palletizing, sorting and inspection of work-parts | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | - | - | - | - | - | - | - | M | - | - | M | S | M | - |
| CO2 | S | M | M | - | - | - | - | - | M | - | - | M | S | M | - |
| CO3 | S | M | M | - | - | - | - | - | M | - | - | M | S | M | - |
| CO4 | S | M | M | - | M | - | - | - | M | - | - | M | S | M | - |
| CO5 | S | M | M | - | M | - | - | - | M | - | - | M | S | M | - |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**Introduction to Robotics**. Mechanical structure: Robot Configuration - Robot Anatomy, Sub-systems/ Elements of Industrial Robot - Performance characteristics of industrial Robots. Mobile robot locomotion: Introduction, key issues for locomotion, wheeled locomotion-wheel design, geometry, stability, manoeuvrability and controllability. Applications - Progressive advancement in Robots – Point to point and continuous motion applications - Mobile manipulators and its applications.

**Kinematic model:** Forward Kinematics for two DOF manipulator – Algebraic method, Mechanical structure and notations, Coordinate frames, Description of objects in space, Transformation of vectors, Fundamental rotation matrices (principal axes and fixed angle rotation) Description of links and joints, Denavit-Hartenberg (DH) notation, Forward Kinematics for multi-Degrees of Freedom (DOF) manipulator. Inverse kinematics of two DOF planar manipulator - Manipulator workspace. Mobile Robot kinematics: kinematic model and constraints, Mobile robot workspace-motion control.

**Static model:** Differential relationship - Velocity analysis – Jacobian matrix – Determination of forces and equivalent torques for joints of two link planar robot arm. Dynamic model: Euler –Lagrangian formulation - Forward and inverse dynamic model for two DOF planar manipulator.

**Trajectory planning:** Definitions and planning tasks, Joint space techniques – Motion profiles – Cubic polynomial, Linear Segmented Parabolic Blends and cycloidal motion - Cartesian space techniques. Navigation: Graph search and potential field path planning - navigation architecture - offline and online planning.

**Robot Programming**- Manual Programming – Teach Pendant, Offline programming - VAL programming, Online Programming. Case Studies.

**TEXTBOOKS**


1. S.K.Saha, “Introduction to Robotics”, Second Edition, McGraw Hill Education (India) Private Limited, 2014.
2. Roland Siegwart and Illah R.Nourbakhsh, “Introduction to Autonomous Mobile Robots”, Prentice Hall of India (P) Ltd., 2005.


**REFERENCE BOOKS**


1. 1. B. Siciliano, L. Sciavicco, L. Villani, G. Oriolo, “Robotics: Modelling, Planning and Control”, First Edition, Springer-Verlag London,2009
2. K.S. Fu, R.C Gonzalez and C.S. Lee, “Robotics- Control, Sensing, Vision and Intelligence”, Tata McGraw-Hill Editions, 2008.
3. John J.Craig, “Introduction to Robotics, Mechanics and Control”, Third Edition, Pearson Education, 2005.
4. Mark W.Spong, M.Vidyasagar, “Robot Dynamics and Control”, Wiley India, 2009.
5. George A. Bekey, “Autonomous Robots – From Biological Inspiration to Implementation and Control”, MIT Press, 2005.
6. Howie Choset, Kevin M. Lynch, Seth Hutchinson, George A. Kantor, Wolfram Burgard, Lydia E. Kavraki and Sebastian Thrun, “Principles of Robot Motion – Theory, Algorithms and Implementation”, MIT Press, 2005.
7. Mikell P. Groover, Mitchell Weiss, Roger N.Nagel and Nicholas G. Odrey, “Industrial Robotics – Technology, Programming and Applications” Tata McGraw-Hill, 2008.
8. Yoram Koren, “Robotics for Engineers”, McGraw-Hill Book Co., 1992.
9. P.A. Janakiraman, “Robotics and Image Processing”, Tata McGraw-Hill, 1995.

| COURSE DESIGNERS | | | | |
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| 17MECC12 | COMPUTER INTEGRATED MANUFACTURING | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |

**Preamble**

The students completing this course are expected to understand the nature and role of computers in Design, manufacturing & Business aspects.

**Prerequisite: Nil**

**Course Objective**

| | |
|---|---|
| 1 | To understand the concepts involved in CAD , CAM and CIM |
| 2 | To apply geometric modelling techniques and various graphics standards in CAD |
| 3 | To apply Modelling Techniques & graphic standard while designing. |
| 4 | To make use of GT and CAPP concepts in processing components. |
| 5 | To identify the components of FMS and SFC |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO1 | Discuss the basic concepts of Computer Aided Design and Manufacturing | Understand |
| CO2 | Apply the concept of Modeling techniques for designing the components | Apply |
| CO3 | Develop CNC programs for various mechanical components with different operations. | Apply |
| CO4 | Apply the concepts of Group technology and Computer aided process planning techniques in Manufacturing | Apply |
| CO5 | Identify the functions of various components of Shop Floor Control and Flexible Manufacturing Systems. | Apply |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | M | - | - | L | - | - | - | - | - | - | - | L | L | |
| CO2 | S | S | S | S | S | - | - | - | M | M | M | - | L | L | |
| CO3 | S | S | L | S | S | - | - | - | M | M | - | - | L | L | |
| CO4 | M | L | M | M | S | - | - | - | M | - | M | - | L | L | |
| CO5 | M | L | S | L | - | - | - | - | - | - | - | - | L | L | |

**S- Strong; M-Medium; L-Low**

**Syllabus**

**INTRODUCTION TO CAD/CAM**

The design process - Morphology of design, Product cycle - Computer Aided Design, Benefits of CAD. Role of computers - principles of computer graphics - Current trends in manufacturing engineering - Design for Manufacturing and Assembly - Sequential and concurrent engineering - Rapid prototyping.

**SOLID MODELING**

Graphic software: coordinate representation- graphic functions, software standards. Graphical Kernel system (GKS) - Initial graphics exchange system (IGES) - Graphic packages. Geometric Modeling - Wire frame, Surface and Solid models - Constructive Solid Geometry (CSG) and Boundary Representation (B-REP) Techniques - Features of Solid Modeling Packages.

**FUNDAMENTALS OF CNC MACHINES**

CNC Technology - Functions of CNC Control in Machine Tools - Classification of CNC systems - Contouring System - Interpolators, open loop and closed loop CNC systems - CNC Controllers, Direct Numerical Control (DNC Systems). - Work holding devices and tool holding devices- Automatic Tool changers. Feedback devices - Principles of Operation-Machining Centers - Tooling for CNC machines

Numerical control codes - Standards - Manual Programming - Canned cycles and subroutines - Computer Assisted Programming, CAD / CAM approach to NC part programming - APT language, machining from 3D models.

**GROUP TECHNOLOGY AND COMPUTER AIDED PROCESS PLANNING**

Introduction to CIM and its related activities-History of group technology- role of G.T. in CAD/CAM integration - part families - classification and coding - DCLASS and MICLASS and OPITZ coding systems-facility design using G.T. - benefits of G.T. - cellular manufacturing. Process planning - role of process planning in CAD/CAM integration - approaches to computer aided process planning - variant approach and generative approaches - CAPP and CMPP process planning systems.

**SHOP FLOOR CONTROL AND INTRODUCTION OF FMS**

Shop floor control-phases-factory data collection system -automatic identification methods- Bar code technology-automated data collection system. FMS-components of FMS - types -FMS workstation -material handling and storage systems- FMS layout -computer control systems- application and benefits.

**Text Books**

| | |
|---|---|
| **1** | Mikell.P.Groover "Automation, Production Systems and Computer Integrated manufacturing", Pearson Education 2016. |
| **2** | Radhakrishnan P, Subramanyan.S. and Raju V., "CAD/CAM/CIM", New Age International (P) Ltd., New Delhi. |

**Reference Books**

| | |
|---|---|
| **1** | Yorem koren, "Computer Integrated Manufacturing System", McGraw-Hill. |
| **2** | Ranky, Paul G., "Computer Integrated Manufacturing", Prentice Hall International. |

| | |
|---|---|
| **3** | David D.Bedworth, Mark R.Hendersan, Phillip M.Wolfe "Computer Integrated Design and Manufacturing", McGraw-Hill Inc. |
| **4** | Roger Hanman "Computer Integrated Manufacturing", Addison – Wesley. |
| **5** | Viswanathan.N, Narahari.Y "Performance Modeling & Automated Manufacturing systems" Prentice hall of india pvt. Ltd. |

**Course Designers**

| S.No | Faculty Name | Designation | Department / College | Email id |
|---|---|---|---|---|
| **1** | J.Sathees babu | Associate Professor | Mech / VMKVEC | satheesbabu@vmkvec.edu.in |
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| 17MECC15 | FINITE ELEMENT ANALYSIS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 2 | 1 | 0 | 3 |

**Preamble**

Finite Element Analysis is an advanced computer technique based on numerical methods for solving wide variety of engineering problems. FEA can produce accurate, reliable approximate solutions, at a small fraction of the cost of more rigorous, closed-form analyses. This course provides the basic theoretical knowledge to competently perform finite element analysis for structural and thermal analyses. It also provides an introduction to the finite element analysis from engineering point of view.

**Prerequisite**

Strength of Materials.

**Course Objective**

| | |
|---|---|
| 1 | To learn basic principles of finite element analysis procedure |
| 2 | Study the basics of Standard truss, beam, plane triangular and quadrilateral elements |
| 3 | Analysis of one and two-dimensional problems |
| 4 | Learn to model complex geometry problems and solution techniques |
| 5 | Understand the concepts of heat transfer and structural analysis |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO 1. | Solve the physical problem using functional approximation method. | Apply |
| CO 2. | Derive the shape functions and stiffness matrix for one dimensional structural and thermal problems | Apply |
| CO 3. | Derive the shape functions and stiffness matrix for two dimensional structural and thermal problems. | Apply |
| CO 4. | Derive the shape functions and stiffness matrix for Isoparametric elements. | Apply |
| CO 5. | Perform structural analysis of mechanical components like beams, trusses, corner bracket and plates | Apply |
| CO 6. | Perform thermal analysis of composite walss, composite cylinders and fins | Apply |
| CO 7. | Performm model and harmonic analysis of mechanical components like beams and spring-mass damper system | Apply |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | S | S | S | M | _ | _ | _ | _ | _ | _ | _ | _ | L | L | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO2. | S | S | S | M | _ | _ | _ | _ | _ | _ | _ | _ | L | L | |
| CO3. | S | S | S | M | _ | _ | _ | _ | _ | _ | _ | _ | L | L | |
| CO4. | S | S | S | M | _ | _ | _ | _ | _ | _ | _ | _ | L | L | |
| CO5. | S | S | S | M | S | _ | _ | _ | _ | _ | _ | _ | L | L | |
| CO6. | S | S | S | M | S | _ | _ | _ | _ | _ | _ | _ | L | L | |
| CO7. | S | S | S | M | S | _ | _ | _ | _ | _ | _ | _ | L | L | |

**S- Strong; M-Medium; L-Low**

**SYLLABUS**

**BASIC CONCEPTS OF THE FINITE ELEMENT ANALYSIS**

Basics of FEA, Derive the stiffness matrix of Spring, bar and beam elements – Derive the stiffness matrix of beam elements – Problems on spring and bar elements – Local and global coordinate systems – assembly of elements, calculation of element stress – simple applications, trusses, Drive the stiffness matrix – Problems on Trusses, stiffness matrix calculation, Member stress calculation.

**VARIATIONAL AND WEIGHTED RESIDUAL APPROACHES**

Variational problems, Euler's Equation – Problems on solving first order differential using 2-node 1D element – Example problems, solving first order differential equation using 1D-sub-parametric elements – Weighted residual approaches, Galerkin formulation and Point-collocation – Problems on Galerkin formulation and Point-collocation simple regular beam sections with different types of loads – Sub-domain collocation, Least-square minimization – Problems on Sub-domain collocation and Least-square minimization regular beam sections with different types of loads.

**TWO DIMENSIONAL ISOPARAMETRIC ELEMENTS AND GAUSS NUMERICAL INTEGRATION**

Natural coordinate systems – Interpolation function for Triangular Elements (CST, LST and QST) – Interpolation function for 4-node, 8-node and 9-node quadrilateral Elements – Element stiffness matrix formulation for two dimensional elements – Gauss Numerical Integration – Derivation of one point and two point formula (1D problems).

**EIGEN VALUE PROBLEMS FOR ONE DIMENSION PROBLEMS (DYNAMIC CONSIDERATION)**

Formulation – Hamilton's Principle – Characteristic polynomial Technique – Element mass matrix formulation for one dimensional Elements (2-node isoparametric and 3-node sup-parametric elements) – Problems for 1-D Problems to find eigenvalues and eigenvectors using 2-node isoparametric and 3-node isoparametric.

**STEADY STATE HEAT TRANSFER ANALYSIS**

| | |
|---|---|
| Introduction, straight uniform fin analysis, Derivation 1D Element matrices – Problems on straight uniform fin analysis and Taper fin analysis Heat Flex Boundary Conditions – Analysis of uniform fins using 1D Quadratic Elements – Two Dimensional Steady state Problems using CST Elements – 1-D and 2-D simple Problems using any commercial FEA software. | |
| **Text Books** | |
| **1** | Hutton, D.V., "Fundamentals of Finite Element Analysis", McGraw Hill, International Edition, 2004. |
| **2** | Segerlind, L.J., "Applied Finite Element Analysis", John Wiley & Sons, 1984. |
| **Reference Books** | |
| **1** | Chandrupatla, T.R., Belegundu, A.D., "Introduction to Finite Elements in Engineering", Prentice Hall of Ind ia, 2002. |
| **2** | Zienkiewicz, O.C., "Finite Elements and Approximation", Dover International, 2006. |
| **3** | Cook R.D., Malkus, D.S., Plesha, M.E., Witt, R.J., "Concepts and Applications of Finite Element Analysis", 4th Edition, John Wiley & Sons, 2001. |

**Course Designers**

| S.No. | Faculty Name | Designation | Department/Name of the College | Email id |
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| 17MEEC01 | HYDRAULICS AND PNEUMATIC SYSTEMS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC(PS) | 3 | 0 | 0 | 3 |

**PREAMBLE**

The students completing this course are expected to understand the concepts of Hydraulic and pneumatic systems and its applications.

**PREREQUISITE-NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To understand about basics of fluid power systems fundamentals |
| 2 | To acquire knowledge about components used in hydraulic and pneumatic systems |
| 3 | To understand about the various types of valves and actuators |
| 4 | To develop hydraulic circuits for different applications |
| 5 | To develop pneumatic circuits for different applications |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1.** Describe the different drive systems and identify which is suitable for specific application. | Understand |
| **CO2.** Discuss the working of different components in fluid power system. | Understand |
| **CO3.** Explain about the utilization of cylinders, accumulators, valves and various control components. | Understand |
| **CO4**.Develop a feasible hydraulic circuit for a given application. | Apply |
| **CO5**. Develop a feasible pneumatic circuit for a given application. | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | L | L | | | - | | | | | | | L | | |
| CO2 | S | L | L | | | - | | | | | | | L | | |
| CO3 | S | M | M | | | - | | | | | | | L | | |
| CO4 | S | S | S | M | | M | | | | | | | L | | |
| CO5 | S | S | S | M | | M | | | | | | | L | | |

**S- Strong; M-Medium; L-Low**

**SYLLABUS**

**FLUID POWER SYSTEMS AND FUNDAMENTALS**

Introduction to fluid power, Advantages and Applications of fluid power system. Basic Laws in Fluid power system, Types of fluid power systems, Properties of fluids – General types of fluids – Fluid power symbols.

| |
|---|
| Basic Laws in Fluid power system. Low cost automation. |
| **HYDRAULIC SYSTEM & PNEUMATIC SYSTEMS COMPONENTS** |
| Pump classification – Gear pump, Vane Pump, Piston pump, construction and working of pumps– Variable displacement pumps. Pneumatic Components: Compressors-types. Filter, Regulator, Lubricator Unit, Muffler |
| **VALVES AND ACTUATORS** |
| Construction of Control Components: Director control valve – 3/2 way valve ,4/2 way valve, Shuttle valve ,check valve – pressure control valve –pressure reducing valve, sequence valve-Flow control valve.. Fluid Power Actuators: Linear hydraulic actuators – Types of hydraulic cylinders – Single acting, Double acting special cylinders like Telescopic, Cushioning mechanism, Construction of single acting and double acting cylinder. |
| **DESIGN OF HYDRAULIC CIRCUITS** |
| Accumulators and Intensifiers: Types of accumulators – Accumulators circuits, intensifier – Intensifier circuit. Circuits: Reciprocating- Regenerative - Quick return – Sequencing – Synchronizing - Safety circuits - Press – Planer. |
| **DESIGN OF PNEUMATIC CIRCUITS** |
| Fluid Power Circuit Design: Speed control circuits, synchronizing circuit, Sequential circuit design for two and three cylinder using cascade method. Pneumo-hydraulic circuit. Electro pneumatic circuit, Fluid power circuits- failure and troubleshooting. |
| **Text Books:** |
| 1. Anthony Esposito - "Fluid Power with Applications"- Pearson Education - 2013<br>**2.** Srinivasan - "Hydraulic and Pneumatic Controls"- TMH - 2011.<br>3. Parr, A. *Hydraulics and pneumatics: a technician's and engineer's guide*. Elsevier - 2011. |
| **Reference:** |
| 1. Thomson, "Introduction to Fluid power"- Prentice Hall - 2004.<br>2. Majumdar, S.R., *Oil hydraulic systems: principles and maintenance*. McGraw-Hill- 2003.<br>3. Majumdar, S.R., *Pneumatic systems: principles and maintenance*. Tata McGraw-Hill -1996 Education. |

| S.No | Name of the Faculty | Designation | Department / Name of the College | Mail ID |
|---|---|---|---|---|
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| 17EECC81 | **ELECTRIC CIRCUITS LAB** | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 0 | 0 | 4 | 2 |

**PREAMBLE**

The significance of the Electric Circuit Lab is renowned in the various fields of engineering applications. For an Electrical Engineer, it is obligatory to have the practical ideas about the Electric Circuits

**PREREQUISITE**

NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | Understand and gain knowledge about circuit laws and theorems. |
| 2 | Gain knowledge about time domain analysis of circuit transients. |
| 3 | Understand the concept of resonance in series and parallel circuits. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | | |
|---|---|---|
| CO1 | Analyze and solve the Electrical circuits | Analyze |
| CO2 | Knowledge about circuit theorems and apply in analysing problems in power system | Apply |
| CO3 | Perform analyse of coupled circuits and transient response of circuits. | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | S | S | S | S | M | S | - | S | M | S | M | S | M | - |
| CO2 | S | S | S | S | S | S | S | - | S | M | S | M | S | M | - |
| CO3 | S | S | S | M | M | M | S | - | S | M | S | L | S | M | - |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**LIST OF EXPERIMENTS**

1. Verification of Ohm's Law
2. Verification of Kirchhoff's laws
3. Verification of Thevenin's Theorem
4. Verification of Norton's Theorem
5. Verification of Superposition theorem

6. Verification of Reciprocity theorem
7. Verification of Maximum Power Transfer theorem
8. Time Domain analysis of RL transient circuits
9. Time Domain analysis of RC transient circuits
10. Series Resonance Circuit
11. Parallel Resonance Circuit
12. Three Phase Power Measurement by Two Wattmeter method

**COURSE DESIGNERS**

| S.No. | Name of the Faculty | Designation | Department | E-Mail ID |
|---|---|---|---|---|
| 1. | R. SATHISH | Assistant Professor | EEE | sathish@vmkvec.edu.in |
| 2. | D. SARANYA | AP/GRADE-II | EEE | |

| 17CVCC92 | FLUID MECHANICS AND STRENGTH OF MATERIALS LAB | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 0 | 0 | 4 | 2 |

**Preamble**

The aim of the subject is to provide make the students to understand the basic mechanism of Fluids and strength of materials.

**Prerequisite**

Nil

**Course Objectives**

1. To understand the concepts of fluid mechanics
2. To get hands on experience to conduct testing of materials.
3. To perform operations in hydraulic machineries and test various materials.

**Course Outcomes**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Measure the flow in pipe section using orificemeter and venturimeter and discharge in channels using notches | Apply |
| Co2. Determine the major and minor losses in pipes | Apply |
| Co3. Determine the behavior of structural elements, such as bars, beams and springs subjected to tension, compression, shear, bending, and torsion by means of experiments | Apply |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | L | L | - | - | - | M | - | - | - | - | L | - | - |
| CO2 | S | M | M | L | - | - | - | M | - | - | M | - | L | - | L |
| CO3 | S | M | L | M | L | L | - | M | L | M | M | - | L | L | L |

S- Strong; M-Medium; L-Low

**List of Experiments**

1. A comparative analysis of Coefficient of discharge using Orifice meter & venturimeter.
2. Determination of pipe loses(major & minor).
3. Determination of Tensile strength and Compression strength on a given specimen.
4. Determination of shear strength of Mild steel and Aluminium rods
5. Determination of Torsional strength of mild steel rod
6. Determination of Impact strength
7. Conduct of Hardness test on metals - Brinell and Rockwell Hardness.
8. Conduct of Deflection test on beams

**Text Books**

1. **'**Fluid mechanics and strength of materials lab manual', Department of Civil engineering, VMKV engineering College, Vinayaka Mission's Research Foundation (Deemed to be University),Salem.

**Reference Books**


1. Modi P.N and Seth S.M, "Hydraulics and Fluid Mechanics Including Hydraulic Machines" Standard Book House" New Delhi, 20thEdition 2015.
2. Bansal R.K, "Fluid Mechanics and Hydraulic Machines" Laxmi Publications, New Delhi, 2015.
3. Rajput. R.K, "A Text book of Fluid Mechanics and Hydraulic Machines", S.Chand and Company, New Delhi, 2011.


**Course Designers:**


| S.No | Name of the Faculty | Designation | Department/College | Mail ID |
|---|---|---|---|---|
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| 17ECCC81 | SEMICONDUCTOR DEVICES LAB | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 0 | 0 | 4 | 2 |

**PREAMBLE**

To reinforce learning in the accompanying semiconductor devices course through hands-on experience by examining the electrical characteristics of various semiconductor devices, such as diodes, BJTs and FETs. To provide the student with the capability for performing various analysis of semiconductor devices.

**PRERQUISITE-** NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To emphasize the practical, hands-on component of this course. |
| 2 | To complement the theoretical material presented in lecture, and as such, is integral and indispensible to the mastery of the subject. |
| 3 | To study experimentally the characteristics of diodes, BJT's and FET's. |
| 4 | To verify practically the response of various special purpose electron devices. |
| 5 | To provide students engineering skills by way of breadboard circuit design with electronic devices and components. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Construct and find the ripple factor and efficiency of HWR and FWR by conducting experiments. | Apply |
| CO2. Construct clipper and clamper circuits for any given specifications and illustrate their output. | Apply |
| CO3. Determine the given transistor parameters from the characteristics of BJT in CE and CC Configuration. | Apply |
| CO4. Design transistor voltage regulator for given specifications and verify its output. | Analyze |
| CO5. Examine the characteristics of SCR, DIAC and TRIAC. | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | M | - | - | - | M | - | M | - | M | - | S | M | M |
| CO2 | S | M | M | - | - | - | M | - | M | - | M | - | S | M | M |
| CO3 | S | M | M | - | - | - | M | - | M | - | M | - | S | M | M |
| CO4 | S | M | M | - | - | - | M | - | M | - | M | - | S | M | M |
| CO5 | S | M | M | - | - | - | M | - | M | - | M | - | S | M | M |

S- Strong; M-Medium; L-Low

**LIST OF EXPERIMENTS**

1. Half Wave Rectifier
2. Full Wave Rectifier
3. Clipper
4. Clamper
5. Input/output Characteristics of CE Amplifier
6. Input/output Characteristics of CC Amplifier
7. Transfer Characteristics of JFET
8. Voltage Regulator
9. TRIAC, DIAC
10. SCR

**COURSE DESIGNERS**

| S.No. | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
| 1 | Dr.P.Selvam | Professor | ECE | hodeee@vmkvec.edu.in |
| 2 | Dr.T.Sheela | Associate Professor | ECE | sheela@vmkvec.edu.in |
| 3 | Mr.N.Manikanda Devarajan | Assistant Professor | ECE | manikandadevarajan@vmkvec.edu.in |
| 4 | Mr.S.Selvam | Assistant Professor (Gr-II) | ECE | selvam@avit.ac.in |

| 17ECCC82 | DIGITAL LOGIC CIRCUITS & DESIGN LAB | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 0 | 0 | 4 | 2 |

**PREAMBLE**

To provide experience & explore designs in analyzing and testing of digital logic circuits like combinational and sequential circuits using lab instruments as well as simulation software.

**Prerequisite** : Basic Electrical and Electronics Engineering

**PRERQUISITE**

17EEES03 - Basics of Electrical and Electronics Engineering

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To impart the knowledge in analysis and design of various combinational logic circuits. |
| 2 | To learn about design and analysis of sequential circuits using flip flops. |
| 3 | To Expose students about design and simulation of logic circuits using HDL. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1.Construct various logic circuits. | Apply |
| CO2. Demonstrate the various combinational logic circuits by using discrete components | Apply |
| CO3. Analyze different sequential logic circuits by using discrete components. | Analyze |
| CO4. Test the various digital logic circuits by using simulation software. | Evaluate |
| CO5. Measure and record the experimental data for various digital circuits. | Evaluate |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | - | - | - | M | - | - | - | M | - | - | L | - | - | - |
| CO2 | S | - | - | - | S | - | - | - | M | - | - | L | S | - | - |
| CO3 | S | M | M | M | M | - | - | - | M | - | - | L | - | - | - |
| CO4 | S | M | - | - | M | - | - | - | M | - | - | L | M | M | M |
| CO5 | S | M | - | - | M | - | - | - | M | - | - | L | - | M | - |

S- Strong; M-Medium; L-Low

**List of Experiments**

Hardware Experiments

1. Design and implementation of Adders using logic gates.
2. Design and implementation of Sub tractors using logic gates.
3. Design and implementation of BCD to Excess -3 code converter using logic gates
4. Design and implementation of Binary to Gray code converter using logic gates
5. Design and implementation of 4 bit BCD adder using IC 7483
6. Design and implementation of 2 Bit Magnitude comparator using logic gates
7. Design and implementation of Multiplexer and De-Multiplexer using logic gates
8. Design and implementation of encoder and decoder using logic gates
9. Design and implementation of 3 bit synchronous up/down counter.
10. Implementation of SISO, SIPO, and PISO shift registers using flip flops.

**Software Experiments using HDL**

1. Design and Simulation of Full adder circuit using Gate level modelling
2. Design and Simulation of 2X2 multiplier circuit using structural level modeling.
3. Design and Simulation of 8 to 1 Multiplexer circuit using behavioural level modeling.

**COURSE DESIGNERS**

| S.No. | Name of the Faculty | Designation | Department | Mail ID |
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| 3 | Ms.R.Mohana Priya | Assistant Professor (Gr-II) | ECE | mohanapriya@avit.ac.in |

| 17MECC92 | DYNAMICS LAB | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 0 | 0 | 4 | 2 |

**Preamble**

The aim of the subject is to provide sufficient knowledge and ability to apply the various concepts of the dynamic characteristics of various machineries.

**Prerequisite - NIL**

**Course Objective**

| | |
|---|---|
| 1 | To learn the mass moment of inertia and Radius of gyration of the compound pendulum. |
| 2 | To learn experimentally the moment of inertia of a rectangular bar of a Bifilar suspension system. |
| 3 | To study experimentally the moment of inertia and radius of a circular plate Trifilar suspension system. |
| 4 | The objective of this experiment to determine the natural frequency if a spring mass system. |
| 5 | The objective of this centrifugal governor to study the dynamic characteristics and to determine its controlling force at various positions and compare the experimental and theoretical values. |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO1. | Estimate the mass moment of inertia of using , bi-filar suspension Trifilar Suspension, compound pendulum. | Apply |
| CO2. | Apply and Inspect the critical speed of shaft under the given load conditions and the gyroscopic effect and couple on motorized gyroscope. | Apply |
| CO3. | Determine the application of characteristic curves of Watt, Porter, Proell and Hartnell governors. | Apply |
| CO4. | To apply and Determine the Natural Frequency of Spring Mass System. | Apply |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO1 1 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | L | M | L | - | - | - | | - | - | - | L | - | - |
| CO2 | S | M | L | M | L | - | - | - | | - | - | - | L | - | - |
| CO3 | S | L | L | M | L | - | -- | - | | - | - | - | L | - | - |
| CO4 | S | L | L | M | L | - | - | - | | - | - | - | L | - | - |

**S- Strong; M-Medium; L-Low**

**Syllabus**

**LIST OF EXPERIMENTS**

1. Perform an Experiment on Watt and Porter Governor and to find the stability and sensitivity.

2. To Determine the controlling force and speed of a Proell Governor.

3. To Determine the position of sleeve against controlling force and speed of a Hartnell Governor.

4. Determination of Gyroscopic couple using Motorized Gyroscope.

5. Determination of critical speed of Whirling Shaft.

6. Determination of Natural Frequency of single degree of freedom system in a spring mass system.

7. Determination of Radius of Gyration- compound Pendulum

8. To Determine the moment of inertia by Trifilar and Bifilar Suspension.

**Text Books**

| | |
|---|---|
| **1** | **DYNAMICS Lab Manual** |

**Course Designers**

| **S.No** | **Faculty Name** | Designation | Department / Name ofthe College | Email id |
|---|---|---|---|---|
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| 17EECC87 | CONTROL SYSTEMS LAB | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 0 | 0 | 4 | 2 |

**PREAMBLE**

Control Systems simulation Lab consists of multiple workstations, each equipped with an oscilloscope, digital multi-meter, PID trainers, control system trainers and stand alone inverted-pendulum, ball and beam control, magnetic-levitation trainers. This lab also covers the industrial implementation of advanced control systems via different computer tools such as MATLAB and Simulink.

**PREREQUISITE**

NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response |
| 2 | To assess the system performance using time domain analysis and methods for improving it |
| 3 | To assess the system performance using frequency domain analysis and techniques for improving the performance |
| 4 | To design various controllers and compensators to improve system performance |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | | |
|---|---|---|
| CO1 | How to improve the system performance by selecting a suitable controller and/or a compensator for a specific application | Understand |
| CO2 | Apply various time domain and frequency domain techniques to assess the system performance | Apply |
| CO3 | Apply various control strategies to different applications(example: Power systems, electrical drives etc) | Analyze |
| CO4 | Test system controllability and observability using state space representation and applications of state space representation to various systems | Analyze and Create |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | S | L | M | S | - | - | - | M | L | - | L | S | M | S |
| CO2 | S | S | L | M | S | - | - | L | M | L | M | - | S | M | - |
| CO3 | S | S | S | M | S | - | L | - | M | L | - | M | S | M | S |
| CO4 | S | S | - | M | S | L | - | - | M | L | - | M | S | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**LIST OF EXPERIMENTS**

1. Transfer function of self and separately excited DC Generator.
2. Transfer function of Armature and Field controlled DC Motor.
3. Transfer function of AC Servomotor.
4. Frequency response of Lag, Lead & Lag – Lead networks.
5. Study of Synchros and DC Stepper Motor
6. Transfer function of Ward – Leonard method of speed control of DC motor.
7. Study of DC Position Control system and study of various transducers
8. Study of P, PI and PID Controllers (First Order).
9. Analog and simulation of type – o and type – 1 systems
10. Stability analysis of Linear Systems
11. Digital simulation of first order systems
12. Digital simulation of second order systems

**COURSE DESIGNERS**

| S.No. | Name of the Faculty | Designation | Department | e-mail id |
|---|---|---|---|---|
| 1. | R. SATHISH | Assistant Professor | EEE | sathish@vmkvec.edu.in |
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| 17ECCC96 | SENSORS AND ELECTRONIC MEASUREMENTS LAB | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 0 | 0 | 4 | 2 |

**Preamble**

This course provides comprehensive idea about working operation of various types of sensors used to measure various physical quantities. measurement techniques to assess the quality of processes, components, systems..

**Prerequisite**

Nil

**Instructional Objective**

| | |
|---|---|
| 1 | Uses technical knowledge, design methodology, and appropriate design tools and related resources. |
| 2 | Distinguishes between different design steps and carries out steps; Analyzes/evaluates progress of design. |
| 3 | Student will learn the different kind of measurements ie: Displacement, speed, temperature. |
| 4 | To learn the measurement of capacitance & inductance. |
| 5 | Student will learn the signal conditional circuits ie: Analog to Digital converter. |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO1. | Select appropriate transducer to measure given parameters. | Apply |
| CO2. | Construct a proper AC/ DC bridges for measurement of R, L & C. | Apply |
| CO3. | Analyze the characteristics of strain gauges. | Analyse |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O1 | PS O2 | PS O3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | M | - | M | - | - | - | M | - | - | M | S | S | M |
| CO2 | S | S | M | M | M | - | - | - | M | - | - | M | S | S | - |
| CO3 | S | M | M | - | M | - | - | - | M | - | - | M | S | S | M |

**S- Strong; M-Medium; L-Low**

**Syllabus**

**List of Experiments**

1. Speed measurement using Photoelectric tachometer
2. Digital transducer – shaft angle encoder
3. Strain gauge characteristics.
4. Torque measurement
5. Displacement measurement using potentiometric transducer.
6. Measurement of Temperature using RTD.
7. Measurement of temperature using Thermocouple.
8. Measurement of Capacitance using Schering bridge.
9. Measurement of Resistance using Wein bridge.
10. Measurement of Inductance using Anderson bridge.

**Reference Books**

| | |
|---|---|
| **1** | Laboratory reference manual |

**Course Designers**

| **S.No** | **Faculty Name** | **Designation** | Department | **Email id** |
|---|---|---|---|---|
| **1** | Mr.G.Murali | Assistant Professor | ECE | muralig@vmkvec.edu.in |
| **2** | Mr. P. Subramanian | Associate Professor | ECE | subramanian@avit.ac.in |

| 17ECCC95 | MICROCONTROLLERS LAB | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 0 | 0 | 4 | 2 |

**PREAMBLE:**

Microcontroller is one of the usually used methods in many electronic systems and automatic devices. It is essential to know their operation and how they can be used in automated control system applications. The main objective of this lab course is to gain the practical hands on experience of programming the 8086 microprocessor and 8051 microcontroller and gain knowledge on interfacing of different peripherals to microcontroller. Students can be able to write the assembly language programming skills, knowledge in interfacing devices and real time applications of microcontroller.

**PRERQUISITE –** Nil

**COURSE OBJECTIVES**

1. To Learns Assembly Language Programming For Arithmetic Operations Using 8051.
2. To Study The Various Peripheral Devices And Interfacing With Microcontroller.
3. To Expand Writing Skills For Assembly Language Programming For Microcontroller.
4. Develop Assembly Language Programs For Various Applications Using 8051 Microcontroller.

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1.** Write ALP Programming For Microprocessor And Microcontroller | Understand |
| **CO2.** Interface Different I/Os With Microcontroller | Apply |
| **CO3.** Generate Different Waveforms Using Microcontroller | Apply |
| **CO4.** Design Circuits For Various Applications Using Microcontrollers | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | S | M | -- | S | -- | -- | -- | S | L | -- | M | - | - | -- |
| CO2 | S | S | M | -- | S | M | -- | -- | S | L | -- | M | S | S | - |
| CO3 | S | S | M | -- | S | M | -- | -- | S | L | -- | M | S | - | - |
| CO4 | S | S | M | -- | S | S | -- | -- | S | L | -- | M | - | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**LIST OF EXPERIMENTS**

1. 8085 & 8086 Assembly Language Program (ALP) for Arithmetic Operations.
2. 8051 Assembly Language Program (ALP) for Arithmetic Operations.
3. 8051 Assembly Language Program (ALP) for Logical Operations.

4. 8051 Assembly Language Program (ALP) for Bit Manipulation Operations.
5. 8051 Assembly Language Program (ALP) for arrange the numbers in Ascending and Descending order.
6. 8051 Assembly Language Program (ALP) for Interrupt & UART Operations.
7. Interfacing an ADC to 8051 Controller.
8. Interfacing DAC to 8051 Controller and generate Square, Triangular & Saw-tooth waveform.
9. Interfacing a Stepper motor to 8051 Controller and operate it in clockwise and anti-clockwise directions.

Interfacing a Keyboard & Display controller (8279) to 8051 Controller.

**REFERENCE**

1. Laboratory Reference Manual

**COURSE DESIGNERS**


| S.No. | Name of the Faculty | Mail ID |
|---|---|---|
| 1 | Mr. R.Karthikeyan | rrmdkarthikeyan@avit.ac.in |
| 2 | Dr. R.Ramani | ramaniapece@gmail.com |
| 3 | Mr. N.Manikandadevarajan | manikandadevarajan@vmkvec.edu.in |
| 4 | Mr. G.Suresh kumar | sureshkumar@vmkvec.edu.in |

| 17MTCC81 | **PROGRAMMABLE LOGIC CONTROLLERS LAB** | **Category** | **L** | **T** | **P** | **Credit** |
|---|---|---|---|---|---|---|
| | | CC | 0 | 0 | 4 | 2 |

**PREAMBLE -** This course provides comprehensive idea about working operation of PLC control the various automatic devices

**PREREQUISITE -**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | Uses technical knowledge PLC operation of various control the parts. |
| 2 | Distinguishes between different control steps and carries out steps; Analyzes/evaluates progress of design. |
| 3 | Student will learn the different kind of control ie: ON / OFF, speed, temperature.etc |
| 4 | Student will learn the timer and counter. |
| 5 | Student will learn the advanced controller devices. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Construct and Verify the performance of various types of control using PLC ladder diagram. | Apply |
| CO2. Interface stepper motor , DC motor with PLC module to control the speed of rotation. | Apply |
| CO3. Design and test ON /OFF control in flow and pressure process control using PLC. | Apply |
| CO4.Test various relays and traffic light control using PLC. | Analyse |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO06 | PO07 | PO08 | PO09 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | M | M | L | - | M | - | M | - | - | M | S | M | - |
| CO2 | S | M | M | M | M | - | - | - | M | - | - | M | S | M | - |
| CO3 | S | S | S | S | L | - | M | - | M | - | L | M | S | M | M |
| CO4 | S | M | M | M | M | - | - | - | M | - | - | M | S | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

1. PLC ladder diagram using logic gates.

2. Stepper Motor interface.

3. D.C motor controller interface.

4. Linear actuation of hydraulic cylinder with counter and speed control.

5. Sequential operation of pneumatic cylinders.

6. Traffic light controller.

7. Speed control of DC motor using PLC.

8. Testing of Relays using PLC.

9. Design of ON / OFF control in Flow and Pressure process control in PLC.

**Reference Books**

1. Laboratory reference manual

**COURSE DESIGNERS**

| S.No | Name of the Faculty | Designation | Department | Email ID |
|---|---|---|---|---|
| 1 | Mr.S.Kannan | Assistant Professor | ECE | kannan@vmkvec.edu.in |
| 2 | Mr.G.Murali | Assistant Professor | ECE | Muralig@vmkvec.edu.in |
| 3 | Dr. L. K. Hema | Professor & Head | ECE | hemalk@avit.ac.in |

| 17MECC88 | COMPUTER INTEGRATED MANUFACTURING LAB | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 0 | 0 | 4 | 2 |

**Preamble**
This course provides the basic knowledge about CNC machine and CNC programming

**Prerequisite –** NIL

**Course Objective**

| | |
|---|---|
| 1 | To explain the basics of part programming for turning and milling using G & M codes. |
| 2 | To construct the CNC program for a given profile in milling. |
| 3 | Make use of Canned Cycle, Mirroring and subroutines for machining a given profile |
| 4 | To Construct the program for a given profile in turning. |
| 5 | To examine the tool path simulation and generation of codes using Software |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO1. | To demonstrate the basic knowledge about G and M codes | Understand |
| CO2. | Apply the programming knowledge to write the program for linear and circular interpolation, circular & rectangular pocketing | Apply |
| CO3. | Apply the knowledge of mirroring, canned cycle and subroutine concepts to write the CNC program | Apply |
| CO4. | Apply the knowledge of different types of canned cycles including turning, facing, grooving, drilling, boring and threading etc., | Apply |
| CO5 | Analyze the tool path simulation and generation of codes using Software | Analyze |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO1 1 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | L | L | - | - | - | - | - | - | - | - | L | M | L | |
| CO2 | S | S | M | - | - | - | - | - | M | - | - | M | M | L | |
| CO3 | S | S | S | - | - | - | - | - | M | - | - | M | M | L | |
| CO4 | S | S | S | - | - | - | - | - | M | - | - | M | M | L | |
| CO5 | S | S | S | - | S | - | - | - | S | - | - | S | M | L | |

**S- Strong; M-Medium; L-Low**

**SYLLABUS:**

**LIST OF EXPERIMENTS:**

**Introduction:**

1. Study of G and M codes

2. Manual Part Programming for CNC Machines using Standard G and M Code.
3. Machining practice on Trainer Type CNC Machines
4. Simulation of tool path using CAM simulation Software

**Part programming for CNC Milling:**

1. Point to point motions
2. Linear motions
3. Circular interpolations
4. Contour motions
5. Rectangular pocketing
6. Mirroring
7. Circular Pocketing
8. Fixed /canned cycles
9. Subroutines

**Part programming for CNC Turning :**

1. Turning and facing
2. Step turning and Taper Turning
3. Grooving
4. Fixed/Canned Cycles
5. Thread cutting Cycles
6. Peck Drilling Cycles

**Text Books**

| | |
|---|---|
| **1** | **CAM LAB Manual** |

**Course Designers**

| **S.No** | **Faculty Name** | **Designation** | **Department/ College** | **Email id** |
|---|---|---|---|---|
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| 17MTCC82 | **ROBOTICS LAB** | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 0 | 0 | 4 | 2 |

**PREAMBLE**

Robotics is the prominent component of manufacturing automation which will affect human labor at all levels, from unskilled workers to professional engineers and managers of production. Future robots may applications outside of the factory in banks, restaurants, and even homes.

**PRERQUISITE**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To introduce different types of robotics and demonstrate them to identify different parts and components |
| 2 | To write programming for simple operations like pick and place, rotoxim etc. |
| 3 | To practice with the simulation from simple to six axis robot. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1.Implement the programming and control of robots | Apply |
| CO2.Predict the Path and trajectory planning for given environment | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | M | M | L | - | - | - | M | - | L | L | S | M | M |
| CO2 | S | S | S | M | M | M | - | - | M | - | M | M | S | M | M |

S- Strong; M-Medium; L-Low

**List of Experiments**

1) Study of different types of robots based on configuration and application.
2) Study of different type of links and joints used in robots
3) Study of components of robots with drive system and end effectors.
4) Simulation of Forward and Inverse Kinematics using Robo Analyzer.
5) Simulation of Workspace Analysis of a 6 axis robot.
6) Forward and inverse kinematics using QBot 2
7) Verification of transformation (Position and orientation) with respect to gripper and world coordinate system
8) Estimation of accuracy, repeatability and resolution.

**COURSE DESIGNERS**

| S.No | Name of The Faculty | Designation | Department | Email.ID |
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| 17MECC93 | HYDRAULICS AND PNEUMATIC SYSTEM LAB | Category | L | | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 0 | 0 | 4 | 2 |

**Preamble**

Togain knowledge about components used in fluid power system and familiarize various circuits used in industry

**Prerequisite –** NIL

**Course Objective**

| | |
|---|---|
| 1 | To impart practice in hydraulic and pneumatic circuit |
| 2 | To experiment with various hydraulic circuits designed for different needs. |
| 3 | To utilize the skills to design a circuit for any application |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO1. | Construct a hydraulic system for the specific need in the industries. | Apply |
| CO2. | Develop a pneumatic system for the specific need in the industries. | Apply |
| CO3. | Identify the possibilities of automation and develop a suitable system to automate the processes. | Apply |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | S | S | M | M | - | - | - | M | - | - | L | M | L | |
| CO2 | S | S | S | M | M | - | - | - | M | - | - | L | M | L | |
| CO3 | S | S | M | M | L | - | - | - | M | - | - | M | M | L | |

**S- Strong; M-Medium; L-Low**

**SYLLABUS:**

**LIST OF EXPERIMENTS:**

1. Study of Speed Control Circuit on Hydraulic Trainer
2. Study of Sequencing Circuit on Hydraulic Trainer
3. Study of Synchronizing Circuit on Hydraulic Trainer
4. Study of Regenerative Circuit on Hydraulic Trainer
5. Study of Counterbalancing Circuit on Hydraulic Trainer
6. Study of ISO/GIS Fluid Power Symbols
7. Design and assembly of hydraulic / pneumatic circuit
8. Visit Report for Demonstration of Fluid Power Circuit

| Text Book | | | | |
|---|---|---|---|---|
| **HYDRAULICS AND PNEUMATIC SYSTEM LAB Manual** | | | | |
| **Course Designers** | | | | |
| **S.No** | **Faculty Name** | **Designation** | **Department/ College** | **Email id** |
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| 17MTEC01 | DESIGN OF MECHATRONICS SYSTEM | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC(PS) | 3 | 0 | 0 | 3 |

**PREAMBLE**

A Mechatronic system design is a design process that is characterized by synergistic integration of mechanisms, sensors, actuators and control to perform complex tasks in a metaphysical environment. An important characteristic of Mechatronic devices and systems is their built-in intelligence, which results through a combination of precision mechanical and electrical engineering and real-time programming integrated with the design process. Mechatronics system design makes possible to understand the basic design process involved in mechatronics, selection of sensors and actuators, the interface issues and communication problems.

**PREREQUISITE**

**NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To familiarize with the design parameters of Mechatronics system. |
| 2 | To acquire knowledge in port components used in system modeling. |
| 3 | To know about Generalized Mechatronics Design Process. |
| 4 | To understand the role of piezo electric sensors and actuators in various applications |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Discuss about Modelling of Mechatronics System | Understand |
| CO2.Explain the design process involved in mechatronics | Understand |
| CO3. Select the sensor and Actuator for a Mechatronic application | Apply |
| CO4 Develop a Mechatronic product for the given problem | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | M | M | - | - | - | - | - | - | - | L | M | - | - |
| CO2 | S | M | M | L | - | - | - | - | - | - | - | L | S | M | - |
| CO3 | S | M | M | - | - | - | - | - | - | - | - | L | S | M | M |
| CO4 | S | S | M | M | M | M | - | - | M | - | M | M | S | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**Introduction to Mechatronic System Design**:

Key elements – Mechatronics Design process –Design Parameters – Traditional and Mechatronics designs – Advanced approaches in Mechatronics - Industrial design and ergonomics, safety.

**System Modelling by Bond Graphs**:

Introduction-model categories-fields of application, generalized variables in bond graph- Power variables – Energy variables, Basic components in Bond graph-1 Port components- 1 Port Resistor- 1 Port Capacitor – 1 Port Inductor, 2 Port components- Transformer- Gyrator, 3 Port Components – 0 Junction, 1 Junction, Model development-Design examples.

**Generalized Mechatronics Design Process**:
Recognition of the Need, Conceptual Design and Functional Specification, First principle Modular Mathematical Modeling, Sensor and Actuator Selection, Drivers for Actuators, Control System Design, Design Optimization, Prototyping, Hardware-in-the-loop Simulation, Deployment/Life Cycle, Deployment of Embedded Software, Life Cycle Optimization

**Design of cantilever beam vibration control system based on piezo sensors and actuators** :
Introduction, Modeling of the Cantilever Beam and PZT Actuator (Modeling of the Beam, Modeling of the PZT Actuator, Modeling of the Sensor), Beam Experimental Setup (properties and dimensions of the beam, dimensions and bonding techniques), instrumental setup (Charge amplifier, Voltage amplifier, Data Acquisition), Controller and Software (Development of the PID VI)

**Text Book**


1. Shruva Das, "Mechatronic Modelling and Simulation Using Bond Graphs" CRC Press, 2009.
2. W. Bolton, "Mechatronics – Electronic control systems in Mechanical & Electrical Engineering", Pearson Education Ltd., 2003.
3. Shetty and Kolk , "Mechatronics System Design" , CENGAGE Learning, India, second edition, 2011.


**Reference Books**


1. Bishop, Robert H, "Mechatronics Hand book", CRC Press, 2002.
2. Kenji Uchino and Jayne R. Giniewicz, "Mechatronics" publication: Marcel Dekker, Inc.


**COURSE DESIGNERS**

| S.No. | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
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| 17EEEC07 | **INTELLIGENT CONTROLLERS** | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC | 3 | 0 | 0 | 3 |

**PREAMBLE**

Intelligent control achieves automation via the emulation of biological intelligence. It either seeks to replace a human who performs a control task (e.g., a chemical process operator) or it borrows ideas from how biological systems solve problems and applies them to the solution of control problems. This course provides an overview of several techniques used for intelligent control and discusses challenging industrial application domains where these methods may provide particularly useful solutions. The subject begins with a brief overview of the main areas in intelligent control, which are fuzzy control and neural networks

**PREREQUISITE**

17EECC08 Control systems

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | Analyze the performance of the controller using fuzzy logic system and neural network for armature controlled DC motor seed control |
| 2 | Analyze the performance of neural network and fuzzy logic systemfor system identification |
| 3 | Analyze the reason for better generalization capability of SVM as compared to Neural network |
| 4 | Analyze the performance of fuzzy based gain scheduling control |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | | |
|---|---|---|
| CO1 | Explain the role of Artificial intelligence in industrial controllers and basics of fuzzy and neural systems. | Understand |
| CO2 | Explain the modeling of a controller using fuzzy and neural systems | Understand |
| CO3 | Apply fuzzy and neural systems for system identification | Apply |
| CO4 | Analyze the performance of the controllers based on fuzzy and neural for industrial applications. | Analyze |
| CO5 | Apply genetic algorithm to Optimal control problems using Simulation Tool Box | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | - | M | - | - | - | - | - | - | - | - | - | M | - | - |
| CO2 | S | M | S | M | M | - | - | - | - | - | - | - | - | - | L |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO3 | S | S | S | S | S | M | - | M | - | - | - | - | S | - | - |
| CO4 | S | S | S | S | S | S | M | - | S | - | - | - | S | - | - |
| CO5 | S | L | S | L | S | - | - | - | L | L | - | - | M | S | - |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**INTRODUCTION**

Approaches to intelligent control. Architecture for intelligent control. Symbolic reasoning system, rule-based systems, the AI approach. Knowledge representation. Expert systems.

**ARTIFICIAL NEURAL NETWORKS**

Concept of Artificial Neural Networks and its basic mathematical model, McCulloch Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron. Learning and Training the neural network. Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations. Hopfield network, Self-organizing network and Recurrent network. Neural Network based controller

**GENETIC ALGORITHM**

Basic concept of Genetic algorithm and detail algorithmic steps, adjustment of free parameters. Solution of typical control problems using genetic algorithm. Concept on some other search techniques like tabu search and ant-colony search techniques for solving optimization problems.

**FUZZY LOGIC SYSTEM**

Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning. Introduction to fuzzy logic modeling and control. Fuzzification, inferencing and defuzzification. Fuzzy knowledge and rule bases. Fuzzy modeling and control schemes for nonlinear systems. Self-organizing fuzzy logic control. Fuzzy logic control for nonlinear time-delay system.

**APPLICATIONS**

GA application to power system optimisation problem, Case studies: Identification and control of linear and nonlinear dynamic systems using Matlab-Neural Network toolbox. Stability analysis of Neural-Network interconnection systems. Implementation of fuzzy logic controller using Matlab fuzzy-logic toolbox. Stability analysis of fuzzy control systems.

**TEXT BOOKS**

1. Padhy.N.P. Artificial Intelligence and Intelligent System, Oxford University Press. (2005),

2. KOSKO,B. "Neural Networks And Fuzzy Systems", Prentice-Hall of India Pvt. Ltd., 1994.

3. Siddique, Nazmul, "Intelligent Control", Springer 2014

**REFERENCES:**

1. Jacek.M.Zurada, "Introduction to Artificial Neural Systems", Jaico PublishingHouse, 1999.
2. KLIR G.J. & FOLGER T.A. "Fuzzy sets, uncertainty and Information", Prentice-Hall of India Pvt. Ltd., 1993.
3. Zimmerman H.J. "Fuzzy set theory-and its Applications"-Kluwer Academic Publishers, 1994.
4. Driankov, Hellendroon, "Introduction to Fuzzy Control", Narosa Publishers.
5. Goldberg D.E. (1989) Genetic algorithms in Search, Optimization and Machine learning, Addison Wesley.

**COURSE DESIGNERS**


| S.No. | Name of the Faculty | Designation | Department | e-Mail ID |
|---|---|---|---|---|
| 1. | R. SATHISH | Assistant Professor | EEE/VMKVEC | sathish@vmkvec.edu.in |
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| 17EEEC23 | PRINCIPLES OF AUTOMATIC CONTROL | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC | 3 | 0 | 0 | 3 |

**PREAMBLE**

To provide the basics and fundamental concepts of automatic control systems. This will permit an engineer to exploit time domain and frequency domain tools to design and study automatic linear control systems

**PREREQUISITE**

1. NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To provide a clear view of operational characteristics of sensors for its use in control system |
| 2 | To accustom with different industrial control system |
| 3 | To impart knowledge of pneumatic and hydraulic control actions |
| 4 | To acquire and apply knowledge of stability of control system |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | | |
|---|---|---|
| CO1 | Understand and apply the knowledge of different type of sensors in control system | Understand |
| CO2 | Develop analogy for spring-mass damping system with electrical systems, thermal system, flow system | Apply |
| CO3 | Understand and apply the knowledge of different types of pneumatic and hydraulic control actions | Understand |
| CO4 | Understand and apply the knowledge of stability of control system | Understand |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | - | L | - | - | - | - | L | - | - | - | M | M | - | - |
| CO2 | - | S | M | L | M | L | - | - | - | - | M | S | - | M | - |
| CO3 | S | M | L | - | - | - | - | - | - | - | - | S | S | - | - |
| CO4 | - | S | M | - | M | - | L | - | S | - | - | - | S | - | - |

S- Strong; M-Medium; L-Low

## SYLLABUS

**Unit 1**

Introduction Architecture industrial automation system, development trends in industrial automation, classification of existing systems, and functionality of industrial automation system. Relay and contactor logic, AC and DC relays and their role for load control. Power and Auxiliary contactors and their usage for load control.

**Unit 2**

Industrial Measurement System Characteristics Sensors and control logic, control using potential free output sensors Control using PO, PC, NO, NC type output sensor, 2W(2wire), 3W(3 wire), 4W(4wire) and 4WC sensors, Linear potentiometer Timer hardware architecture, Controlling industrial system using timers Controlling industrial system using counters .Temperature Measurement, Pressure, Force and Torque Sensors, Motion Sensing, Flow Measurement, Signal Conditioning, Data Acquisition Systems.

**Unit 3**

Automatic Control Introduction, P-I-D Control, manual and auto PID Control Tuning, Feed forward Control Ratio Control, Time Delay Systems and Inverse Response Sy stems, Special Control Structures. Temperature controller hardware architecture.

**Unit 4**

PLC Introduction to Sequence Control, PLC, RLL (Relay Ladder Logic), Sequence Control. Scan Cycle, Simple RLL Programs, Sequence Control. More RLL Elements, RL L Syntax, A Structured Design Approach to Sequence, PLC Hardware Environment, Introduction To CNC Machines, Contour generation and Motion Control, Allen Bradley PLC and SIEMEN PLC.

**Unit 5**

Industrial Control Basics of hydraulics, Hydraulic components their functions and symbols Hydraulic actuators, Pumps and its operation, pump control, Hydraulic valves (Direction control, pressure and flow control), special valves, pressure gauges and switches, hydraulic logic circuits, Hydraulic Control System, Multiple pressure and speed operations, Industrial Hydraulic Circuit, Pneumatic systems and components Pneumatic Control Systems, compressor operation and control, air treatment.

**Text books :**


1. Butterworth-Heinemann ,Principles of Automatic control, , 2nd edition 1975
2. S N Verma Automatic Control Systems Khanna Publishers (2002)
3. Farid Golnaraghi, Benjamin C. Kuo, Automatic Control Systems, Wiley; Ninth edition (2014)


**References:**


1. Lingefeng Wang, Kay Chen Tan, "Modern Industrial Automation and Software Design" John Wiley & Sons Inc.
2. K. L.S. Sharma, " Overview of Industrial Process Automation", Elsevier
3. Kok Kiong "Drives and Control for Industrial Automation", Springer


**COURSE DESIGNERS**


| S.No. | Name of the Faculty | Designation | Department | e-Mail ID |
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| 17ECEC25 | MICRO ELECTRO MECHANICAL SYSTEMS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC(PS) | 3 | 0 | 0 | 3 |

**PREAMBLE**

Micro Electro Mechanical System (MEMS) contains components of sizes less than 1 millimeter. MEMS achieve some engineering functions by electro mechanical or electro chemical means. In general a sensor, an actuator and a signal transduction unit forms the MEMS device. Automobile, Aerospace, Health care are some of the areas where MEMS found applications. Natural science, Mechanical, Electrical, Chemical, Materials and Industrial Engineering are the disciplines involved in design, Manufacture and Packaging of MEMS devices. This course provides a comprehensive treatment with synergetic integration of wide spectrum of discipline in science and engineering to cater the multidisciplinary nature of Mechatronics

**PREREQUISITE -**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To gain basic knowledge on overview of MEMS (Micro electro Mechanical System) and various fabrication techniques |
| 2 | This enables them to design, analysis, fabrication and testing the MEMS based components. |
| 3 | Introduce the students various opportunities in the emerging field of MEMS. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Summarize the working principles of MEMS and Microsystems | Understand |
| CO2. Solve problems in scaling laws applicable to miniaturization | Apply |
| CO3. Explain Materials for MEMS and Microsystems | Apply |
| CO4. Select micro-system fabrication and Micro-manufacturing process for a given application | Apply |
| CO5. Explain the packaging aspects of Micro System | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO06 | PO07 | PO08 | PO09 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | L | L | - | - | - | - | - | - | - | L | S | M | - |
| CO2 | S | M | M | M | M | - | - | - | - | - | - | L | S | M | M |
| CO3 | S | M | M | - | - | - | - | - | - | - | - | L | S | M | - |
| CO4 | S | S | M | M | L | - | - | - | - | - | - | L | S | M | M |
| CO5 | S | L | L | - | - | - | - | - | - | - | - | L | S | - | - |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**Overview of MEMS and Micro Systems:** MEMS and Microsystems, products, Evolution of micro-fabrication, Micro system and Microelectronics, The multidisciplinary nature of MEMS, Miniaturization, applications of micro systems in automotive, health care, aerospace, and telecommunication fields.

**Working Principles of Microsystems:** Introduction, micro sensors: Acoustic waves, optical, chemical, pressure, thermal, biomedical and bio sensors. Micro actuation: using thermal forces, shape memory alloys, piezoelectric crystals and electrostatics forces. MEMS with micro actuators: micro grippers, micro motors, micro valves, micro pumps, micro accelerometer

**Scaling law in miniaturization**: Introduction to scaling, scaling in rigid body dynamics, electrostatic forces, electromagnetic forces, electricity, fluid mechanics and heat transfer.

**Materials for MEMS and Microsystems:** Introduction, substrate and wafers, active substrate materials, silicon, silicon compounds, silicon piezoresistors, polymers and packaging materials.

**Microsystem fabrication process:** Introduction, Photolithography, ion implantation, diffusion, oxidation, chemical vapour deposition, physical vapour deposition (sputtering), Deposition by epitaxy, wet and plasma etching.

**Overview of Micro manufacturing: I**ntroduction, bulk micromachining, surface micromachining, the LIGA process. Microsystem packaging: Introduction, Microelectronics packaging, Microsystem packaging, Interfaces in microsystem packaging, Essential packaging technologies, Pressure sensor packaging

**TEXTBOOKS**

1. Tai –Ran Hsu, "MEMS and Microsystem: Design and Manufacture ", Tata McGraw Hill, First Edition, 2002.

**REFERENCE BOOKS**

1. G.K. Ananthasuresh, K. J. Vinoy, S. Gopalakrishnan, K.N. Bhat and V.K. Athrae "Micro and Smart System", Wiley India Pvt Ltd, First edition, 2010.
2. Chang Liu , "Foundation of MEMS", 2nd Edition, Pearson education, 2012.
3. Gad El Hak (Editor), "The MEMS Hand Book", Three volume set, 2nd revised Edition.CRC press, 2005.

**COURSE DESIGNERS**


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| 17ECEC26 | AVIONICS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC(PS) | 3 | 0 | 0 | 3 |

**PREAMBLE**

The aim of the subject is to provide knowledge in aircrafts avionics. This subject will provide the students an in-depth knowledge about the avionics and its architecture, This will also give the detailed knowledge about navigation systems and auto pilot systems.

**PREREQUISITE:-**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To Develop interdisciplinary Knowledge. |
| 2 | To Develop skills on Electronics. |
| 3 | To study on interest for Multi disciplinary Attitude |
| 4 | To Enable and Enhance life for learning |
| 5 | To feature knowledge based on various system |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | | |
|---|---|---|
| CO1. | Explain the basic concept and importance of avionics. | Understand |
| CO2. | Summarize the basics and design modern data benefits. | Apply |
| CO3. | Identify the problem &suggest suitable implement on various system. | Analyze |
| CO4. | Design and Modify the system as per the Needs | Analyze |
| CO5. | Create a new system with additional advance new feature. | Evaluate |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | M | - | - | - | - | - | - | - | - | - | - | S | - | M |
| CO2 | M | M | - | - | - | - | - | - | - | - | - | - | S | S | M |
| CO3 | S | M | M | - | - | - | - | - | - | - | - | M | S | S | M |
| CO4 | S | S | M | - | - | - | - | - | - | - | - | M | S | S | M |
| CO5 | S | S | M | - | - | - | - | - | - | - | - | M | S | S | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**UNIT I INTRODUCTION TO AVIONICS**

Need for avionics in civil and military aircraft and space systems – integrated avionics and weapon systems – typical avionics subsystems, design, technologies – Introduction to digital computer and memories.

**UNIT II DIGITAL AVIONICS ARCHITECTURE**

Avionics system architecture – data buses – MIL-STD-1553B – ARINC – 420 – ARINC – 629.

**UNIT III FLIGHT DECKS AND COCKPITS**

Control and display technologies: CRT, LED, LCD, EL and plasma panel – Touch screen – Direct voice input (DVI)– Civil and Military Cockpits: MFDS, HUD, MFK, HOTAS.

**UNIT IV INTRODUCTION TO NAVIGATION SYSTEMS**

Radio navigation – ADF, DME, VOR, LORAN, DECCA, OMEGA, ILS, MLS – Inertial Navigation Systems (INS) – Inertial sensors, INS block diagram – Satellite navigation systems – GPS.

**UNIT V AIR DATA SYSTEMS AND AUTO PILOT**

Air data quantities – Altitude, Air speed, Vertical speed, Mach Number, Total air temperature, Mach warning, Altitude warning – Auto pilot – Basic principles, Longitudinal and lateral auto pilot.

**TEXTBOOK:-**

1. Albert Helfrick. D, 'Principles of Avionics', Avionics communications Inc., 2004

2. Collinson, R.P.G, 'Introduction to Avionics', Chapman and Hall, 1996.

**REFERENCE BOOKS:-**

1. Middleton, D.H, 'Avionics Systems', Longman Scientific and Technical, Longman Group UK Ltd, England, 1989.

2. Spitzer, C.R. 'Digital Avionics Systems', Prentice Hall, Englewood Cliffs, N.J., USA1993.

3. Spitzer, C.R, 'The Avionics Handbook', CRC Press, 2000.

4. Pallet, E.H.J, 'Aircraft Instruments and Integrated Systems', Longman Scientific, 1992

**COURSE DESIGNERS**


| S.No. | Name of the Faculty | Designation | Department | Mail ID |
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| 17MESE10 | DESIGN FOR MANUFACTURE AND ASSEMBLY | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC(SE) | 3 | 0 | 0 | 3 |

**Preamble**

To study how a design can be made suitable for various manufacturing and assembly process requirements.

**Prerequisite**

**NIL**

**Course Objective**

| | |
|---|---|
| 1 | To understand the factors for Design for Manufacture |
| 2 | To know about the basics of Form Design of casting and welding |
| 3 | To know about the basics of Form design of forged and machined components |
| 4 | To study about design for assembly |
| 5 | To study about the various assembly methods and processes and design for assembly guidelines |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO1. | Understand the factors to be considered for design and manufacturability | Understand |
| CO2. | Understand the requirements and design consideration for casting & welding | Understand |
| CO3. | Understand the requirements and design consideration for forging & machining | Understand |
| CO4. | Apply the various types of approaches followed in Design for assembly methods | Apply |
| CO5. | Analyze the various methods for assembly procedure depending on the process | Apply |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | L | - | - | - | - | - | - | - | - | - | - | L | - | - |
| CO2 | S | S | L | | | - | - | - | - | - | - | - | L | - | - |
| CO3 | S | L | M | | S | - | - | - | - | - | - | - | L | - | - |
| CO4 | S | M | S | M | S | - | - | - | - | - | - | - | M | - | - |
| CO5 | S | M | S | S | M | - | - | - | - | - | - | - | L | - | - |

**S- Strong; M-Medium; L-Low**

**SYLLABUS**

**INTRODUCTION TO DESIGN FOR MANUFACTURE**

Qualities of a designer - Systematic working plan - Factors influencing choice of materials - Manufacturing methods. Process capability. Tolerances - Relevant to manufacturing, assembly. Tolerance stack - effects on assembly- Methods of eliminating tolerance stack.

**FORM DESIGN - CASTING AND WELDING**

Influence of loading, materials, production methods on form design. Casting considerations - Requirements and rules. Welding considerations - Requirements and rules. Redesign of components for castings. Redesign of components for welding. Case studies.

**FORM DESIGN - FORGING AND MACHINING**

Forging considerations - Requirements and rules. Choice between casting, forging and welding. Machining considerations - Requirements and rules. Redesign of components for forging. Redesign of components for machining. Case studies.

**INTRODUCTION TO DESIGN FOR ASSEMBLY**

Distinction between assembly methods and processes. Factors determining assembly methods and processes. Design factors independent of methods and processes. Design factors dependent on methods. Design factors dependent on processes.

**DESIGN FOR ASSEMBLY METHODS**

Approaches to design for assembly - Approaches based on design principles and rules - Qualitativeevaluation procedures, knowledge based approach, Computer aided DFA methods. Assemblability measures. Boothroyd Dewhurst DFA method, Redesign of a simple product. Case studies.

**Text Books**

| | |
|---|---|
| **1** | Alan Redford and chal, Design for Assembly-Principles and Procedures, McGraw Hill International Europe, London, 1994. |
| **2** | Swift. K.G.,Knowledge Based Design for Manufacture,Kogan Page Ltd.,1987 |

**Reference Books**

| | |
|---|---|
| **1** | James G. Bralla, Hand Book ofProduct Design for Manufacturing, McGraw Hill Co., 1986 |

**Course Designers**

| **S.No** | **Faculty Name** | **Designation** | **Department/Name of the College** | **Email id** |
|---|---|---|---|---|
| 1 | R.PRAVEEN | ASST. PROF –GR-II | Mech / AVIT | praveen@avit.ac.in |
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| 17ECCC24 | INTRODUCTION TO VLSI DESIGN | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC (PS) | 3 | 0 | 0 | 3 |

**PREAMBLE**

In the recent times fabrication technology is revolutionized and especially LSI has become so dense that on a single tens and thousands of transistors are placed. Thus integrated circuits have become integrated systems and development of fabrication technology VLSI plays very important role.

**PRERQUISITE**

17ECCC05 Digital Logic Circuit & Design

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To realize various MOS circuits likes NMOS, PMOS and CMOS. |
| 2 | To familiarize with Architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology. |
| 3 | To gain knowledge in the transistor circuit level design in design of CMOS Analog IC. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1.Elucidate the CMOS process technology. | Understand |
| CO2.Design several basic CMOS Combinational circuits. | Apply |
| CO3. Develop the basic CMOS Sequential circuits. | Apply |
| CO4. Analyze Arithmetic Building Blocks | Analyze |
| CO5. Describe the techniques of chip design using programmable devices. | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | - | - | M | - | - | - | M | - | - | L | S | M | - |
| CO2 | S | S | S | M | M | - | - | - | M | - | - | L | S | S | - |
| CO3 | S | S | S | M | M | - | - | - | M | - | - | L | S | M | - |
| CO4 | S | M | M | M | M | - | - | - | M | - | - | L | S | S | M |
| CO5 | S | S | S | S | M | - | - | - | M | - | - | L | S | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**Unit I MOS TRANSISTOR PRINCIPLE**

NMOS and PMOS transistors, Process parameters for MOS and CMOS, Electrical properties of CMOS circuits a device modeling, Scaling principles and fundamental limits, CMOS inverter scaling, propagation delays, Stick diagra Layout diagrams.

**Unit II COMBINATIONAL LOGIC CIRCUITS**

Examples of Combinational Logic Design, Elmore's constant, Pass transistor Logic, Transmission gates, static a

dynamic CMOS design, Power dissipation – Low power design principles.

**Unit III SEQUENTIAL LOGIC CIRCUITS**

Static and Dynamic Latches and Registers, Timing issues, pipelines, clock strategies, Memory architecture and mem control circuits, Low power memory circuits, Synchronous and Asynchronous design.

**Unit IV DESIGNING ARITHMETIC BUILDING BLOCKS**

Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed add accumulators, Multipliers, dividers, Barrel shifters, and speed and area tradeoff.

**UNIT – V IMPLEMENTATION STRATEGIES**

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

**Text Books**


1. Jan Rabaey, AnanthaChandrakasan, B.Nikolic, "Digital Integrated Circuits: A Design Perspective", Sec Edition, Prentice Hall of India, 2003.
2. M.J. Smith, "Application Specific Integrated Circuits", Addisson Wesley, 1997


**REFERENCES:**


1. N.Weste, K.Eshraghian, "Principles of CMOS VLSI Design", Second Edition, Addision Wesley 1993.
2. R.Jacob Baker, Harry W.LI., David E.Boyee, "CMOS Circuit Design, Layout and Simulation", Prentice Hal India 2005.
3. A.Pucknell, Kamran Eshraghian, "BASIC VLSI Design", Third Edition, Prentice Hall of India, 2007.


**COURSE DESIGNERS**


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| 3 | Mr.G.SureshKumar | Assistant Professor | ECE | sureshkumar@vmkvec.edu.in |

| 17ECCC15 | ANALOG & DIGITAL COMMUNICATION | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |

**PREAMBLE**

This course provides a thorough introduction to the basic principles of Analog and Digital Communications. It also deals with Analog and Digital Modulation techniques, Communication Transmitter & Receiver design, Baseband and Bandpass Communication Techniques, Noise Analysis and Multiplexing techniques.

**PREREQUISITE - NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To Understand the basic elements of analog communication system |
| 2 | To learn the basic concepts behind the transmission and reception of Angle Modulation |
| 3 | To impart the knowledge about Analog to Digital Transition Systems &Information Theory |
| 4 | To Analyze & design the performance of various digital carrier transmission. |
| 5 | To Apply the knowledge of Digital Communication circuits in various fields. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1.Interpret the various Analog communication systems. | Understand |
| CO2.Illustrate the principle and operation behind various Modulators , Demodulators in Analog communications | Apply |
| CO3. Apply different coding theory to estimate Entropy, Mutual information, Information rate etc. | Apply |
| CO4.Demonstrate the concept of various digital carrier modulation and determine their error probability. | Apply |
| CO5.Analyze the major classifications of spread spectrum techniques . | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | L | - | - | - | - | - | - | - | - | - | L | M | - | - |
| CO2 | S | M | M | - | M | - | - | - | - | - | - | M | S | M | - |
| CO3 | S | M | M | M | - | - | - | - | - | - | - | M | S | M | - |
| CO4 | S | S | M | M | - | - | - | - | - | - | - | M | S | M | - |
| CO5 | S | M | M | M | L | - | - | - | - | - | - | L | S | - | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**Analog Communication Systems**

Principles of Amplitude Modulation – AM Modulators- Double Side Band Suppressed Carrier Modulation, Single Side Band Modulation, Vestigial Side Band Modulation, AM Demodulators,AM transmitters-Low level & High level Transmitters, AM Receivers – TRF, Super Heterodyne Receiver, Double conversion AM receivers.

**Angle Modulation: Transmission And Reception**

Angle Modulation - FM and PM, Modulation Index, Frequency Modulators and Demodulators, Phase Modulators, FM transmitters- Direct & Indirect transmitters, Angle Modulation Vs Amplitude Modulation, FM Receivers, Frequency Vs Phase modulation.

**Analog to Digital Transition Systems & Information Theory**

Pulse Amplitude Modulation, Pulse Position Modulation, Pulse Code Modulation, Sampling Rate, DPCM, Delta Modulation, Time Division Multiplexing, Information Theory- Uncertainty, Information and entropy, source coding theorem, Discrete Memoryless channels, Mutual Information, Channel capacity, Channel coding theorem.

**Digital Transmission**

Pulse Transmission – Inter Symbol Interference, Eye pattern, Digital carrier Modulation-Binary Amplitude Shift Keying, Binary Frequency Shift Keying, Binary Phase Shift Keying, QPSK, bit and baud rate, BER Analysis

**Spread Spectrum Modulation**

Pseudo noise sequences, Direct sequence Spread Spectrum with coherent BPSK, Frequency hop spread spectrum modulation, Multiple Access Techniques – Wireless Communication, TDMA and FDMA

**TEXT BOOK:**

1. Simon Haykin and Michael Moher, "Communication systems" John Wiley & Sons, Fifth Edition, 2016

**REFERENCE BOOKS:**

1. Simon Haykin and Michael Moher, "An Introduction to Analog and Digital Communications", John Wiley & Sons, second Edition, 2006.
2. Martin S.Roden, "Analog and Digital Communication System", 3rd Edition, PHI, 2002
3. Wayne Tomasi, "Electronic Communication Systems: Fundamentals Through Advanced", Pearson Education, 2001.
4. B. Carlson, "Introduction to Communication systems", 3rd Edition, McGraw Hill, 1989

**COURSE DESIGNERS**


| S.No. | Name of the Faculty | Designation | Department | Mail ID |
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| 3 | Mr.P.Subramanian | Associate Professor | ECE | subramanian@avit.ac.in |

| 17EEPI03 | VIRTUAL INSTRUMENTATION | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | PI | 3 | 0 | 0 | 3 |

**PREAMBLE**

A virtual instrument consists of an industry-standard computer or workstation equipped with powerful application software, cost-effective hardware such as plug-in boards, and driver software, which together perform the functions of traditional instruments.

**PREREQUISITE-NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | Review background information required for studying virtual instrumentation. |
| 2 | Study the basic building blocks of DAQ in virtual instrumentation. |
| 3 | Study the various techniques of interfacing of external instruments of PC. |
| 4 | Study the various graphical programming environments in virtual instrumentation |
| 5 | Study a few applications in virtual instrumentation |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1: Review the study of signal time domain and AC/DC converters. | Remember |
| CO2: The concepts of operation of virtual instrumentation and classification. | Understand |
| CO3:Classify and design of interfacing of external instruments | Evaluator |
| CO4: Apply the concepts of graphical programming. | Apply |
| CO5: Analyze the tools and simple applications in systems for Fourier transform Power spectrum correlation windowing and filtering tools. | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | - | L | S | M | L | M | S | - | - | - | L | M | - |
| CO2 | - | S | M | - | S | M | L | M | S | - | - | - | L | M | - |
| CO3 | S | -- | - | - | - | M | L | M | S | L | L | - | M | M | - |
| CO4 | S | M | S | L | S | M | L | M | S | - | - | - | M | S | - |
| CO5 | M | M | M | L | S | | L | | S | - | - | L | M | S | - |

S- Strong; M-Medium; L-Low

**REVIEW OF DIGITAL INSTRUMENTATION**

Representation of analog signals in the digital domain - Review of quantization in amplitude and time axes, sample and hold, sampling theorem, ADC and DAC.

**FUNDAMENTALS OF VIRTUAL INSTRUMENTATION**

Concept of virtual instrumentation - PC based data acquisition - Typical on board DAQ card - Resolution and sampling frequency - Multiplexing of analog inputs - Single-ended and differential inputs - Different strategies for sampling of multi-channel analog inputs. Concept of universal DAQ card - Use of timer-counter and analog outputs on the universal DAQ card.

**CLUSTER OF INSTRUMENTS IN VI SYSTEM**

Interfacing of external instruments to a PC - RS232, RS 422, RS 485and USB standards - IEEE 488 standard - ISO-OSI model for serial bus - Introduction to bus protocols of MOD bus and CAN bus.

**GRAPHICAL PROGRAMMING ENVIRONMENT IN VI**

Concepts of graphical programming - Lab-view software - Concept of VIs and sub VI - Display types - Digital - Analog - Chart Oscilloscopic types - Loops - Case and sequence structures - Types of data - Arrays - Formulae nodes -Local and global variables String and file I/O.

**ANALYSIS TOOLS AND SIMPLE APPLICATIONS IN VI**

Fourier transform - Power spectrum - Correlation - Windowing and filtering tools - Simple temperature indicator - ON/OFF controller - P-I-D controller - CRO emulation - Simulation of a simple second order system - Generation of HTML page.

**TOTAL HOURS: 45**

**TEXT BOOKS**

1. S. Gupta and J.P Gupta, 'PC Interfacing for Data Acquisition and Process Control', Instrument society of America, 1994.
2. Peter W. Gofton, 'Understanding Serial Communications', Sybex International. 3. Robert H. Bishop, 'Learning with Lab-view', Prentice Hall, 2003.

**REFERENCE BOOKS**

1. Kevin James, 'PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control', Newness, 2000.
2. Gary W. Johnson, Richard Jennings, 'Lab-view Graphical Programming', McGraw Hill Professional Publishing, 2001.

**COURSE DESIGNERS**


| S.No. | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
| 1 | Mr.A.Balamurugan | Associate Professor | EEE/VMKVEC | balamurugan@vmkvec.edu.in |
| 2. | Mrs.D.Saranya | Assist Professor (Gr-II) | EEE/AVIT | dsaranya@avit.ac.in |

| 17ECEC27 | NANOELECTRONICS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC(PS) | 3 | 0 | 0 | 3 |

**PREAMBLE**

The course will focus on current trends in nanoelectronics with special focus on functional electronic and magnetic properties in nanostructured materials. The academic focus is: one-electron transistors and one-electron electronics, effect of 1 and d-dimensional structures on transport properties and electron transport in nanostructures.

**PREREQUISITE** – 17PHBS05 Smart Materials

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | Explain the fundamental science and quantum mechanical effects associated with low dimensional semiconductors. |
| 2 | Identify the significance of nano level fabrication of particles and layers and their characterization |
| 3 | Correlate the concept of quantum level transport and tunneling in similar structured nano devices. |
| 4 | Analyze nanoscale nanostructures time, length scales and Statistics of the electrons devices etc. |
| 5 | To know the low-dimensional structures electrons in quantum and electron transport in quantum wires |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Familiarizes with high-quality nano devices and an enormous variety of applications from computers to biosensors, from cell phone to space shuttles. | Understand |
| CO2. Scaling of transistors and other devices to smaller and smaller sizes to provided the basis for this exponential growth by nano electronics in the next coming decade. | Apply |
| CO3. Analyze photonics, molecular electronics or revolutionary engineering solutions, such as departure from two-dimensional ICs on the surface of silicon wafers to three-Dimensional structures. | Analyze |
| CO4. Actively debate all the gigantic challenges and potential nanotechnology solutions. | Apply |
| CO5. Describe the Numerical analysis of a single heterojunction and Electrons quantum | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO06 | PO07 | PO08 | PO09 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | M | - | L | M | - | - | - | - | - | M | S | S | - |
| CO2 | S | S | S | - | M | - | - | - | - | - | - | M | S | M | - |
| CO3 | S | M | M | M | M | M | - | - | - | - | - | M | S | M | M |
| CO4 | S | M | M | - | M | - | - | - | - | - | - | M | S | M | - |
| CO5 | S | M | S | - | M | - | - | - | - | - | - | M | S | M | - |

S- Strong; M-Medium; L-Low

**SYLLABUS**

UNIT-I:
Free Electron Theory & The New Ohm's Law:Why Electrons flow, Classical free electron theory, Sommerfeld's theory, The quantum of conductance, Coulomb blockade, Towards Ohm's law. The Elastic Resistor: Conductance of an Elastic Resistor, Elastic Resistor-Heat dissipation.

Unit-II:
Materials for nanoelectronics:Semiconductors, Crystal lattices:bonding in crystals, Electron energy bands, Semiconductor heterostructures , Lattice-matched and pseudomorphic heterostructures ,Inorganic nanowires, Organic semiconductors ,Carbon nanomaterials: nanotubes and fullerenes

UNIT-III: Ballistic and Diffusive Transport:Ballistic and Diffusive Transfer Times, Channels for Conduction Conductivity, Conductivity: E(p) or E(k) Relations, Counting States, Drude Formula, Quantized Conductance, Electron Density - Conductivity

Unit-IV:
Electron transport in semiconductors and nanostructures Time and length scales of the electrons in solids, Statistics of the electrons in solids and nanostructures, Fermi statistics for electrons, the density of states of electrons in nanostructures, Electron transport in nanostructures.

Unit -V:
Electrons in traditional low-dimensional structures Electrons in quantum wells: Single modulation-doped heterojunctions, Numerical analysis of a single heterojunction, Control of charge transfer, Electrons in quantum wires, Electron transport in quantum wires, Electrons in quantum dots.

**TEXTBOOKS**

1. Introduction to Nano Science and Technology by S.M. Lindsay.
2.Supriyo Dutta -Lessons from Nanoscience: A Lecture Note Series, World Scientific (2012).

**REFERENCE BOOKS**

1. Supriyo Dutta --Quantum Transport-Atom to Transistor,Cambridge University Press (2005).
2 .Introduction to Nanoelectronics : Science, Nanotechnology,Engineering & Applications by Vladimir.V.Mitin.

**COURSE DESIGNERS**

| S.No. | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
| 1 | Mr. R. Karthikeyan | Assistant Professor (Gr-II) | ECE | rrmdkarthikeyan@avit.ac.in |
| 2 | Mr.R.Ramani | Assistant professor | ECE | ramani@vmkvec.edu.in |

| 17MTEC02 | LOW COST AUTOMATION | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC(PS) | 3 | 0 | 0 | 3 |

**PREAMBLE**

The main aim of low cost automation is to increase productivity and quality of product to reduce the cost of production and not reduce labor.

**PREREQUISITE –** 17ECEC20 Robotics and Automation

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To Understand the Concept and scope of industrial automation and advantages and limitations. |
| 2 | To apply the Automated handling systems Working principles and techniques. |
| 3 | To apply the Concepts of CNC systems. |
| 4 | To design a various elements of hydraulic and Pneumatic systems |
| 5 | To apply and develop a CNC part programming, 'G' and 'M' codes |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Describe the working of the mechanization and automation | Apply |
| CO2. Develop the programming in various types of handling systems | Apply |
| CO3. Develop the design in Automation drives and circuits | Apply |
| CO4. Generate CNC machine control systems | Analyze |
| CO5. Develop a Manual part programming and Computer aided part programming | Create |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO06 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | - | - | - | - | - | - | - | - | - | - | - | S | - | - |
| CO2 | S | M | M | - | - | - | - | - | - | - | - | - | S | - | - |
| CO3 | S | M | M | M | M | - | - | - | - | - | - | M | S | - | - |
| CO4 | S | S | L | - | M | - | - | - | M | - | - | M | S | S | M |
| CO5 | S | S | S | M | S | - | - | - | - | - | - | M | S | S | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

Introduction to Concept and scope of industrial automation – mechanization and automation, classification, balancing of assembly line using available algorithms. Transfer line-monitoring system (TLMS) using Line Status, Line efficiency. Buffer stock Simulation in assembly line.

Automated handling systems Working principles and techniques, job orienting and feeding devices. Transfer mechanisms- automated feed cut of components, performance analysis. Uses of various types of handling systems, including AGV and its various guiding technologies.

Automation drives and circuits Design aspects of various elements of hydraulic systems such as pumps, valves, filters,

reservoirs, accumulators, actuators, intensifiers. Pneumatic fundamentals - control elements, position and pressure sensing - logic circuits - switching circuits -sequential circuits - cascade methods - mapping methods – step counter method - compound circuit design - combination circuit design.

Concepts of CNC systems, features, fundamentals, advantages and classification of NC systems Control system fundamentals, adaptive & feedback controller, transfer function, system stability, Transducer, actuators, MCU, CNC machine tooling, CNC machine control systems– ACO and ACC systems.

CNC part programming, 'G' and 'M' codes, Graphical Numerical Control - part programming - design of post processor. Manual part programming. Computer aided part programming - post processor – APT programming – programming for CNC turning center, CNC Millers, Machining center and CNC EDM.

**TEXTBOOKS**

1. Pressman R.S, Numerical Control and CAM-. John Wiley 1993 Williams

2. Scrope Kalpakjian, "Manufacturing processes for Engineering Materials", Addison Wesley, 1997.

**REFERENCE BOOKS**

1. Radhakrishnan, P., "Computer Numerical Control Machines", New Central Book Agencies, 1997.

2. Yoram Korem., "Computer control of Manufacturing systems", Mc Graw Hill, 1986.
3. Groover, M.P., CAD/CAM- Prentice Hall

**COURSE DESIGNERS**



| S.No. | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
| 1 | Mr.R. Karthikeyan | Assistant Professor (Gr-II) | ECE | rrmdkarthikeyan@avit.ac.in |
| 2 | Mr.S.Kannan | Assistant Professor | ECE | kannan@vmkvec.edu.in |

| 17MESE16 | INDUSTRIAL TRIBOLOGY | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC(SE) | 3 | 0 | 0 | 3 |

**Preamble**
To present the engineering concepts of friction, its effects and different lubrication theories and types used in industries.

**Prerequisite NIL**

**Course Objective**

| | |
|---|---|
| 1 | To understand the concept of tribology. |
| 2 | To examine the concepts of various types of wear |
| 3 | To understand and apply the film lubrication theory |
| 4 | To illustrate the various types of lubricants for different applications. |
| 5 | To demonstrate the various surface engineering concepts and bearing materials. |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO1. | Explain the concepts of friction, wear and lubrication | Understand |
| CO2. | Illustrate about the various types of wear, wear mechanism and its measurements | Apply |
| CO3. | Examine the various film lubrication theory | Apply |
| CO4. | Illustrate about the various types of lubricants | Apply |
| CO5. | Examine various surface modifications and bearing materials. | Apply |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | L | - | - | - | - | - | - | - | - | - | M | - | L |
| CO2 | S | M | L | - | - | L | - | - | - | - | - | - | M | - | L |
| CO3 | S | M | L | - | - | L | - | - | - | - | - | - | M | - | L |
| CO4 | S | S | M | M | - | L | - | - | - | - | - | - | M | - | L |
| CO5 | S | S | S | M | - | L | - | - | - | - | - | - | M | - | L |

**S- Strong; M-Medium; L-Low**

**SYLLABUS**

**SURFACES AND FRICTION**

Introduction to the concept of tribology, Tribological problems- Nature of engineering surfaces, Surface topography- Surface profilometer, measurement of surface topography-Contact between surfaces, Sources of sliding Friction- Friction due to ploughing, Friction due to adhesion- Friction characteristics of metals and non-metals -Sources of rolling friction, Stick slip motion -Friction of ceramic materials and polymers-Measurement of friction.

**WEAR**

Wear and Types of Wear-Simple theory of sliding wear mechanism-Abrasive wear-Adhesive wear-Corrosive wear-Surface fatigue wear situations-Wear of ceramics-Wear of polymers-Wear measurements.

**FILM LUBRICATION THEORY**

Coefficient of viscosity, Fluid film in simple shear-Viscous flow between very close parallel plates:Tutorials-Lubricant supply, Lubricant flow rate-Cold jacking,Couette flow-Cavitations, Film rupture, oil whirl-Shear stress variation within the film-Lubrication theory by Osborne Reynolds: Tutorials-Pressure fields for full sommerfeld, Half sommerfeld-Reynolds boundary conditions.

**LUBRICANTS AND LUBRICATION TYPES**

Types of Lubricants-Properties of Lubricants-Testing methods-Hydrodynamic Lubrication-Elasto-hydrodynamic Lubrication-Hydrostatic lubrication

**SURFACE ENGINEERING AND MATERIALS FOR BEARINGS**

Classification of Surface modifications and Surface coatings-Surface modifications, Transformation hardening-Surface modifications, surface fusion-Thermo chemical Processes-Surface coatings -Materials for rolling element bearings- Materials for fluid film bearings-Materials for marginally lubricated and dry bearings.

**Text Books**

| | |
|---|---|
| **1** | Bearing Tribology: priniciples and applications. |
| **2** | Williams.J.A, “Engineering Tribology”, Oxford University Press. |
| **3** | GwidonStachowiak, Andrew W Batchelor., “Engineering tribology”, Elsevier Butterworth – Heinemann, USA. |

**Reference Books**

| | |
|---|---|
| **1** | Industrial Tribology: Tribosystems, Friction, Wear and Surface Engineering, Lubrication Hardcover , by Theo Mang, Kirsten Bobzin, Thorsten Bartels |
| **2** | Cameron.A, “Basic Lubrication Theory”, Longman, U.K. |
| **3** | Neale.M.J. (Editor), “Tribology Handbook”, Newnes Butter worth, Heinemann, U.K. |

**Course Designers**

| **S.No** | **Faculty Name** | **Designation** | **Department/Name of the College** | **Email id** |
|---|---|---|---|---|
| 1 | M.Saravanan | Asst Prof | MECH./ AVIT | saravanan@avit.ac.in |
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| 17ECEC21 | ADVANCED ROBOTICS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC(PS) | 3 | 0 | 0 | 3 |

**PREAMBLE** Advanced Robotics will explore in great depth areas relevant to not only industrial robotics but service robots (i.e. robots outside a factory environment particularly mobile robots) and the application of this technology to real world environments e.g. driverless vehicles, unmanned aerial vehicles and tele-robots. Students will also master robot kinematics and dynamics.

**PREREQUISITE – NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To gain knowledge in robotic elements |
| 2 | To explore the kinematics of serial and parallel robotics |
| 3 | To know the motion of robot in various coordinates and surfaces |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Illustrate the kinematics of parallel robotics | Apply |
| CO2. Examine about the kinematics of serial robot such as the direct and inverse kinematic problems | Apply |
| CO3. Discriminate various robotic elements like sensors and actuators | Analyze |
| CO4. Investigate the motion of robot in various coordinates | Analyze |
| CO5. Explore the motion of robot in several surfaces like flat surface, uneven terrain | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | - | - | - | - | - | - | - | - | - | M | M | L | L |
| CO2 | S | M | - | - | - | - | - | - | - | - | - | M | M | L | - |
| CO3 | S | S | S | - | - | - | - | M | - | - | - | M | L | L | L |
| CO4 | S | S | S | - | - | - | - | M | - | - | - | M | M | L | - |
| CO5 | S | S | S | - | - | - | - | M | - | - | - | M | L | L | - |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**Elements of robots -- joints, links, actuators, and sensors**

Position and orientation of a rigid body, Homogeneous transformations, Representation of joints, link representation using D-H parameters, Examples of D-H parameters and link transforms, different kinds of actuators – stepper, DC servo and brushless motors, model of a DC servo motor, Types of transmissions, Purpose of sensors, internal and

external sensors, common sensors – encoders, tachometers, strain gauge based force-torque sensors, proximity and distance measuring sensors, and vision.

**Kinematics of serial robots**

Introduction, Direct and inverse kinematics problems, Examples of kinematics of common serial manipulators, workspace of a serial robot, Inverse kinematics of constrained and redundant robots, Tractrix based approach for fixed and free robots and multi-body systems, simulations and experiments, Solution procedures using theory of elimination, Inverse kinematics solution for the general 6R serial manipulator.

**Kinematics of parallel robots**

Degrees-of-freedom of parallel mechanisms and manipulators, Active and passive joints, Constraint and loop-closure equations, Direct kinematics problem, Mobility of parallel manipulators, Closed-from and numerical solution, Inverse kinematics of parallel manipulators and mechanisms, Direct kinematics of Gough-Stewart platform.

**Motion planning and control**

Joint and Cartesian space trajectory planning and generation, Classical control concepts using the example of control of a single link, Independent joint PID control, Control of a multi-link manipulator, Non-linear model based control schemes, Simulation and experimental case studies on serial and parallel manipulators, Control of constrained manipulators, Cartesian control, Force control and hybrid position/force control, Advanced topics in non-linear control of manipulators.

**Modeling and analysis of wheeled mobile robots**

Introduction and some well known wheeled mobile robots (WMR), two and three-wheeled WMR on flat surfaces, Slip and its modeling, WMR on uneven terrain, Design of slip-free motion on uneven terrain, Kinematics, dynamics and static stability of a three-wheeled WMR's on uneven terrain, Simulations using Matlab and ADAMS.

**Reference Books**


1. Ghosal, A., Robotics: Fundamental Concepts and Analysis, Oxford University Press, 2nd reprint, 2008.
2. Fu, K., Gonzalez, R. and Lee, C.S. G., Robotics: Control, Sensing, Vision and Intelligence¸McGraw- Hill, 1987.


**COURSE DESIGNERS**


| S.No | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
| 1 | Dr.L.K.Hema | Professor | ECE | hemalk@avit.ac.in |
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| 3 | G.Murali | Assistant Professor | ECE | muraligvmkvec@vmkvec.edu.in |

| 17MESE17 | MODERN MANUFACTURING METHODS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC(SE) | 3 | 0 | 0 | 3 |

**Preamble**

This course aims to teach the various advanced manufacturing processes used in industries for making products. The students will get complete knowledge of the unconventional processes in terms of aspects stated above.

**Prerequisite –** Nil

**Course Objective**

| | |
|---|---|
| 1 | To discuss the basic concepts of various unconventional machining processes |
| 2 | To Demonstrate the Mechanical energy based unconventional machining processes. |
| 3 | To Demonstrate the Electrical energy based unconventional machining processes. |
| 4 | To Demonstrate the Chemical & Electro-Chemical energy based unconventional machining processes. |
| 5 | To Demonstrate the Thermal energy based unconventional machining processes. |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO1. | Discuss the basic concepts of various unconventional machining processes | Understand |
| CO2. | Explain the Mechanical energy based unconventional machining processes | Apply |
| CO3. | Illustrate the Electrical energy based unconventional machining processes | Apply |
| CO4. | Explain the Chemical & Electro-Chemical energy based unconventional machining processes | Apply |
| CO5. | Illustrate the Thermal energy based unconventional machining processes | Apply |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | - | - | - | L | - | - | - | - | - | M | - | L | | |
| CO2 | S | - | - | M | M | - | - | - | - | - | M | - | L | | |
| CO3 | S | - | - | M | M | - | - | - | - | - | M | - | L | | |
| CO4 | S | - | - | M | M | - | - | - | - | - | M | - | L | | |
| CO5 | S | - | - | M | M | - | - | - | - | - | M | - | L | | |

**S- Strong; M-Medium; L-Low**

| SYLLABUS |
|---|
| **INTRODUCTION** |
| Unconventional machining Process – Need – classification – Brief overview–merits –demerits– Applications |
| **MECHANICAL ENERGY BASED PROCESSES** |
| Abrasive Jet Machining – Water Jet Machining – Abrasive Water Jet Machining - Ultrasonic Machining. Working Principles & Applications – equipment used – process parameters – MRR - Variation in techniques used. |
| **ELECTRICAL ENERGY BASED PROCESSES** |
| Electric Discharge Machining - working principle and applications – equipments - process parameters - surface finish and MRR- Power and control circuits–Wire cut EDM – working principle and Applications. |
| **CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES** |
| Chemical machining and Electro-Chemical Machining- Electro Chemical Grinding and Electro chemical Honing-working principle and applications-Process Parameters -Surface finish and MRR -Etchants– Maskants |
| **THERMAL ENERGY BASED PROCESSES** |
| Laser Beam Machining and drilling, Plasma Arc Machining and Electron Beam Machining Working principles & Applications – Equipment –Types - Beam control techniques. Micromachining and Nanofabrication Techniques |
| **Text Books** |

| | |
|---|---|
| **1** | Vijay.K. Jain "Advanced Machining Processes" Allied Publishers Pvt. Ltd. |
| **2** | P.K.Mishra , " Non Conventional Machining "- - The Institution of Engineers (India) Text Books: Series. |
| **Reference Books** | |
| **1** | Benedict. G.F. "Nontraditional Manufacturing Processes" Marcel Dekker Inc., NewYork |
| **2** | Pandey P.C. and Shan H.S. "Modern Machining Processes" Tata McGraw-Hill, New Delhi. |
| **3** | Paul De Garmo, J.T.Black, and Ronald.A.Kohser, "Material and Processes in Manufacturing" |

**Course Designers**

| S.No | Faculty Name | Designation | Department/Name of the College | Email id |
|---|---|---|---|---|
| 1 | S.PRAKASH | Assistant Professor (Gr-II) | Mech / AVIT | prakash@avit.ac.in |
| 2 | M SARAVANAN | Asst Prof | Mech / VMKVEC | saravananm@vmkvec.edu.in |

| 17PHBS06 | ENERGY PHYSICS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | Basic Sciences | 3 | 0 | 0 | 3 |

**PREAMBLE**

This course provides an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternate energy sources and their technology and application. The class will explore society's present needs and future energy demands, examine conventional energy sources and systems, including fossil fuels and nuclear energy, and then focus on alternate, renewable energy sources such as solar, biomass (conversions), wind power, geothermal, and hydro. Energy conservation methods will be emphasized.

**PRERQUISITE**

**NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To understand various energy required for science and technology |
| 2 | To explain the significance of Green technology through Physics principles |
| 3 | To execute the various energy in science and technology |
| 4 | To differentiate various energy available in the universe |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1: Differentiate various energy available in the universe | Understand |
| CO2: Discuss various form of energy and its application | Understand |
| CO3: Illustrate various form of energy and its application in science and technology | Apply |
| CO4: Categorize energy storage devices | Analyze |
| CO5: Develop the energy conservation for various applications. | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | | M | | | | | | | | | M | M | | M |
| CO2 | M | M | M | S | | | | | | | | M | | | M |
| CO3 | S | S | S | M | | | | | | | | S | M | M | M |
| CO4 | M | M | M | | | | | | | | | | | | M |
| CO5 | | | | | | | | | | | | | | | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**SOLAR ENERGY**

Solar constant - Solar radiation at the earth's surface - Beam and diffuse Solar radiation - Solar radiation measurements - Angstrom compensation Pyrheliometer - Solar records - Solar pond - application of Solar ponds – Solar cells - principals - semiconductor fixation - conversion efficiency and power output - Solar functions - Solar cooking - Box type Solar cooker - Solar Green house - Types of Green houses.

**WIND ENERGY**

Basic principles of wind energy conversion - wind data and energy estimation - Basic components of a WECS (Wind Energy Conversion System) - Generator Control - Local Control - application of wind energy - energy from tides.

**BIO - MASS ENERGY**

Bioman energy - classification - Biomann Conversion technologies - Thermo chemical conversion - Fermentation - photosynthesis - classification of Biogas plants - Janta Biogas - Plant - Gasification of wood - Ethanol from wood by acid hydrolysis.

**ENERGY STROAGE**

Lead acid battery - Nickel cadmium battery - High temperature battery - Sodium Sulphur cell - Advantages of Batteries - Hydrogen Storage

**ENERGY CONSERVATION**

Principles of energy conservation - Types of energy audit – Energy conservation Approach Technologies - Co-generation - Gas turbines and diesel engine - Heat pipes - Principle - classification of heat pipes.

**TEXT BOOK:**

1. Solar Energy – Dr. Muyiwa S Adaramola, 2014
2. Solar Energy - S. P. Sukhatme, Fourth Edition, 2017

**REFERENCES:**

1. Non - Conventional energy Sources - G. D. RAI, Fourth Edition reprint 2003, Khanna Publication.
2. Solar Energy - M. P. Agarwal, S. Chand & Co.,

**COURSE DESIGNERS**


| S.No. | Name of the Faculty | Designation | Department | Mail ID |
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| 3 | Dr .G. LATHA | Asso. Prof | Physics | latha.physics@avit.ac.in |
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| 17CSES06 | PROGRAMMING IN C | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | ES | 3 | 0 | 0 | 3 |

**PREAMBLE**

This is a course offered in first semester for the students of Bio-Tech Engineering. This course has three credits dedicated to provide the students a strong foundation on programming concepts and its application. It also enables the students to solve problems using programmable logic.

**PREREQUISITE**

NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To introduce Basics of C. |
| 2 | To understand Control Structures & Arrays. |
| 3 | To learn String concept, Structure and Union in C. |
| 4 | To understand the concepts of Functions and Pointers. |
| 5 | To understand Memory and File management concepts in C. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1:** Understand the basics of C Data types, scope of variables, different types of Operators | Understand |
| **CO2:** Apply the concept of Input/ Output functions, Decision making and Loop structures in C programming | Apply |
| **CO3:** Demonstrate the C programs for string, arrays, union & structure. | Apply |
| **CO4:** Develop C programs for functions and pointers | Apply |
| **CO5:** Apply the file management concept to develop the C programs. | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | S | M | - | S | - | - | - | M | - | S | M | M | - | M |
| **CO2** | S | M | M | - | S | - | - | - | M | - | S | S | M | M | M |
| **CO3** | S | M | M | - | S | - | - | - | M | - | S | S | M | M | M |
| **CO4** | S | M | M | - | S | - | - | - | M | - | S | S | M | - | M |
| **CO5** | S | M | M | - | S | - | - | - | M | - | S | S | M | M | M |

S- Strong; M-Medium; L-Low

SYLLABUS

**BASICS OF C**

Identifiers, variables, expression, keywords, data types, constants, scope of variables. Operators: arithmetic, logical, relational, conditional and bitwise operators – Special operators: size of ( ) & comma (,) operator – Precedence and associatively of operators – Type conversion in expressions.

**CONTROL STRUCTURES**

Basic input/output and library functions: Single character input/output i.e. getch( ), getchar( ), getche( ), putchar( ) – Formatted input/output: printf( ) and scanf( ) – Library functions (mathematical and character functions). Decision Making and Branching – Looping statements.

**ARRAYS, STRING, STRUCTURE & UNION**

Arrays – Initialization – Declaration – One dimensional and two dimensional arrays. Strings: Declaration – Initialization and string handling functions. Structure and Union: structure declaration and definition – Accessing a Structure variable – Structure within a structure – Union.

**FUNCTIONS AND POINTERS**

Function – Function Declaration – function definition – Pass by value – Pass by reference – Recursive function – Pointers – Definition – Initialization

**MEMORY AND FILE MANAGEMENT**

Static and dynamic memory allocation – Storage class specifier – Preprocessor directives. File handling concepts – File read – write – Functions for file manipulation: fopen, fclose, gets, puts, fprintf, fscan, getw, putw, fputs, fgets, fread, fwrite.

**TEXT BOOKS**

1.Balaguruswami. E, “Programming in C”, TMH Publications, 1997

**REFERENCES**

1. Behrouz A. Forouzan & Richard F. Gilberg, “Computer Science A Structured Programming using C”, Cengage Learning, 3rd Edition, 2007.
2. Gottfried, “Programming with C”, schaums outline series, TMH publications, 1997.
3. Mahapatra , “Thinking in C”, PHI publications, 2nd Edition, 1998.
4. Subbura.R , “Programming in C”, Vikas publishing, 1st Edition, 2000

**COURSE DESIGNERS**



| S. No. | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
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| 17ECSE04 | EMBEDDED SYSTEM DESIGN | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC(SE) | 3 | 0 | 0 | 3 |

**PREAMBLE**

Ability to understand comprehensively the technologies and techniques underlying in building an embedded solution to a wearable, mobile and portable system

**PREREQUISITE -** Nil

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To understand the Embedded concepts and Embedded system Architecture |
| 2 | To learn the architecture and programming of ARM Cortex Microcontroller |
| 3 | To select a proper Microcontroller for an application |
| 4 | To understand the usage of the development and debugging tools |
| 5 | To learn and apply the knowledge of Memory systems and Peripherals |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Define an embedded system and compare with general purpose System. | Understand |
| CO2. Appreciate the methods adapted for the development of a typical Embedded system | Apply |
| CO3. Get introduced to RTOS and related mechanisms like an ability to design a system, component, or process to meet desired needs within realistic constraints | Analyze |
| CO4. Identify, formulate, and solve engineering problems | Analyze |
| CO5. Use the techniques, skills, and modern engineering tools necessary for engineering practice | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | M | L | L | - | - | - | - | - | - | L | S | - | - |
| CO2 | S | S | S | M | M | - | - | - | - | - | - | M | S | M | - |
| CO3 | S | M | M | - | L | - | - | - | - | - | - | M | S | M | - |
| CO4 | S | S | S | M | M | - | - | - | - | - | - | M | S | - | M |
| CO5 | S | S | S | - | M | - | - | - | - | - | - | M | S | - | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**INTRODUCTION TO EMBEDDED SYSTEM**

Embedded system processor, hardware unit, soft wareembedded into a system, Example of an embedded system, Embedded Design life cycle,Embedded System modeling [flow graphs, FSM, Petri nets], Layers of Embedded Systems.

**PROCESSOR AND MEMORY ORGANIZATION**

Bus Organization, Memory Devices and their Characteristics, Instruction Set Architecture [RISC, CISC], Basic Embedded Processor/Microcontroller Architecture [8051, ARM, DSP, PIC], memory system architecture [cache, virtual, MMU and address translation], DMA, Co-processors and Hardware Accelerators, pipelining.

**I/O DEVICES AND NETWORKS**

I/O Devices[Timers, Counters, Interrupt Controllers, DMA Controllers, A/D and D/A Converters, Displays, Keyboards, Infrared devices], Memory Interfacing, I/O Device Interfacing [GPIB, FIREWIRE, USB, IRDA], Networks for Embedded systems(CAN, I2C, SPI, USB, RS485, RS 232), Wireless Applications [Bluetooth, Zigbee].

**OPERATING SYSTEMS**

Basic Features of an Operating System, Kernel Features [polled loop system, interrupt driven 113 system, multi rate system], Processes and Threads, Context Switching, Scheduling[RMA, EDF, fault tolerant scheduling], Inter-process Communication, real Time memory management [ process stack management, dynamic allocation], I/O[synchronous and asynchronous I/O, Interrupts Handling, Device drivers], RTOS [ VxWorks, RT-LINUX].

**EMBEDDED SYSTEM DEVELOPMENT**

Design Methodologies [UML as Design tool, UML notation, Requirement Analysis and Use case Modeling],Design Examples[Telephone PBX, Inkjet Printer, PDA ,Elevator Control System, ATM System], Fault-toleranceTechniques, Reliability Evaluation Techniques.

**REFERENCE BOOKS:**

1.Wayne Wolf "Computers as components: Principles of Embedded Computing System design" The Morgan Kaufmann Series in Computer Architecture and Design, 2012.
2.Jane W. S., Liu, "Real time systems", Pearson Education, 2004.
3.Raj Kamal, "Embedded systems Architecture, Programming and design", Second Edition, 2008.
5.Steve Heath , "Embedded Systems Design", EDN Series,2003.

**COURSE DESIGNERS**



| S.No | Name of the Faculty | Designation | Department | Mail ID |
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| 17EEEC01 | **ADVANCED CONTROL SYSTEM** | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC | 3 | 0 | 0 | 3 |

**PREAMBLE**

This course introduces systematic approaches to the design and analysis of control systems for industrial applications which aims at giving an adequate exposure in state space analysis, state space controller design, MIMO system, Non-linear system, stability analysis. The course will be of particular interest to automation engineers employed in various industries, such as the process, energy, water, oil & gas, pharmaceutical and food industries, who are involved with process automation and control, either in the design or development of control systems, their application, operation and management

**PREREQUISITE**

1. 17EECC08 Control systems

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | Gain comprehensive knowledge about structures of modern computer control systems |
| 2 | Develop an awareness of available design tools |
| 3 | Become familiar with the methodologies available for applying control in single loop |
| 4 | Gain an understanding of the dynamics of processes and modelling methods |
| 5 | Gain an understanding of the design process for continuous and discrete controllers for these systems |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | | |
|---|---|---|
| CO1 | Develop the mathematical model of the system. | Understand |
| CO2 | Gain the knowledge on basic concepts of stability and analyze the stability of the system. | Understand |
| CO3 | Formulate and analyze the describing functions of non linear systems. | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | - | S | M | - | M | L | - | - | - | - | - | M | - | - | S |
| CO2 | S | M | M | - | M | L | M | - | M | - | - | M | M | S | M |
| CO3 | - | M | M | - | M | - | - | - | - | - | - | - | M | - | - |

S- Strong; M-Medium; L-Low

**SYLLABUS**

STATE VARIABLE ANALYSIS

Concept of state – State Variable and State Model – State models for linear and continuous time systems – Solution of state and output equation – controllability and\ observability - Pole Placement – State observer Design of Control Systems with observers.

PHASE PLANE ANALYSIS

Features of linear and non-linear systems - Common physical non-linearities – Methods of linearising non-linear systems - Concept of phase portraits – Singular points – Limit cycles – Construction of phase portraits – Phase plane analysis of linear and non-linear systems – Isocline method.

DESCRIBING FUNCTION ANALYSIS

Basic concepts, derivation of describing functions for common non-linearities – Describing function analysis of non-linear systems – Conditions for stability – Stability of oscillations.

STABILITY ANALYSIS

Introduction – Liapunov's stability concept – Liapunov's direct method – Lure's transformation – Aizerman's and Kalman's conjecture – Popov's criterion – Circle criterion.

OPTIMAL CONTROL

Introduction -Decoupling - Time varying optimal control – LQR steady state optimal control – Optimal estimation – Multivariable control design.

TEXT BOOKS

1. I.J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.

2. Ashish Tewari, 'Modern control Design with Mat lab and Simulink', John Wiley, New Delhi, 2002.

3. Sarkar B.N , 'Advanced Control Systems' Prentice Hall India Learning Private Limited (2013)

REFERENCE BOOKS

1. George J. Thaler, 'Automatic Control Systems', Jaico Publishers, 1993.

2. M.Gopal, Modern control system theory, New Age International Publishers, 2002.

3. Gene F. Franklin, J. David Powell and Abbasemami-Naeini, " Feedback Control of Dynamic Systems", Fourth edition, Pearson Education, Low price edition. 2002.

| | | | | |
|---|---|---|---|---|
| **COURSE DESIGNERS** | | | | |
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| 17MESE42 | DESIGN FOR QUALITY | Category | L | T | P | C |
|---|---|---|---|---|---|---|
| | | EC(SE) | 3 | 0 | 0 | 3 |

**PREAMBLE**

This course reviews the statistical techniques, designing various experiments and special experiments and optimization techniques

**PREREQUISITE: NIL**

COURSE OBJECTIVES

| | |
|---|---|
| 1 | Understand about Design principles and analysis of statistical techniques |
| 2 | Apply single factor & multi factorial experiments |
| 3 | Analyze factorial designs |
| 4 | Analyze the Selection of orthogonal arrays |
| 5 | Apply the Principles of robust design |

COURSE OUTCOMES

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1** Understand the the various statistical techniques | Understand |
| **CO2.** Design and apply single factor & multi factorial experiments | Apply |
| **CO3**. Analyse the special designs in factorial experiments | Analyze |
| **CO4**. Analyse the design of orthogonal experiments | Analyze |
| **CO5.** Analyse the robust design and how to optimize those data | Apply |

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PS01 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | **S** | **S** | **S** | **M** | - | - | - | - | - | - | - | - | M | L | |
| CO2 | **S** | **S** | **S** | **M** | - | - | - | - | - | - | - | - | M | L | |
| CO3 | **S** | **S** | **S** | **M** | - | - | - | - | - | - | - | - | M | L | |
| CO4 | **S** | **S** | **S** | **M** | - | - | - | - | - | - | - | - | M | L | |
| CO5 | **S** | **S** | **S** | **M** | - | - | - | - | - | - | | - | M | L | |

**S- Strong M-Medium L- Low**

**Syllabus**

**INTRODUCTION**

Perception of quality, Taguchi's definition of quality – quality loss function, Planning of experiments, design principles, terminology, normal probability plot, Analysis of variance, Linear regression models.

**FACTORIAL EXPERIMENTS**

Design and analysis of single factor and multi-factor experiments, tests on means, EMS rules

| |
|---|
| **SPECIAL DESIGNS** |
| 2 K Factorial designs, Fractional factorial designs, Nested designs, Blocking and Confounding. |
| **ORTHOGONAL EXPERIMENTS** |
| Selection of orthogonal arrays (OA's), OA designs, conduct of OA experiments, data collection and analysis of simple experiments, Modification of orthogonal arrays |
| **ROBUST DESIGN** |
| Variability due to noise factors, Product and process design, Principles of robust design, objective functions in robust design - S/N ratios , Inner and outer OA experiments, optimization using S/N ratios, fraction defective analysis, case studies |
| **Text Books:** |
| 1. Krishnaiah, K. and Shahabudeen, P. Applied Design of Experiments and Taguchi Methods, PHI learning private Ltd., 2012<br>2. Douglas C Montgomery, " Design and Analysis of Experiments" , John Wiley & Sons Ltd. |
| **Reference:** |
| 1. Larry B. Barrentine, "An introduction to Design of Experiments A simplified approach", New Age International Publishers, 2010<br>2. Nicolo Belavendram, "Quality by design" Taguchi techniques for Industrial experimentation, Prentice Hall. |
| Course Designer |

| S. No. | Name of the Faculty | Designation | Department / Name of the College | Mail ID |
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| 17MEEC13 | INDUSTRIAL SAFETY | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC(PS) | 3 | 0 | 0 | 3 |

**Preamble**

To familiarize with safety issues in design, handling and industrial environment including the safety aspects and various laws associated with industrial safety.

**Prerequisite**

**NIL**

**Course Objective**

| | |
|---|---|
| 1 | To understand about safety management and understand all the safety aspects thoroughly. |
| 2 | To understand the various safety procedures and precaution to be followed during the operation of different types of machines. |
| 3 | To apply thoroughly equipped with sufficient knowledge of handling the different types of equipments and materials used for industrial safety. |
| 4 | To analyze the sufficient knowledge and sharing of expertise for emergency situations arising due to accidents and monitoring of health aspects. |
| 5 | To analysis of the various laws regarding health issues and safety of personals. |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO1. | Explain the safety concepts and role of safety management. | Understand |
| CO2. | Discuss various safety aspects associated with operational safety of equipments like boilers, pressure vessels and other machineries used in workshop. | Understand |
| CO3. | Apply various safety measures to be undertaken with respect to industrial safety. | Apply |
| CO4. | Illustrate the various strategies to prevent accidents and implementation. | Analyze |
| CO5. | Outline the implementation of safety standards and the various laws related to safety, health and welfare of personnel. | Analyze |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | L | L | L | - | - | - | - | - | - | - | - | M | L | - |
| CO2 | S | L | L | L | - | - | - | - | - | - | - | - | M | L | - |
| CO3 | S | M | M | L | - | - | - | - | - | - | - | - | M | L | - |
| CO4 | S | M | M | L | - | - | - | - | - | - | - | - | M | L | - |
| CO5 | S | M | M | L | - | - | - | - | - | - | - | - | M | L | - |

**S- Strong; M-Medium; L-Low**

**SYLLABUS**

**UNIT I - SAFETY MANAGEMENT**

Evaluation of modern safety concepts - Safety management functions – safety organization, safety department – safety committee, safety audit - performance measurements and motivation - employee participation in safety - safety and productivity.

**UNIT II: OPERATIONAL SAFETY**

Hot metal Operation - Boiler, pressure vessels - heat treatment shop - gas furnace operation – electroplating-hot bending pipes -Safety in welding and cutting. Cold-metal Operation – Safety in Machine shop - Cold bending and chamfering of pipes - metal cutting –shot blasting, grinding, painting - power press and other machines

**UNIT III: SAFETY MEASURES**

Layout design and material handling - Use of electricity - Management of toxic gases and chemicals - Industrial fires and prevention - Road safety - highway and urban safety – Safety of sewage disposal and cleaning - Control of environmental pollution - Managing emergencies in Industries - planning, security and risk assessments, on- site and off site. Control of major industrial hazards.

**UNIT IV: ACCIDENT PREVENTION**

Human side of safety - personal protective equipment - Causes and cost of accidents. Accident prevention programs -Specific hazard control strategies - HAZOP - Training and development of employees - First Aid- Fire fighting devices - Accident reporting, Investigation.

**UNIT V SAFETY, HEALTH, WELFARE & LAWS**

Safety and health standards - Industrial hygiene - occupational diseases prevention – Welfare facilities - History of legislations related to Safety-pressure vessel act-Indian Boiler act - The environmental protection act - Electricity act - Explosive act.

**Text Books**

| | |
|---|---|
| **1** | Krishnan N.V. "Safety Management in Industry" Jaico Publishing House |
| **2** | Handlin.W, "Industrial Hand Book", McGraw-Hill, 2000. |

**Reference Books**

| | |
|---|---|
| **1** | Heinrich.H.W, "Industrial Accident Prevention", McGraw-Hill, 1980. |
| **2** | Rudenko.N, "Material Handling Equipments", Mir Publishers, Moscow, 1981. |
| **3** | Lees.F.P, "Loss "Prevention in Process Industries", Butterworths, New Delhi, 1986. |
| **4** | Accident Prevention Manual for Industrial Operations",N.S.C.Chicago, 1982 |

**Course Designers**

| **S.No** | **Faculty Name** | **Designation** | **Department/Name of the College** | **Email id** |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
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| 2 | C.Thygarajan | AP II | Mech/AVIT | Thygararajan@avit.ac.in |

| 17BMCC04 | BIOMEDICAL INSTRUMENTATION & MEASUREMENTS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |

**PREAMBLE**

The variety of diagnostic, control, and monitoring equipment used for medical purposes comprises an array of biomedical instrumentation. These electronic systems can be used in a physician's office, a medical laboratory, or be implanted into a patient. This course is designed to acquire knowledge about the different components of various biomedical equipment and its working principle and to measure various physiological parameters.

**PREREQUISITE –** NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To know about bioelectric signals, electrodes and its types. |
| 2 | To know the various Bio potential amplifiers. |
| 3 | To study about various Physiological measurements. |
| 4 | To study the recording of various cardiac signals. |
| 5 | To study about clinical laboratory instruments and blood cell counters. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Explain the acquisition of various bio signals using various types of Electrodes. | Understand |
| CO2. Examine the different blood types of cell and usage of clinical laboratory instruments. | Apply |
| CO5. Use bio-amplifiers in medical applications. | Apply |
| CO3. Record and analyze various physiological signals. | Analyze |
| CO4. Classify various cardiac function measurements. | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | L | -- | -- | -- | L | -- | -- | -- | -- | -- | M | M | M | M |
| CO2 | S | M | M | S | -- | M | -- | L | M | -- | -- | M | -- | M | S |
| CO3 | S | M | M | S | -- | M | M | L | M | -- | -- | M | M | M | S |
| CO4 | S | M | S | M | -- | M | S | M | S | -- | -- | S | M | S | S |
| CO5 | S | M | S | M | -- | M | S | M | S | -- | -- | S | M | S | S |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**BIOELECTRIC SIGNALS AND ELECTRODES**

Basic medical instrumentation system, Origin of Bioelectric Potential – Resting and action potential, Nernst equation, Goldman equation. Recording electrodes – Electrodes: Tissue interface, Electrolyte – skin interface, Polarization, Skin contact impedance, motion artefacts. Electrodes – Silver – silver chloride electrodes, electrodes for ECG, electrodes for EEG, electrodes for EMG, Electrical conductivity of electrode jellies and creams, Types of electrodes.

**BIO AMPLIFIERS**

Bio amplifier, Need for Bio amplifier, Operational amplifier characteristics, Different modes of operation of differential amplifier, Basic operational amplifier circuits – Inverting, Non inverting, differential amplifier, Instrumentation amplifier. Chopper amplifier, Isolation Amplifier.

**BIO SIGNALS RECORDING**

ECG- Anatomy and Electrical conducting system of heart, Genesis of ECG, Einthoven triangle, Lead system, Segments and intervals of ECG, Normal and abnormal ECG wave forms, ECG Machine, Recording set up of EMG and EEG. Heart sounds and PCG, ERG, EOG.

**CARDIAC FUNCTION MEASUREMENTS**

Blood pressure measurement – direct and indirect method, Respiration rate measurement, Measurement of heart rate and pulse rate, Plethysmography technique. Blood flow measurement – electromagnetic, ultrasonic. Cardiac output measurement – Indication dilution method and dye dilution method

**CLINICAL LABORATORY INSTRUMENTS AND BLOOD CELL COUNTERS**

Spectrophotometer, colorimeter, flame photometer, auto-analyser. Types of blood cells, Methods of cell counting, coulter counters, automatic recognition and differential counting.

**TEXT BOOKS:**


1. Khandpur R.S, **"Hand-book of Biomedical Instrumentation"**, Tata McGraw Hill, 2nd Edition, 2003.
2. Leslie Cromwell, Fred Weibell J, Erich Pfeiffer. A, **"Biomedical Instrumentation and Measurements"**, Prentice-Hall India, 2nd Edition, 1997.
3. Arumugam, M, **"Biomedical Instrumentation"**, Anuradha publications, 2008.


**REFERENCES:**


1. John G. Webster, **"Medical Instrumentation Application and Design"**, John Wiley, 3rd Edition, 1997.
2. Carr, Joseph J, Brown, John.M **"Introduction to Biomedical Equipment Technology"**, John Wiley and sons, New York, 4th Edition, 1997.


**COURSE DESIGNERS**


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| 17MESE32 | COMPOSITE MATERIALS | Category | L | T | P | C |
|---|---|---|---|---|---|---|
| | | EC(SE) | 3 | 0 | 0 | 3 |

**PREAMBLE**

This course reviews the various composite materials their processing techniques and their behaviors , and to develop models and their applications in aerospace, automotive and medical fields

**PREREQUISITE -** NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | Understand about Fibre reinforced Plastics |
| 2 | Understand the manufacturing processes of the composite materials |
| 3 | Analyse about macro mechanical behavior of FRP |
| 4 | Analyse about micromechanical behavior of composite materials |
| 5 | Understand about material models of composites |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1** .Understand the types of reinforcements and fibers used in composite materials | Understand |
| **CO2.** Understand various manufacturing techniques in composite manufacturing | Understand |
| **CO3**. Analyse the macro mechanical behavior of Fiber Reinforced Plastics | Analyze |
| **CO4**. Analyse the Micro mechanical behavior of Fiber reinforced plastics | Analyze |
| **CO5.** Apply models for solving the composite material manufacturing | Apply |

| COS | PO 1 | PO 2 | PO 3 | PO4 | PO5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | **S** | - | **L** | - | - | **M** | **S** | - | - | - | - | - | **L** | - | |
| CO2 | **S** | - | **L** | - | - | **L** | **S** | - | - | - | - | - | **L** | - | - |
| CO3 | **S** | **S** | **S** | **S** | **L** | **L** | **S** | - | - | - | - | - | M | - | |
| CO4 | **S** | **S** | **S** | **S** | **L** | **L** | **S** | - | - | - | - | - | M | - | |
| CO5 | **S** | **S** | **S** | **S** | **S** | **L** | - | - | - | - | - | - | **M** | - | |

**S- Strong M-Medium L- Low**

**Syllabus**

**FIBRE REINFORCED PLASTICS (FRP)**

Definition; Types; General properties and characteristics; Reinforcing materials – particles, fibers,

whiskers; Properties of reinforcing materials; Matrix materials; Additives; Properties of FRP materials; Applications

**MANUFACTURING PROCESSES**

Open mold processes – Hand layup, Spray up, Vacuum bag, Pressure bag & autoclave, Centrifugal casting,Filament winding; Closed mold processes – Compression molding, Resin transfer molding (RTM), Injection molding, Pultrusion; SMC & DMC products, etc.

**MACROMECHANICAL BEHAVIOR OF FIBRE REINFORCED PLASTICS**

Design variables; Selection of fiber-matrix and manufacturing process; Effects of mechanical, thermal, electrical and environmental properties, Fiber orientation, Symmetric and asymmetric structure; Effects of unidirectional continuous and short fibers; Lamination theory; Failure theories.

**MICROMECHANICAL BEHAVIOR OF FIBRE REINFORCED PLASTICS**

Strengthening methods, Elasticity of fibre composites, Plasticity and fracture of composites, Crack propagation in fibre composites, Failure under compressive loads.

**MATERIAL MODELS**

Law of Mixtures, Shear lag model,Laminated plate model, Eshelby's models, Other models.

**Text Books:**

1. Haslehurst.S.E., "Manufacturing Technology ", ELBS, London.

2. Krishnan K. Chawle. "Composite Material: Science and Engineering" Second Edition, Springer.

**Reference:**

1.. T.W.Clyne, P.J. Withers, "An Introduction to metal matrix composites", Cambridge University Press.

2. F.C. Campbell "Structural Composite Materials", Materials Park,ASM International,2010

Course Designers


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| 17MESE08 | PRODUCT DESIGN AND DEVELOPMENT | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC(SE) | 3 | 0 | 0 | 3 |

**Preamble**

The focus of Product Design and Development is integration of the marketing, design, and manufacturing functions of the firm in creating a new product.

**Prerequisite**

**NIL**

**Course Objective**

| | |
|---|---|
| 1 | To ensure understanding of the growth of the organization |
| 2 | To gain application knowledge of the surplus capacity of the organization, such as physical facility , man power, etc. |
| 3 | To apply knowledge of application in the utilization of surplus fund of the organization. |
| 4 | To gain applicability knowledge in new requirement of the customers. |
| 5 | To analyze ways to increase company's market share and to target new market segment. |
| 6 | To ensure analysis capability in complete product range in company's portfolio. |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO1. | Understand concepts of product development and outline product planning process. | Understand |
| CO2. | Understand relative importance of customer needs in establishing product specifications. | Understand |
| CO3. | Identify concept generation activities and summarize the methodology involved in concept selection and testing. | Apply |
| CO4. | Outline supply chain considerations in product architecture and understand the industrial design process. | Apply |
| CO5. | Apply design for manufacturing concepts in estimating manufacturing costs. | Apply |
| CO6. | Apply principles of prototyping in product development economics and highlight importance of managing projects. | Apply |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | L | M | - | M | - | - | - | - | L | - | - | M | - | - |
| CO2 | L | L | M | - | - | - | - | - | - | - | - | - | M | - | - |
| CO3 | S | M | M | S | - | - | - | - | - | - | - | - | S | - | - |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO4 | M | M | S | - | | L | - | - | - | M | M | - | - | - | - |
| CO5 | S | - | S | L | M | M | - | - | - | - | - | - | M | - | - |
| CO6 | S | L | L | S | S | - | - | - | M | - | - | - | M | - | - |

**S- Strong; M-Medium; L-Low**

**SYLLABUS**

**UNIT-I INTRODUCTION - DEVELOPMENT PROCESSES AND ORGANIZATIONS – PRODUCT PLANNING**

Characteristics of successful product development to Design and develop products, duration and cost of product development, the challenges of product development. A generic development process, concept development: the front-end process, adapting the generic product development process, the AMF development process, product development organizations, the AMF organization. The product planning process, identify opportunities. Evaluate and prioritize projects, allocate resources and plan timing, complete pre project planning, reflect all the results and the process.

**UNIT-II IDENTIFYING CUSTOMER NEEDS AND PRODUCT SPECIFICATIONS**

Gathering raw data from customers, interpreting raw data in terms of customer needs, organizing the needs into a hierarchy, establishing the relative importance of the needs and reflecting on the results and the process. Specifications, establish specifications, establishing target specifications setting the final specifications.

**CONCEPT GENERATION - CONCEPT SELECTION AND CONCEPT TESTING**

The activity of concept generation clarify the problem search externally, search internally, explore systematically, reflect on the results and the process, Overview of methodology, concept screening, concept scoring, caveats. Purpose of concept test, choosing a survey population and a survey format, communicate the concept, measuring customer response, interpreting the result, reflecting on the results and the process.

**PRODUCT ARCHITECTURE -INDUSTRIAL DESIGN AND DESIGN FOR MANUFACTURING**

Meaning of product architecture, implications of the architecture, establishing the architecture, variety and supply chain considerations, platform planning, related system level design issues. Assessing the need for industrial design, the impact of industrial design, industrial design process, managing the industrial design process, is assessing the quality of industrial design. Definition, estimation of manufacturing cost, reducing the cost of components, assembly, supporting production, impact of DFM on other factors.

**PROTOTYPING PRODUCT DEVELOPMENTAND ECONOMICS MANAGING PROJECT**

Prototyping basics, principles of prototyping, technologies, planning for prototypes, Elements of economic analysis, base case financial mode,. Sensitive analysis, project trade- offs, influence of qualitative factors on project success, qualitative analysis. Understanding and representing task, baseline project planning, accelerating projects, project execution, postmortem project evaluation.

**Text Books**

| | |
|---|---|
| **1** | Ulrich K. T, Eppinger S.D and Anita Goyal , "Product Design and Development", Tata McGraw Hill, 2009. |

**Reference Books**

| | |
|---|---|
| **1** | 1.Karl Ulrich,T, Steven Eppinger, D, "Product Design and Development", McGrawHill, 2015.<br>2. Chitale, AK, Gupta, RC, "Product Design and Manufacturing" PHI, 2013. |

| | |
|---|---|
| | 3. Timjones, "New Product Development:An Introduction to a multifunctional process", Butterworth-Heinemann, 1997.<br>4. Geoffery Boothroyd, Peter Dewhurst and Winston Knight,A, "Product Design for Manufacture and Assembly", CRC Press, 2011. |

**Course Designers**

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| 17MESE20 | RAPID PROTOTYPING AND TOOLING | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC(SE) | 3 | 0 | 0 | 3 |

**PREAMBLE**

This course provides to impart knowledge of the Rapid Prototyping and Tooling techniques, which is one of the recent manufacturing technologies.

**PREREQUISITE:** NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To understand the history and development for rapid product development. |
| 2 | To discuss the various techniques of solid based process for rapid production. |
| 3 | To discuss the various techniques of based process for rapid production. |
| 4 | To discuss the various tooling used for Rapid manufacturing tooling techniques. |
| 5 | Optimize FDM process parameters to improve the quality of the parts. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | | |
|---|---|---|
| CO1. | Understand the working principle and various RPT techniques. | Understand |
| CO2. | Explain the various solid and liquid based methods for RPT techniques used to select suitable process. | Apply |
| CO3. | Explain the various powder based methods for RPT techniques used to select suitable process. | Apply |
| CO4. | Apply the tooling and molding devices used for RPT machining operations. | Apply |
| CO5. | Gain application oriented knowledge related to RPT in Reverse Engineering application process | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | L | - | - | - | - | - | - | - | - | - | M | - | - |
| CO2 | S | M | L | - | M | - | - | - | - | - | - | - | M | - | - |
| CO3 | S | M | M | - | M | - | | - | - | - | - | - | M | - | - |
| CO4 | S | S | S | - | M | - | - | - | - | - | - | - | M | - | - |
| CO5 | S | S | S | - | M | - | - | - | | - | - | - | M | - | - |

**S- Strong; M-Medium; L-Low**

**Syllabus**

**INTRODUCTION**

History – Development of RP systems – RP process chain - Impact of Rapid Prototyping on Product Development –Digital prototyping - Virtual prototyping-Rapid Manufacturing- Principle – Fundamental – File format – Other translators-Data Processing for Rapid Prototyping: CAD model preparation, Part orientation and support generation, Support structure design, Model Slicing and contour data organization, direct and adaptive slicing, Tool path generation.

**LIQUID AND SOLID BASED PROCESS:**

Classification – Liquid based system – Stereolithography (SLA)-Solid Ground Curing (SGC)- products, Advantages, Limitations, Applications and Uses. Solid based system – Fused Deposition Modeling- Laminated Object Manufacturing-Multi Jet Modeling System-principle, process, products, advantages, applications and uses

**POWDER BASED PROCESS**

Selective Laser Sintering – Three Dimensional Printing – Direct shell production casting –Laser Engineered Net Shaping (LENS)- -Direct Metal Deposition-Principle-Materials-process- products,-advantages- limitations-applications

**RAPID TOOLING**

Introduction-Need-Types -Advantages-Applications-Indirect rapid Tooling-silicone Rubber Tooling-Spray metal tooling-RSP Tooling-Reaction Injection Moulding-Direct Rapid Tooling-Direct AIM-DMLS-Copper Polyamide-Laminated Tooling

**REVERSE ENGINEERING**

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

**TEXT BOOKS:**

1. Rafiq I. Noorani, Rapid Prototyping, “Principles and Applications”, Wiley & Sons, 2006.
2. Chua C.K, Leong K.F and Lim C.S, “Rapid Prototyping: Principles and Applications”, Second Edition, World Scientific, 2003.

**REFERENCES:**

1. N.Hopkinson, R.J.M, Hauge, P M, Dickens, “Rapid Manufacturing – An Industrial revolution for the digital age”, Wiley, 2006
2. Ian Gibson, “Advanced Manufacturing Technology for Medical applications: Reverse Engineering, Software conversion and Rapid Prototying”, Wiley, 2006
3.Paul F.Jacobs, “Rapid Prototyping and Manufacturing : Fundamentals of Stereolithography”, McGraw Hill 1993.
4.Pham. D.T., and Dimov. S.S., “Rapid Manufacturing”, Springer Verlog 2001.



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| 17MESE22 | AUTOMOTIVE INFOTRONICS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC(SE) | 3 | 0 | 0 | 3 |

**Preamble**
To study Instrument Clusters, Telematics Systems, Power train, Electronic Control Units and Cockpit Electronics products for vehicles.

**Prerequisite NIL**

**Course Objective**

| | |
|---|---|
| 1 | To Learn the various driver assistant system in a Vehicle. |
| 2 | To Learn the Global positioning and navigation system. |
| 3 | To known the collision warning and detection system. |
| 4 | To study about the adaptive control system and comfort systems in automobiles |
| 5 | To study about the security and smart card system. |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO1. | Known the vehicle motion control and stabilization system. | Understand |
| CO2. | Gain the knowledge of Safety and comfort system. | Understand |
| CO3. | Known the various safety systems used in vehicles. | Understand |
| CO4. | Describe the basics of vehicle collision and its effects. | Understand |
| CO5. | Apply the importance of Driver assistance, security and warning system. | Apply |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | L | - | - | - | - | - | - | - | - | - | - | L | - | - |
| CO2 | S | L | L | - | - | - | - | - | - | - | - | - | L | - | - |
| CO3 | S | L | L | - | - | - | - | - | - | - | - | - | L | - | - |
| CO4 | S | L | L | - | - | - | - | - | - | - | - | - | L | - | - |
| CO5 | S | M | M | L | - | - | - | - | - | - | - | L | L | - | - |

**S- Strong; M-Medium; L-Low**

| SYLLABUS |
|---|
| **DRIVER ASSISTANCE SYSTEMS** |
| Driver information, driver perception, driver convenience, driver monitoring, general vehicle control, longitudinal and lateral control, collision avoidance and vehicle monitoring. |
| **TELEMATICS** |
| Global positioning system, geographical information systems, navigation system, architecture, automotive vision system and road recognition. |
| **COLLISION WARNING AND AVOIDANCE** |
| Collision warning system, causes of rear end collision, frontal object detection, rear vehicle object detection system, object detection system with braking system interactions. |
| **ADAPTIVE CONTROL SYSTEMS AND COMFORT SYSTEMS** |
| Adaptive cruise control system, adaptive noise control, active suspension system, power steering, collapsible and tilt able steering column and power windows, Adaptive lighting system. |
| **SECURITY SYSTEMS** |
| Antitheft technologies–mechanical, electromechanical and electronic immobilizers, alarm system, stolen vehicle tracking system, remote keyless entry, smart card system and number plate coding. |

| **Text Books** | |
|---|---|
| **1** | Ljubo Vlacic, Michel Parent and Fumio Harashima, "Intelligent Vehicle Technologies", Butterworth-Heinemann publications, Oxford, 2001. |
| **2** | Robert Bosch, "Automotive Hand Book", 5th Edition, SAE, 2000. |
| **3** | Ronald K Jurgen, "Navigation and Intelligent Transportation Systems – Progress in Technology", Automotive Electronics Series, SAE, USA, 1998 |
| **Reference Books** | |
| **1** | William B Riddens, "Understanding Automotive Electronics", 5th edition, Butter worth Heinemann Woburn, 1998. |
| **2** | Bechhold, "Understanding Automotive Electronics", SAE, 1998. |
| **3** | Allan W M B, "Automotive Computer Controlled Systems", Elsevier Butterworth-Heinemann, 2011. |

**Course Designers**

| **S.No** | **Faculty Name** | **Designation** | **Department/Name of the College** | **Email id** |
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| 17EEEC21 | **NON CONVENTIONAL ENERGY SOURCES** | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC-PS | 3 | 0 | 0 | 3 |

**PREAMBLE**

Non Conventional sources of energy are generally renewable sources of energy. This type of energy sources include anything, which provides power that can be replenished with increasing demand for energy and with fast depleting conventional sources of energy such as coal, petroleum, "natural gas etc. The non- conventional sources of energy such as energy from sun, wind, biomass, tidal energy, geo thermal energy and even energy from waste material are gaining importance. This energy is abundant, renewable, pollution free and eco-friendly. It can also be more conveniently supplied to urban, rural and even remote areas. Thus, it is also capable of solving the twin problems of energy supply in a decentralized manner and helping in sustaining cleaner environment. It concerned with development of the national grid system will focus on those resources that have established themselves commercially and are cost effective for on grid applications

**PREREQUISITE**

- NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To impart the knowledge of basics of different non conventional types of power generation & power plants |
| | To understand the need and role of Non-Conventional Energy sources. |
| 2 | To learn economical and environmental merits of solar energy for variety applications. |
| 3 | To learn modern wind turbine control & monitoring. |
| 4 | To learn various power converters in the field of renewable energy technologies. |
| 5 | To study and analyse different types of Power converters for Renewable energy conversion |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | | |
|---|---|---|
| CO1 | Identify the different non conventional sources and the power generation techniques to generate electrical energy. | Understand |
| CO2 | Explore the Solar Radiation, different Methods of Solar Energy Storage and its Applications. | Analyse |
| CO3 | Familiarize the Winds energy as alternate form of energy and to know how it can be tapped | Understand |

| | | |
|---|---|---|
| CO4 | Explore the Geothermal Energy Resources and its methods. | Understand |
| CO5 | Identify the Bio mass and Bio gas resources and its tapping technique | Analyze |
| CO6 | Investigate the Tidal, Wave and OTEC Energy, Concepts of Thermo-Electric Generators and MHD Generators | Analyse |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | L | | M | M | | L | L | | L | | | M | | | L |
| CO2 | S | L | M | L | M | M | S | L | M | M | M | S | S | L | S |
| CO3 | | M | M | S | L | M | L | | | L | S | | L | M | L |
| CO4 | M | L | | | | S | | S | S | L | M | S | | | M |
| CO5 | | M | L | M | L | L | M | L | S | M | S | L | L | L | M |
| CO6 | L | | | | | | M | | S | S | | M | M | | L |

S- Strong; M-Medium; L-Low

**SYLLABUS**

## INTRODUCTION

Statistics on conventional energy sources, Classification of Energy Resources, Definition Concepts of NCES, Limitations of RES, Criteria for assessing the potential of NCES. - Solar, Wind, Geothermal, Bio-mass, Ocean Energy Sources, comparison of these energy sources

## SOLAR ENERGY CONCEPT

Introduction to Solar Energy - Radiation and its measurement, Solar Energy conversion and its types - Introduction to Solar Energy Collectors and Storage, Applications of Solar Energy: Solar Thermal Electric Conversion Systems, Solar Electric power Generation, Solar Photo-Voltaic, Solar Cell Principle, Semiconductor Junctions, Conversion efficiency and power output, Basic Photo Voltaic System for Power Generation, Stand-alone, Grid connected solar power satellite

## WIND ENERGY CONCEPT

Introduction - Basic Principles of Wind energy conversion-The nature of wind- The power in the wind (No derivations ) - Forces on the Blades (No derivations)-Site Selection considerations-Basic components of a wind energy conversion system (WECS)-Advantages & Limitations of WECS-Wind turbines (Wind mill )-Horizontal Axis wind mill-Vertical Axis wind mill-performance of wind mills-Environmental aspects - Determination of torque coefficient, Induction type generators

## GEOTHERMAL AND BIOMASS ENERGY

Geothermal Sources - Hydro thermal Sources - a. Vapor dominated systems b. Liquid dominated systems -Prime movers for geothermal energy conversion - Biomass Introduction - Biomass conversion techniques-Biogas Generation-Factors affecting biogas Generation-Types of biogas plants- Advantages and disadvantages of biogas plants-urban waste to energy conversion - MSW incineration plant.

.

## TIDAL AND OTEC ENERGY

Tidal Energy-Basic Principles of Tidal Power-Components of Tidal Power Plants- Schematic Layout of Tidal Power house-Advantages & Limitations of Tidal, Wave, OTEC energy - Difference between tidal and wave power generation, OTEC power plants, Design of 5 Mw OTEC pro-commercial plant, Economics of OTEC, Environmental impacts of OTEC.

**TEXT BOOK**


1. Ashok V Desai, Non-Conventional Energy, Wiley Eastern Ltd, New Delhi, 2003
2. K M, Non-Conventional Energy Systems, Wheeler Publishing Co. Ltd, New Delhi, 2003.
3. Non Conventional Energy Resources, Shobh Nath. Singh, Pearson Education India, 2016, e – ISBN : 978933255906 - 6


**REFERENCES**


1. Ramesh R & Kumar K U, Renewable Energy Technologies, Narosa Publishing House, New Delhi, 2004
2. Wakil MM, Power Plant Technology, Mc Graw Hill Book Co, New Delhi, 2004.
3. Non – Conventional Energy Sources. Rai.


**COURSE DESIGNERS**


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| | | | | |

| 17EECC15 | ELECTRICAL TECHNOLOGY | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | FC | 3 | 0 | 0 | 3 |

**PREAMBLE**

This course is concerned with the constructions, characteristics and applications of various electrical machines and transformer.

**PREREQUISITE**

17EEES03- Basic of Electrical & Electronics Engineering

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To gain knowledge about the working principle, construction, applications of DC machines |
| 2 | To familiarize construction, operation, testing of transformers. |
| 3 | To gain knowledge about the construction, operation and applications of DC machines |
| 4 | To gain knowledge about construction, principle of operation and performance of induction machines. |
| 5 | To understand the construction, operation of special machines. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | | |
|---|---|---|
| CO1 | Explain the construction, characteristics and applications of DC machines | Understand |
| CO2 | Analyze the performance of different types of DC machines | Analyze |
| CO3 | Explain the fundamentals and operation of Transformer | Understand |
| CO4 | Analyze the performance of different types of Transformer | Analyze |
| CO5 | Explain the construction, operation of AC machines and special machines | Understand |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | M | M | - | L | - | - | - | M | M | L | S | M | - |
| CO2 | M | S | - | L | L | - | - | L | L | - | S | - | S | M | - |
| CO3 | M | M | M | S | - | - | - | - | - | L | - | L | S | M | - |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO4 | S | S | - | M | M | M | L | L | L | - | S | - | S | M | - |
| CO5 | S | M | M | M | - | - | - | - | - | L | - | L | - | M | - |

S- Strong; M-Medium; L-Low

## SYLLABUS

**D.C GENERATORS AND DC MOTORS**

Principle of operation of DC Machines- EMF equation – Types of generators – Magnetization and load characteristics of DC generators, DC Motors – Types of DC Motors – Characteristics of DC motors – 3-point starters for DC shunt motor – Losses and efficiency – Swinburne's test – Speed control of DC shunt motor – Flux and Armature voltage control methods.

**TRANSFORMERS**

Principle of operation of single phase transformer – types – Constructional features – Phasor diagram on No Load and Load – Equivalent circuit, Losses and Efficiency of transformer and Regulation – OC and SC tests – Predetermination of efficiency and regulation.

**THREE PHASE INDUCTION MOTOR**

Principle of operation of three-phase induction motors – Slip ring and Squirrel cage motors – Slip-Torque characteristics – Efficiency calculation – Starting methods.

**ALTERNATORS**

Alternators – Constructional features – Principle of operation – Types - EMF Equation – Distribution and Coil span factors – Predetermination of regulation by Synchronous Impedance Method – OC and SC tests.

**SPECIAL MOTORS**

Principle of operation - Synchros-Synchronous reluctance motor -Stepper Motors - Switched reluctance motor-AC servomotor-AC tachometers- Shaded pole motors-Capacitor motors -Characteristics

**TEXT BOOKS**

1. "Introduction to Electrical Engineering "– M.S Naidu and S. Kamakshaiah, TMH Publ.1995
2." Basic Electrical Engineering" - T.K. Nagasarkar and M. S. Sukhija, Oxford University Press, 2005
3. " Electrical Machines" Er. R.K. Rajput , Laxmi Publications, 5th Edition 2016

**REFERENCES**

1. "Theory and Problems of basic electrical engineering" - I.J. Nagarath and D.P Kothari, PHI Publications 2016
2. "Principles of Electrical Engineering "- V.K Mehta, S. Chand Publications.2008

**COURSE DESIGNERS**


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| 17CSCC16 | CLOUD COMPUTING | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |

**PREAMBLE**

To study and understand the concepts in cloud computing and apply them practically.

**PREREQUISITE** NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| **1.** | To understand cloud computing concepts. |
| **2.** | To study various cloud services. |
| **3.** | To apply cloud computing in collaboration with other services. |
| **4.** | To Apply cloud computing services. |
| **5.** | To apply cloud computing online. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1:** Able to Understand basics in Cloud Computing | Understand |
| **CO2:** Able to apply cloud computing concepts in real time | Apply |
| **CO3:** Able to develop cloud computing projects | Apply |
| **CO4**: Able to apply cloud services | Apply |
| **CO5:** Able to collaborate cloud services with other applications | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | M | M | M | M | - | - | - | - | - | - | - | - | M | M | - |
| **CO2** | M | M | M | M | - | - | - | - | - | - | - | - | M | M | M |
| **CO3** | M | M | S | M | - | - | - | - | - | - | - | - | M | M | M |
| **CO4** | S | M | M | M | - | - | - | - | - | - | - | - | M | M | M |
| **CO5** | S | M | M | M | - | - | - | - | - | - | - | - | S | S | M |

S- Strong; M-Medium; L-Low

## SYLLABUS

| INTRODUCTION |
|---|
| Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage –Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services. |
| **DEVELOPING CLOUD SERVICES** |
| Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds. |
| **CLOUD COMPUTING FOR EVERYONE** |
| Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation. |
| **USING CLOUD SERVICES** |
| Collaborating on Calendars, Schedules and Task Management – Exploring Online Scheduling Applications – Exploring Online Planning and Task Management – Collaborating on Event Management – Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing - Collaborating on Databases – Storing and Sharing Files. |
| **COLLABORATING ONLINE** |
| Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services –Evaluating Web Conference Tools – Collaborating via Social Networks and Groupware –Collaborating via Blogs and Wikis. |
| **TEXT BOOKS** |
| 1. Rajkumar Buyya, James Broberg, Andzej M.Goscinski, "Cloud Computing –Principles and Paradigms",John Wiley & Sons, 2010.<br>2. Michael Miller, "Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online", Que Publishing, August 2008. |
| **REFERENCES** |
| 1. Haley Beard, "Cloud Computing Best Practices for Managing and Measuring. Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs", Emereo Pty Limited, July 2008. |

| COURSE DESIGNERS | | | | |
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| 17CSCC09 | JAVA PROGRAMMING | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |

**PREAMBLE**

This course of study builds on the skills gained by students in Java Fundamentals and helps to advance Java programming skills. Students will design object-oriented applications with Java and will create Java programs using hands-on, engaging activities.

**PREREQUISITE**

NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1. | Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc. |
| 2. | Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc. |
| 3. | Be aware of the important topics and principles of software development. |
| 4. | Understand Event Handling and Swing Components. |
| 5. | Understand Generic Programming. |

**COURSE OUTCOMES**

On successful completion of the course, students will be able to

| | |
|---|---|
| CO1.Knowledge of the structure and model of the Java programming language | Understand |
| CO2.Use the Java programming language for various programming technologies | Understand |
| CO3. Develop software in the Java programming language | Apply |
| CO4.Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements | Analyze |
| CO5.Choose an engineering approach to solving problems, Starting from the acquired knowledge of programming and knowledge of operating systems. | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | M | - | S | - | - | - | - | - | - | - | - | - | - |
| CO2 | S | M | M | - | M | - | - | - | - | - | - | - | M | M | - |
| CO3 | S | M | L | L | M | - | - | - | - | - | - | - | M | M | - |
| CO4 | S | M | M | L | M | - | - | - | - | - | - | - | M | M | - |
| CO5 | S | M | L | L | S | - | - | - | - | - | - | - | M | M | - |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**BASICS OF JAVA**

Object oriented programming concepts – objects – classes – methods and messages – abstraction and encapsulation – inheritance – abstract classes – polymorphism.- Objects and classes in Java – defining classes – methods - access specifiers – static members – constructors – finalize method.

**ARRAYS, STRINGS &OBJECTS**

Arrays – Strings - Packages – Java-Doc comments –- Inheritance – class hierarchy – polymorphism – dynamic binding – final keyword – abstract classes - The Object class – Reflection – interfaces – object cloning – inner classes – proxies.

**EVENTS & GRAPHICS PROGRAMMING**

I/O Streams - Filter and pipe streams – Byte Code interpretation - Basics of event handling – event handlers – adapter classes – actions – mouse events – AWT event hierarchy – Graphics programming – Frame – Components – working with 2D shapes.

**SWING & GENERIC PROGRAMMING**

Introduction to Swing – Model-View-Controller design pattern – buttons – layout management – Swing Components – exception handling – exception hierarchy – throwing and catching exceptions - Motivation for generic programming – generic classes – generic methods – generic code and virtual machine – inheritance and generics – reflection and generics.

**THREADS & SOCKET PROGRAMMING**

Multi-threaded programming – interrupting threads – thread states – thread properties – thread synchronization – Executors – synchronizers – Socket Programming – UDP Datagram – Introduction to Java Beans.

**TEXT BOOKS:**


1. Cay S. Horstmann and Gary Cornell, “Core Java: Volume I – Fundamentals”, Eighth Edition, Sun Microsystems Press, 2008.
2. Elliotte Rusty Harold, “ Java Network Programming”, O‟Reilly publishers, 2000.
3. Ed Roman, “Mastering Enterprise Java Beans”, John Wiley & Sons Inc., 1999.


**REFERENCES:**


1. K. Arnold and J. Gosling, “The JAVA programming language", Third edition, Pearson Education, 2000.
2. Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2000.
3. C. Thomas Wu, "An introduction to Object-oriented programming with Java", Fourth Edition, Tata McGraw-Hill Publishing company Ltd., 2006.


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| 17CVEC08 | REMOTE SENSING TECHNIQUES AND APPLICATIONS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC(OE) | 3 | 0 | 0 | 3 |

**PREAMBLE**

Remote sensing is the science and art of obtaining information about an object, area or phenomenon, by the use of either recording or real time sensing devices that are not in physical contact with the object. The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. These GPS satellites circle the earth twice a day in a very precise orbit and transmit signal information to earth. Remote sensing and GPS data are further used in numerous applications, including GIS data collection, surveying, and mapping.

**PREREQUISITE**

**NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | Students will learn about the land use mapping techniques,site suitability techniques |
| 2 | Students will learn about the use of zone mapping for water bodies |
| 3 | Students will learn about the use of mapping techniques for Agriculture and Earth sciences |
| 4 | Students will also learn about the recent techniques used for GPS system |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Recollect the fundamentals of physics of Remote sensing and concepts. | Remember |
| CO2. Outline the various data acquisition systems and collection methods for remote sensing data information and storage | Understand |
| CO3.Apply knowledge of satellites on various Civil Engineering applications. | Apply |
| CO4. Utilize the various data input methods for mapping | Apply |
| CO5. Creation of data models using remote sensing techniques and GPS | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | - | - | - | - | - | - | - | - | - | - | L | - | - | - |
| CO2 | S | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| CO3 | S | L | - | - | - | - | - | - | - | - | - | L | L | - | M |
| CO4 | S | L | - | L | L | S | - | - | L | - | - | - | L | L | L |
| CO5 | S | L | L | - | L | - | - | - | L | L | L | - | L | L | L |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**INTRODUCTION:** Definition – Physics of remote sensing – electromagnetic radiation (EMR) – remote sensing windows – interaction of EMR with atmosphere, earth surface, soils, water and vegetation – platform and sensors – image interpretations.

**LAND USE STUDIES:**Definition of land use – land use / land cover classification – schemes and levels of classification systems with RS data – land use mapping – change detection – urban land use planning, site suitability analysis, transportation planning.

**WATER RESOURCES:** Areal assessment of surface water bodies – Capacity survey of water bodies – mapping of snow-covered areas – flood risk zone mapping – identification of groundwater potential zones, recharge areas – droughts, definition, drought assessment and management.

**AGRICULTURE, SOIL AND FORESTRY:** Crop inventory mapping – production estimation – command area monitoring – soil mapping – crop stress detection - estimation of soil erosion – forest types and density mapping – forest fire risk zone mapping.

**EARTH SCIENCE:** Lithology – lithological mapping – structural mapping – Geomorphology – nature and type of landforms – identification – use of remote sensing data for landslides – targeting mineral resources – Engineering geology and Environmental geology.

**TEXT BOOKS:**


1. Lillesand, T.M., Kiefer, R.W. and J.W.Chipman., Remote Sensing and Image Interpretation. V Edn. John Willey and Sons (Asia) Pvt. Ltd., New Delhi, 2004
2. Lo. C.P.andA.K.W.Yeung, Concepts and Techniques of Geographic Information Systems. Prentice-Hall of India Pvt. Ltd., New Delhi, 2002


**REFERENCES:**


1. Chandra,A.M,GeoInformatics,New Age International(P) Limited,Publishers.
2. Fazal,Shahab,GISBasics,New Age International(P) Limited,Publishers.
3. Space Applications Centre. Manual for Forest mapping and Damage detection using satellite data, Report No.IRS-UP/SAC/FMDD/TN/16/90,1990, pp-253.
4. Sabins, F.F.Jr. Remote sensing principles and interpretation, W.H.Freeman& Co., 1978.
5. Manual of Remote Sensing Vol. II. American Society of Photogrammetry


**COURSE DESIGNERS**


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| 17CVEC18 | WIND ENGINEERING | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC(OE) | 3 | 0 | 0 | 3 |

**PREAMBLE**

The course includes studies of sustainable development and energy sources. Basic mathematical and physical concepts will be covered. An introduction to prerequisites for wind power development including how a wind turbine works, planning for wind energy, environmental impact, location and economic aspects will be given. The phases of wind power projects is studied. Oral and written presentations in a scientific context will be discussed and practiced in the course. A site study visit to an operating wind farm is included.

**PREREQUISITE**

Nil

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To learn about the forces generated on structures due to normal wind as well as gusts. |
| 2 | To analyses the dynamic effects produced due to chimney,tower and silos |
| 3 | To understand about the seismic design of various structures |
| 4 | To analyses the application in design and its implementations |
| 5 | To learn about the forces generated on structures due to normal wind as well as gusts. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. give an account of and analyse energy sources and their sustainability | Understand |
| Co2. identify and explain a wind power project's phases | Apply |
| Co3. identify and evaluate factors affecting wind energy development | Apply |
| Co4. analyse the siting conditions for wind power development | Apply |
| CO5. clearly present an individual or group assignment within wind power in oral or written form | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | L | S | S | S | - | L | S | L | --- | --- | L | --- | - | - | L |
| CO2 | L | S | S | S | L | M | S | L | --- | L | L | --- | - | - | L |
| CO3 | S | S | S | S | L | M | L | L | --- | L | --- | --- | - | L | L |
| CO4 | L | S | L | S | L | --- | S | L | --- | L | --- | L | L | - | M |
| CO5 | S | S | S | S | - | --- | S | M | --- | L | L | --- | L | - | - |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**INTRODUCTION :**Terminology – Wind Data – Gust factor and its determination - Wind speed variation with height – Shape factor – Aspect ratio – Drag and lift.

**EFFECT OF WIND ON STRUCTURES :**Static effect – Dynamic effect – Interference effects (concept only) – Rigid structure – Aeroelastic structure (concept only)..

**EFFECT ON TYPICAL STRUCTURES :** Tail buildings – Low rise buildings – Roof and cladding – Chimneys, towers and bridges

**APPLICATION TO DESIGN :**Design forces on multistorey building, towers and roof trusses.

**INTRODUCTION TO WIND TUNNEL:** Types of models (Principles only) – Basic considerations – Examples of tests and their use.

**TEXT BOOKS:**

1. Peter Sachs, "Wind Forces in Engineering, Pergamon Press, New York, 1992.
2. Lawson T.V., Wind Effects on Buildings, Vols. I and II, Applied Science and Publishers, London, 1993.

**REFERENCE BOOKS:**

1. Devenport A.G., "Wind Loads on Structures", Division of Building Research, Ottowa, 1990.
2. Wind Force on Structures – Course Notes, Building Technology Centre, Anna University, 1995

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| 17CSPI10 | MOBILE APPLICATION DEVELOPMENT | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | PI | 3 | 0 | 0 | 3 |

**PREAMBLE**

In this modern era almost every hands has a handheld devices. Each handheld device have the computing capability to meet the half the needs of user such as banking, browsing, education and emergency etc. It is a must for a computer engineer to have some basic knowledge about the handheld devices platform and its supporting software development. This course will give adequate knowledge in developing a mobile applications for different such as Android, iOS, Windows.

**PRE REQUISITE –** NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| **1.** | Understand system requirements for mobile applications |
| **2.** | Generate suitable design using specific mobile development frameworks |
| **3.** | Generate mobile application design |
| **4.** | Implement the design using specific mobile development frameworks |
| **5.** | Deploy the mobile applications in marketplace for distribution |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1**. Expose to technology and business trends impacting mobile applications | Understand |
| **CO2**.Understand enterprise scale requirements of mobile applications | Understand |
| **CO3.** Familiarize in the Graphics used for Android application development | Apply |
| **CO4.** Competent with the characterization and architecture of mobile applications | Apply |
| **CO5.** Competent with designing and developing mobile applications using one application development framework. | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | M | M | M | M | - | - | M | - | - | - | M | M | M | - |
| **CO2** | S | M | M | M | M | - | - | M | - | - | - | M | M | M | - |
| **CO3** | S | M | L | M | L | - | - | M | - | - | - | L | S | S | M |
| **CO4** | S | M | M | M | M | - | - | M | - | - | - | M | M | M | M |
| **CO5** | S | M | M | M | L | - | - | M | - | - | - | L | M | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**UNIT I INTRODUCTION**

Introduction to mobile applications –Embedded systems -Market and business drivers for mobile applications – Publishing and delivery of mobile applications –Requirements gathering and validation for mobile applications

**UNIT II BASIC DESIGN**

Introduction –Basics of embedded systems design –Embedded OS -Design constraints for mobile applications, both hardware and software related –Architecting mobile applications –User interfaces for mobile applications –touch events and gestures –Achieving quality constraints –performance, usability, security, availability and modifiability.

**UNIT III ADVANCED DESIGN**

Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

**UNIT IV TECHNOLOGY I – ANDROID**

Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI –Persisting data using SQLite–Packaging and deployment –Interaction with server side applications –Using Google Maps, GPS and Wifi –Integration with social media applications.

**UNIT V TECHNOLOGY II –IOS**

Introduction to Objective C –iOS features –UI implementation –Touch frameworks –Data persistence using Core Data and SQLite –Location aware applications using Core Location and Map Kit –Integrating calendar and address book with social media application –Using Wifi -iPhone marketplace.

**TEXT BOOKS**

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012.

**REFERENCES**

1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012.

2. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012.

3. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6 Development: Exploring the iOS SDK”, Apress, 2013

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| 17CSEC34 | WEB DESIGN AND MANAGEMENT | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC | 3 | 0 | 0 | 3 |

**PREAMBLE**

To understand and learn the scripting languages with design of web applications. and maintenance and evaluation of web design management.

**PREREQUISITE**

NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To introduce the student to the tools and facilities of web design |
| 2 | To understand and learn the scripting languages with design of web applications |
| 3 | To learn the maintenance and evaluation of Web design/development process, with Macromedia Dreamweaver as the primary Web development tool |
| 4 | Topics covered include basic and enhanced site structure, local and remote site management, and optimization of Web graphics |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1:** Apply an Information Architecture document for a web site. | Apply |
| **CO2:** Construct a web site that conforms to the web standards of today and includes e-commerce and web marketing | Analyze |
| **CO3:** Perform regular web site maintenance (test, repair and change). | Analyze |
| **CO4:** Understand the principles of various process of Project management | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | M | S | - | M | - | - | - | - | - | - | - | M | M | M |
| **CO2** | S | M | M | - | L | - | - | - | - | - | S | M | M | M | M |
| **CO3** | S | M | M | - | M | - | - | - | - | - | M | M | M | M | M |
| **CO4** | S | M | S | - | M | - | - | M | - | - | S | M | M | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**SITE ORGANIZATION AND NAVIGATION**

User Centered Design–Web Medium–Web Design Process–Basics of Web Design –Introduction to Software used for Web Design – ADOBE IMAGE READY, DREAM WEAVER, FLASH – Evaluating Process – Site Types and Architectures – Navigation Theory – Basic Navigation Practices – Search – Sitemaps.

**ELEMENTS OF PAGEDESIGN**

Browser Compatible Design Issues-Pages and Layout – Templates – Text – Color – Images – Graphics and Multimedia – GUI Widgets and Forms – Web Design Patterns – STATIC pages: Slice– URL in ADOBE IMAGE READY. Creation and Editing of site map – Layer, Tables, Frame set, - CSS style – Forms –Tools like Insert, Rollover etc., in DREAM WEAVER

**SCRIPTING LANGUAGES AND ANIMATION USING FLASH**

Client side scripting :XHTML – DHTML – JavaScript – XML Server Side Scripting: Perl–PHP– ASP/JSP Designing a Simple Web Application - Introduction to MACROMEDIA FLASH, Importing Other File Formats to Flash – Saving and Exporting Flash Files, Frame by Frame Animation–Motion Tweening – Shape Tweening.

**PRE-PRODUCTION MANAGEMENT**

Principles of Project Management – Web Project Method – Project Road Map – Project Clarification – Solution Definition – Project Specification – Content – Writing and Managing Content.

**PRODUCTION, MAINTENANCE AND EVALUATION**

Design and Construction – Testing, Launch and Handover – Maintenance – Review and Evaluation – **Case Study:** Using the Skills and Concepts Learn with the ADOBE IMAGE READY, DREAM WEAVER, FLASH, and Scripts, Develop Portfolios in the Form of Web Pages which have to be uploaded in Free Public Domain.

**TEXT BOOKS**

1.Themas A. Powell, ―The Complete Reference–Web Design‖, Tata McGraw Hill, Third Edition, 2003.
2.Ashley Friedlein, ―Web Project Management‖, Morgan Kaufmann Publishers, 2001.
3.H.M. Deitel, P.J. Deitel, A.B. Goldberg, ―Internet and World Wide Web – How to Program‖, Third Edition, Pearson Education, 2004.

**REFERENCES**

1.Joel Sklar, ―Principles of Web Design‖, Thomson Learning, 2001.
2.Van Duyne, Landay and Hong, ―The Design of Sites: Patterns for Creating Winning Websites‖, Second Edition, Prentice Hall, 2006.
3.Lynch, Horton and Rosenfeld, ―Web Style Guide: Basic Design Principles for Creating Websites‖, Second Edition, Yale University Press, 2002.

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| 17ATCC04 | AUTOMOTIVE ELECTRICAL AND ELECTRONICS SYSTEMS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |

**Preamble**

Automotive electrical and electronic systems used in road vehicles, enable study analyze and apply the concepts of various electrical and electronics component such as battery alternator ignition system and other engine management systems.

**Prerequisite**

Nil

**Course Objectives**

| |
|---|
| 1. To perform the concepts of battery and charging systems.. |
| 2. To compilet the knowledge of starting systems in the vehicle. |
| 3. To employ the knowledge in the application of various types of charging system & lighting system. |
| 4. To demonstrate the application and knowledge of fundamental of automotive electronics. |
| 5. To employ the application and knowledge of sensors and actuators. |

**Course Outcomes**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Outline the concepts of Electrical and Electronics System | Understand |
| CO2. Summarize the various concept of starting systems. | Understand |
| CO3. Apply the various types of charging system & lighting system. | Apply |
| CO4. Identify the application automotive electronics. | Apply |
| CO5. Compare the sensors and actuators. | Apply |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | S | M | M | L | - | - | - | - | - | - | - | L | L | - | - |
| 2. | S | M | M | L | - | - | - | - | - | - | - | L | L | - | - |
| 3. | S | S | S | M | - | - | - | - | - | - | - | M | L | - | M |
| 4. | S | S | S | M | - | - | - | - | - | - | - | M | L | M | - |
| 5. | S | S | S | M | - | - | - | - | - | - | - | M | L | - | - |

S- Strong; M-Medium; L-Low

## Syllabus

**BATTERIES**

Principle and construction of lead-acid battery. Characteristics of battery, rating, capacity and efficiency of batteries. Various tests on battery condition, charging methods. Details of modern storage batteries.

**STARTING SYSTEM**

Condition of starting Behavior of starter during starting. Series motor and its characteristics. Principle & construction of starter motor. Working of different starter drive units. Care & maintenance of starter motor, Starter switches.

**CHARGING SYSTEM & LIGHTING SYSTEM**

Generation of direct current, shunt generator characteristics, armature reaction,third brush regulation, cutout. Voltage and current regulators, compensatedvoltage regulator, alternators principle and constructional aspects and bridgerectifiers, new developments.Lighting system: insulated and earth return system, details of head light and sidelight, LED lighting system, head light dazzling and preventive methods – Horn,wiper system and trafficator.

**FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS**

Current trends in automotive electronic engine management system, electromagnetic interference suppression, electromagnetic compatibility, electronic dashboard instruments, onboard diagnostic system, security and warning system.

**SENSORS AND ACTUATORS**

Types of sensors: sensor for speed, throttle position, exhaust oxygen level,manifold pressure, crankshaft position, coolant temperature, exhaust temperature,air mass flow for engine application. Solenoids, stepper motors, relay.

### TEXT BOOK:


1. Kholi,P.L., Automotive Electrical Equipment, Tata McGraw-Hill Co. Ltd., New Delhi, 2004.
2. Judge,A.W., Modern Electrical Equipment of Automobiles, Chapman & Hall, London, 2004.
3. Younng A.P & Griffiths L, "Automobile Electrical and Electronic Equipments", English Languages Book Society & New Press.
4. Tom Weather Jr and Cland C.Hunter, "Automotive Computers and Control system", Prentice Hall Inc., New Jersey.


### REFERENCES:


1. Vinal,G.W., Storage Batteries, John Wiley & Sons Inc., New York, 1985.
2. Crouse,W.H., Automobile Electrical Equipment, McGraw Hill Book Co. Inc., New York, 1980.
3. Spreadbury,F.G., Electrical Ignition Equipment, Constable & Co. Ltd., London, 1962.
4. Automotive Hand Book, fifth edition, Robert Bosch, Bently Publishers, 2003.


## Course Designers:


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| 17CSEC09 | ETHICAL HACKING | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC | 3 | 0 | 0 | 3 |

**PREAMBLE**
To analyze the basic concepts of security and hacking process

**PREREQUISITE**
NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To understand Technical foundation of cracking and ethical hacking |
| 2 | To identify Aspects of security, importance of data gathering, foot printing and system hacking |
| 3 | To understand evaluation of computer security |
| 4 | To understand Practical tasks will be used to re-enforce and apply theory to encourage an analytical and problem based approach to ethical hacking |
| 5 | To discuss about security tools and its applications |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1:** Identify and analyse the stages an ethical hacker requires to take in order to compromise a target system. | Understand |
| **CO2:** Identify tools and techniques to carry out a penetration testing. | Understand |
| **CO3:** Critically analyze security techniques used to protect system and user data. | Apply |
| **CO4:** Demonstrate systematic understanding of the concepts of security at the level of policy and strategy in a computer system. | Apply |
| **CO5:** To apply information security features in real time | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | M | - | - | - | - | S | - | - | - | M | M | M | M | M |
| CO2 | M | M | S | M | - | - | - | - | - | - | L | M | M | M | M |
| CO3 | M | M | M | M | - | M | - | L | - | - | L | - | S | S | S |
| CO4 | M | S | M | - | - | M | - | - | - | M | - | M | M | M | M |
| CO5 | M | M | - | - | S | M | - | L | - | - | M | M | M | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**INTRODUCTION**

Introduction to Hacking, Types of Hacking, Hacking Process, Security – Basics of Security- Elements of Security, Penetration Testing, Scanning, Exploitation- Web Based Exploitation. Simple encryption and decryption techniques implementation.

**HACKING TECHNIQUES**

Building the foundation for Ethical Hacking, Hacking Methodology, Social Engineering, Physical Security, Hacking Windows, Password Hacking, and Privacy Attacks, Hacking the Network, Hacking Operating Systems- Windows & Linux, Application Hacking, Footprinting, Scanning, and Enumeration. Implementing System Level Hacking- Hacking Windows & Linux.

**WEB SECURITY**

Evolution of Web applications, Web application security, Web Application Technologies- Web Hacking, Web functionality, How to block content on the Internet, Web pages through Email, Web Messengers, Unblocking applications, Injecting Code- Injecting into SQL, Attacking Application Logic. Check authentication mechanisms in simple web applications. Implementation of Web Data Extractor and Web site watcher. Implementation of SQL Injection attacks in ASP.NET.

**WIRELESS NETWORK HACKING**

Introduction to Wireless LAN Overview, Wireless Network Sniffing, Wireless Spoofing, Port Scanning using Netcat, Wireless Network Probing, Session Hijacking, Monitor Denial of Service (DoS) UDP flood attack, Man-in-the-Middle Attacks, War Driving, Wireless Security Best Practices, Software Tools, Cracking WEP, Cracking WPA & WPA-II. Implementation- Locate Unsecured Wireless using Net-Stumbler/ Mini-Stumbler.

**APPLICATIONS**

Safer tools and services, Firewalls, Filtering services, Firewall engineering, Secure communications over insecure networks, Case Study: Mobile Hacking- Bluetooth-3G network weaknesses, Case study: DNS Poisoning, Hacking Laws. Working with Trojans using NetBus.

**TEXT BOOKS**

1. Stuart McClure, Joel Scambray, George Kurtz, "Hacking Exposed 6: Network Security Secrets & Solutions", Seventh edition, McGraw-Hill Publisher, 2012.

2. Kevin Beaver, "Hacking for Dummies" Second Edition, Wiley Publishing, 2007.

3. Dafydd Stuttard and Marcus Pinto, "The Web Application Hacker's Handbook: Discovering and Exploiting Security Flaws" Wiley Publications, 2007.

4. Ankit Fadia, "An Unofficial Guide to Ethical Hacking" Second Edition, Macmillan publishers India Ltd, 2006.

**REFERENCES**

1. Hossein Bidgoli, "The Handbook of Information Security" John Wiley & Sons, Inc., 2005.

**COURSE DESIGNERS**


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| 17CSEC11 | GREEN COMPUTING | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC | 3 | 0 | 0 | 3 |

**PREAMBLE**

To acquire knowledge to adopt green computing practices and To learn about energy saving practices

**PREREQUISITE**

NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To acquire knowledge to adopt green computing practices |
| 2 | To minimize negative impacts on the environment |
| 3 | To learn about energy saving practices |
| 4 | To learn about green compliance. And implementation using IT |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1:** Explain the significance knowledge to adopt green computing practices | Understand |
| **CO2:** Design and develop the green asset used to minimize negative impacts on the environment | Apply |
| **CO3:** Identify an appropriate cooling technologies and infrastructure for optimizing the cost of data center operations | Apply |
| **CO4:** Make use of an knowledge about energy saving practices ,the impact of e-waste and carbon waste | Apply |
| **CO5:** Analyze about green compliance, implementation using IT and derive the case study. | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | - | S | - | - | - | M | - | - | - | - | - | S | S | S |
| **CO2** | S | S | M | - | L | - | S | S | - | M | - | M | S | S | S |
| **CO3** | S | M | M | - | - | M | S | M | - | - | - | - | M | M | M |
| **CO4** | S | S | - | - | - | - | S | S | - | M | - | M | M | M | M |
| **CO5** | S | M | M | - | - | S | M | - | M | - | M | S | M | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**FUNDAMENTALS**

Green IT Fundamentals: Business, IT, and the Environment – Benefits of a Green Data Centre - Green Computing:Carbon Foot Print, Scoop on Power–GreenITStrategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

**GREEN ASSETS AND MODELING**

Green Assets: Buildings, Data Centres, Networks, Devices, Computer and Earth Friendly peripherals, Greening Mobile devices – Green Business Process Management: Modelling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.

**GRID FRAMEWORK**

Virtualizing of IT Systems – Role of Electric Utilities, Telecommuting, Teleconferencing and Teleporting – Materials Recycling – Best Ways for Green PC – Green Data Center – Green Grid Framework. Optimizing Computer Power Management, Systems Seamless Sharing Across. Collaborating and Cloud Computing, Virtual Presence.

**GREEN COMPLIANCE**

Socio-Cultural Aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, And Audits – Emergent Carbon Issues: Technologies and Future. Best Ways to Make Computer Greener.

**GREEN INITIATIVES WITH IT and CASE STUDIES**

Green Initiative Drivers and Benefits with IT - Resources and Offerings to Assist Green Initiatives. - Green Initiative Strategy with IT - Green Initiative Planning with IT - Green Initiative Implementation with IT - Green Initiative Assessment with IT. The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

**TEXT BOOKS**

1.Bhuvan Unhelkar, ―Green IT Strategies and Applications-Using Environmental Intelligence‖,CRC Press, June 2011
2.Carl Speshocky, ―Empowering Green Initiatives with IT‖, John Wiley and Sons, 2010.

**REFERENCES**

1. Alin Gales, Michael Schaefer, Mike Ebbers, ―Green Data Center: Steps for the Journey‖, Shoff/IBM rebook, 2011.
2. John Lamb, ―The Greening of IT‖, Pearson Education, 2009.
3. Jason Harris, ―Green Computing and Green IT- Best Practices on Regulations and Industry‖, Lulu.com, 2008.

**COURSE DESIGNERS**



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| 17CSEC32 | VIRTUAL REALITY | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC | 3 | 0 | 0 | 3 |

**PREAMBLE**

This course provides a detailed understanding of the concepts of Virtual Reality and its application.

**PREREQUISITE**

NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To Learn Geometric modeling and Virtual environment |
| 2 | To Learn Virtual Hardware and Software |
| 3 | To Learn Virtual Reality applications |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1**: Differentiate between Virtual, Mixed and Augmented Reality platforms. | Understand |
| **CO2:** Identify appropriate design methodologies for immersive technology development, especially from a physiological perspective. | Apply |
| **CO3:** Demonstrate foundational literacy in designing gaming systems | Apply |
| **CO4:** Categorize the benefits/shortcomings of available immersive technology platforms. | Analyze |
| **CO5:** To apply the VR concepts to various applications | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | M | L | - | M | - | - | - | - | - | - | M | M | M | M |
| **CO2** | S | M | L | L | M | - | - | - | - | - | - | L | M | M | M |
| **CO3** | S | M | L | - | M | - | - | - | - | - | - | M | M | M | M |
| **CO4** | S | L | L | L | M | - | - | - | - | - | - | M | M | M | M |
| **CO5** | S | M | L | - | M | - | - | - | - | - | - | L | M | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**INTRODUCTION**

**Virtual Reality & Virtual Environment** : Introduction – Computer graphics – Real time computer graphics – Flight Simulation – Virtual environments –requirement – benefits of virtual reality- **3D Computer Graphics** : Introduction – The Virtual world space – positioning the virtual observer – the perspective projection – human vision – stereo perspective projection – 3D clipping – Colour theory – Simple 3D modelling – Illumination models – Reflection models – Shading algorithms

**GEOMETRIC MODELLING**

**Geometric Modelling**: Introduction – From 2D to 3D – 3D space curves – 3D boundary representation - **Geometrical Transformations**: Introduction – Frames of reference – Modelling transformations – Instances – Picking – Flying – Scaling the VE – Collision detection - **A Generic VR system**: Introduction – The virtual environment – the Computer environment – VR Technology – Model of interaction – VR System

**CONTENT CREATION AND INTERACTION ISSUES**

Gestalt perceptual organization - real world content - field of view - paradigm shift from real environment to virtual environment - reusing existing content - transition to VR content Human factors : Direct Vs Indirect Interaction - Modes and flow - Input device characteristics - viewpoint and control patterns.

**DESIGN ISSUES**

Optimizing performance - optimizing target hardware and software - **VR Hardware** : Introduction – sensor hardware – Head-coupled displays –Aquatic hardware – Integrated VR systems-**VR Software**: Introduction – Modelling virtual world –Physical simulation- VR toolkits - multiplayer environment - multiplayer networking architecture.

**APPLICATION**

Engineering – Entertainment – Science – Training – classroom.

**TEXT BOOKS**

1. John Vince, “Virtual Reality Systems “, Pearson Education Asia, 2002
2. Jason Jerald, "The VR book: Human centered design for virtual reality", CRC Press, 2015

**REFERENCES**

1. Adams, “Visualizations of Virtual Reality”, Tata McGraw Hill, 2000.
2. Grigore C. Burdea, Philippe Coiffet, “Virtual Reality Technology” , WileyInterscience,1 Edition,1994.
3. William R. Sherman, Alan B. Craig, “Understanding Virtual Reality: Interface, Application, and Design”, Morgan Kaufmann, 1st Edition,2002.
4. Jonathan Linowes, "Unity Virtual Reality Projects- Explore the world of virtual reality by building immersive and fun VR Projects using Unity 3D", Packt Publishing, 2015.

**COURSE DESIGNERS**



| S. No. | Name of the Faculty | Designation | Department | Mail ID |
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| 17CSCC01 | DATA STRUCTURES | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |

**PREAMBLE**

This course aims at understanding the basic concepts in programming structures, linear structures and non linear structures

**PRERQUISITE**

NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| **1.** | To remember and understand the basic concepts in linear structures |
| **2.** | To learn about tree structures. |
| **3.** | To understand about balanced trees |
| **4.** | To learn about hashing and sets. |
| **5.** | To learn and understand about graphs |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Remember the basic concepts in linear structures | Understand |
| CO2. Learn about tree structures and tree traversals | Apply |
| CO3. Understand about balanced trees | Apply |
| CO4. Learn about hashing and sets. | Apply |
| CO5. Learn and understand about graphs | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | M | - | - | - | - | - | - | - | - | M | S | S | S |
| CO2 | S | M | M | M | M | - | - | - | - | - | - | M | S | S | S |
| CO3 | S | M | L | M | M | - | - | - | - | - | - | M | S | S | M |
| CO4 | S | M | M | M | M | - | - | - | - | - | - | L | S | S | M |
| CO5 | S | M | L | M | M | - | - | - | - | - | - | M | S | S | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**Linear Structures**

Abstract Data Types (ADT) – List ADT – array-based implementation – linked list implementation – cursor-based linked lists – doubly-linked lists – applications of lists –Stack ADT – Queue ADT – circular queue implementation – Applications of stacks and queues.

**Tree Structures**

Tree ADT – tree traversals – left child right sibling data structures for general trees and graphs.

**Balanced Trees**

AVL Trees – Splay Trees – B-Tree - heaps – binary heaps – applications of binary Heaps **.**

**Hashing and Set**

Hashing – Separate chaining – open addressing – rehashing – extendible hashing -Disjoint Set ADT – dynamic equivalence problem – smart union algorithms – path compression – applications of Set.

**Graphs**

Definitions – Topological sort – breadth-first traversal - shortest-path algorithms –minimum spanning tree – Prim's and Kruskal's algorithms – Depth-first traversal – bi-connectivity – Euler circuits – applications of graphs.

**TEXT BOOKS**:


1. Mark A. Weiss, "Data Structures and Algorithm Analysis in C (2nd Edition), Pearson Education.


**REFERENCES:**


1. A. V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", Pearson Education, First Edition Reprint.

2. R. F. Gilberg, B. A. Forouzan, "Data Structures", Second Edition, Thomson India, Edition


**COURSE DESIGNERS**


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| 17CSCC02 | OBJECT ORIENTED PROGRAMMING | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |

**PREAMBLE**

This syllabus is intended for the Computer science students and enables them to learn Object Oriented Programming and the design of computer solutions in a precise manner. The syllabus emphasizes on OOP concepts, Functions, Polymorphism, Inheritance and I/O. The intention is to provide sufficient depth in these topics to enable candidates to apply Object Oriented Programming approach to programming. The modules in the syllabus reflect solving general problems via programming solution. Thus, modules collectively focus on programming concepts, strategies and techniques; and the application of these toward the development of programming solutions.

**PRERQUISITE**

Nil

**COURSE OBJECTIVES**

| | |
|---|---|
| 1. | To learn about the syntax and semantics of C++ programming language |
| 2. | To learn about the concepts of object oriented programming. |
| 3. | To determine how to reuse the code, Constructors and member functions |
| 4. | To Analyse how to reduce the coding by applying overloading concepts |
| 5. | To Analyse how to reuse the code, how to verify and validate the coding |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Construct object-oriented programs for a given scenario using the concepts of abstraction, encapsulation, message-passing and modularity | Apply |
| CO2. Construct object-oriented programs for a given application by using constructors | Apply |
| CO3. Develop object-oriented programs for a given application using the concepts of compile-time and run-time polymorphism | Analyze |
| CO4. Develop object-oriented applications through inheritance concepts | Analyze |
| CO5. Construct object-oriented applications for a given scenario using files, Sting handling and to handle exceptions | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | M | M | M | M | - | - | - | - | - | M | L | M | M | - |
| CO2 | M | M | M | M | M | - | - | - | - | - | M | L | M | M | - |
| CO3 | M | M | S | M | S | - | - | - | - | - | M | L | M | M | - |
| CO4 | S | M | M | M | S | - | - | - | - | - | M | L | M | M | - |
| CO5 | S | M | M | M | M | - | - | - | - | - | M | L | M | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**INTRODUCTION TO FUNDAMENTAL CONCEPTS OF OOP**

Object Oriented Paradigm: Elements of Object Oriented Programming – Working with classes, Classes and Objects-Class specification- accessing class members- defining member functions - Passing and returning objects – Array of objects - inline functions - accessing member functions within class - Static members.

**OBJECT INITIALIZATION AND FRIEND FUNCTION**

Constructors - Parameterized constructors - Constructor overloading. Copy constructor, Destructors, Default arguments - new, delete operators - "this" pointer, friend classes and friend functions.

**OVERLOADING AND GENERIC PROGRAMMING**

Function overloading – Operator overloading- Non-over loadable operators- unary operator overloading- operator keyword- limitations of increment/decrement operators- binary operator overloading- Generic programming with templates-Function templates- class templates.

**INHERITANCE AND VIRTUAL FUNCTION**

Inheritance-Base class and derived class relationship-derived class declaration-Forms of inheritance- inheritance and member accessibility, abstract class, virtual functions, pure virtual function**.**

**EXCEPTION HANDLING AND STREAMS**

Exception handling - Try Catch Throw Paradigm - Uncaught Exception- Files and Streams-Opening and Closing a file- file modes- file pointers and their manipulation, sequential access to a file-random access to a file-Reading and Writing – Exception handling. String Objects.

**TEXT BOOKS:**


1. B. Trivedi, "Programming with ANSI C++", Oxford University Press, 2007.
2. K. R. Venugopal, Rajkumar, T. Ra vishankar, Mastering C++, 4th Edition, Tata McGraw 2. Hill, 2008.
3. Budd T., An Introduction to Object-oriented Programming, Addison-Wesley 3rd 4. Edition, 2008.
4. Bjarne stroustrup, The C++ programming Language, Addison Wesley, 3rd edition2008.
5. Harvey M. Deitel and Paul J. Deitel, C++ How to Program, 7th edition, Prentice Hall, 2010.
6. Tony Gaddis, Starting Out with Java: From Control Structures through Objects, 4/E, Addison-Wesley, 2009.


**REFERENCES:**


1. H.M. Deitel and P.J. Deitel, C How to program Introducing C++ and Java, Fourth Edition, Pearson Prentice Hall, 2005.
2. 2. B. Stroustrup, "The C++ Programming language", Third edition, Pearson Education, 2004.


**COURSE DESIGNERS**


| S.No | Name of the faculty | Designation | Department | Mail Id |
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| 17CSCC03 | DATABASE MANAGEMENT SYSTEM | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |

**PREAMBLE:**

This course aims at facilitating the student to understand the various concepts and functionalities of Database Management Systems, the method and model to store data and how to manipulate them through query languages, the effective designing of relational database and how the system manages the concurrent usage of data in multi user environment.

**PREREQUISITE:**

NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | Describe a relational database and object-oriented database. |
| 2 | Create, maintain and manipulate a relational database using SQL. |
| 3 | Describe ER model and normalization for database design. |
| 4 | Examine issues in data storage and query processing and can formulate appropriate solutions. |
| 5 | Design and build database system for a given real world problem. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Illustrate the database design for applications and use of ER Diagram. | Understand |
| CO2. Build and manipulate the relational database using Structured Query Language and relational languages. | Apply |
| CO3. Develop a normalized database for a given application by incorporating various constraints like integrity and value constraints. | Apply |
| CO4. Apply concurrency control & recovery mechanism for database problems. | Apply |
| CO5. Construct data structures like indexes and hash tables for the fast retrieval of data. | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | M | M | M | - | - | - | - | - | M | S | M | M | M |
| CO2 | M | M | M | L | M | - | - | - | - | - | M | M | M | M | M |
| CO3 | M | M | S | M | M | - | - | - | - | - | M | L | M | M | M |
| CO4 | S | M | M | M | L | - | - | - | - | - | M | M | M | M | M |
| CO5 | S | M | M | M | M | - | - | - | - | - | M | M | M | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**INTRODUCTION**

Database System Applications - Views of data - Data Models - Database Languages -Modification of the Database - Database System Architecture - Database users and Administrator- Introduction to relational databases - Structure of Relational Databases - Entity-Relationship model (E-R model) - E-R Diagrams.

**RELATIONAL APPROACH**

The relational Model - Additional & Extended Relational - Types of Keys - Relational Algebra - Null Values - Domain Relational Calculus - Tuple Relational Calculus - Fundamental operations - Additional Operations- SQL fundamentals - Structure of SQL Queries - SQL Data Types and Schemas - Nested Sub queries - Complex Queries - Integrity Constraints - Triggers - Security - Advanced SQL Features - Embedded SQL- Dynamic SQL- Views - Introduction to Distributed Databases and Client/Server Databases..

**DATABASE DESIGN**

Overview of the Design Process - Functional Dependencies - Non-loss Decomposition - Functional Dependencies - Normalization and its Types - Dependency Preservation - Boyce/Codd Normal Form- Decomposition Using Multi-valued Dependencies and Fourth Normal Form - Join Dependencies and Fifth Normal Form - Entity Sets and its Types.

**TRANSACTION &CONCURRENCY CONTROL**

Transaction Concepts - Transaction State - Transaction Recovery - ACID Properties - System Recovery - Media Recovery - Two Phase Commit - SQL Facilities for recovery -Advanced Recovery Techniques - Buffer Management - Remote Backup Systems - Concurrency Control - Need for Concurrency - Locking Protocols -Two Phase Locking - Internet Locking - Deadlock Handling - Serializability - Recovery Isolation Levels - SQL Facilities for Concurrency.

**STORAGE STRUCTURE**

Introduction to Storage and File Structure - Overview of Physical Storage Media - Magnetic Disks - RAID - Tertiary storage - File Organization - Organization of Records in Files - Indexing and Hashing - Ordered Indices - B+ tree Index Files - B- tree Index Files - Bitmap Indices - Static Hashing - Dynamic Hashing -Query Processing - Catalogue Information for Cost Estimation – Selection Operation - Sorting - Join Operation - Query optimization - Database Data Analysis.

**TEXT BOOKS:**


1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Sixth Edition, McGraw-Hill Education; 6 edition, 2010).


**REFERENCES:**


1. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson India; 7th edition, 2017, 2017).

2. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", Third Edition, McGraw Hill, 2002.

3. Carlos Coronel, Steven Morris , "Database Systems – Design, Implementation and Management, 13th Edition, Cengage Learning; 13th edition, 2018) .


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| 17CSEC06 | CRYPTOGRAPHY AND NETWORK SECURITY | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC | 3 | 0 | 0 | 3 |

**PREAMBLE**

To understand the concepts in cryptography and network security and their applications in real time

**PREREQUISITE**

NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To understand the basic concepts in understanding cryptography and network security |
| 2 | To know about various encryption techniques. |
| 3 | To understand the concept of Public key cryptography. |
| 4 | To study about message authentication and hash functions |
| 5 | To impart knowledge on Network security |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1:** Classify the symmetric encryption techniques | Understand |
| **CO2:** Illustrate various Public key cryptographic techniques | Apply |
| **CO3:** Evaluate the authentication and hash algorithms. | Apply |
| **CO4:** Discuss authentication applications | Apply |
| **CO5:** Summarize the intrusion detection and its solutions to overcome the attacks. | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | M | L | - | M | - | - | - | - | - | - | M | M | M | M |
| **CO2** | S | M | L | - | M | - | - | - | - | - | - | M | M | - | M |
| **CO3** | S | M | L | - | M | - | - | - | - | - | - | M | M | M | M |
| **CO4** | S | M | L | - | M | - | - | - | - | - | - | M | - | M | M |
| **CO5** | S | L | L | - | M | - | - | - | - | - | - | M | M | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**INTRODUCTION**

Security trends – Attacks and services – Classical crypto systems – Different types of ciphers – LFSR sequences – Basic Number theory – Congruences – Chinese Remainder theorem – Modular exponentiation – Fermat and Euler's theorem – Legendre and Jacobi symbols – Finite fields – continued fractions.

**METHODS**

Simple DES – Differential cryptanalysis – DES – Modes of operation – Triple DES –AES – RC4 – RSA – Attacks – Primality test – factoring

**TECHNIQUES**

Discrete Logarithms – Computing discrete logs – Diffie-Hellman key exchange –ElGamal Public key cryptosystems – Hash functions – Secure Hash – Birthday attacks -MD5 – Digital signatures – RSA – ElGamal – DSA.

**AUTHENTICATION**

Authentication applications – Kerberos, X.509, PKI – Electronic Mail security – PGP,S/MIME – IP security – Web Security – SSL, TLS, SET.

**SECURITY AND FIREWALLS**

System security – Intruders – Malicious software – viruses – Firewalls – Security Standards

**TEXT BOOKS**

1. Dr. S. Bose and Dr.P. Vijayakumar, "Cryptography and Network Security", First Edition, Pearson Education, 2016.
2. Wade Trappe, Lawrence C Washington, "Introduction to Cryptography with coding theory", 2nd ed, Pearson, 2007.
3. William Stallings, "Cryptography and Network Security Principles and Practices", Pearson/PHI, 6th edition, 2013.

**REFERENCES**

1. W. Mao, "Modern Cryptography – Theory and Practice", Pearson Education, Second Edition, 2007.
2. Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing Third Edition –Prentice Hall of India, 2006.

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| 17BMEC09 | DESIGN OF MEDICAL DEVICES | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC-PC | 3 | 0 | 0 | 3 |

**PREAMBLE**

This course will offer students exposure to the core concepts of the global medical device regulatory framework and provide a foundation for the practical application. It includes all elements of the device product lifecycle from idea to initial market entry, sustaining activities and post-market activities.

**PREREQUISITE – NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To understand the post-marketing requirements associated with medical devices. |
| 2 | To understand the necessary steps to take an idea to a prototype. |
| 3 | To follow a deterministic engineering design process to create new products. |
| 4 | To apply engineering theory to practice. |
| 5 | To perform risk assessment and countermeasure development. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1.** Discuss the necessary steps to take an idea to a prototype. | Understand |
| **CO2.** Utilize fundamental design principles, machine elements, manufacturing and assembly techniques. | Apply |
| **CO3.** Analyze risk management concepts into the quality management system. | Analyze |
| **CO4.** Assess the medical device regulatory framework for any given country based upon device type. | Evaluate |
| **CO5.** Create potential regulatory pathway. | Create |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | -- | -- | -- | -- | -- | -- | -- | M | -- | -- | M | S | M | M |
| CO2 | S | M | -- | -- | -- | -- | -- | -- | M | -- | -- | M | S | M | M |
| CO3 | S | M | M | L | -- | M | -- | L | M | -- | -- | S | S | M | M |
| CO4 | S | S | M | M | M | S | -- | M | S | -- | M | S | S | S | M |
| CO5 | S | S | S | M | M | S | -- | M | S | -- | M | S | S | S | S |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**INTRODUCTION TO MEDICAL DEVICES AND MEDICAL DEVICE REGULATIONS**

Medical Device Classification, Bioethics and Privacy, Biocompatibility and Sterilization Techniques, Design of Clinical Trials, Design Control & Regulatory Requirements.

**INTRODUCTION TO SPECIFIC MEDICAL TECHNOLOGIES**

Biopotential measurement (EMG, EOG, ECG, EEG), Medical Diagnostics (In-vitro diagnostics), Medical Diagnostics (Imaging), Minimally Invasive Devices, Surgical Tools and Implants.

**MEDICAL DEVICES STANDARD AND INTELLECTUAL PROPERTY**

Standard-ISO, IES, Intellectual Property - Patents, Copy rights, Trademarks, Trade secrets.

**HARDWARE AND SOFTWARE DESIGN**

Hardware design, Hardware risk analysis, Design and project merits, Design for six sigma, software design, software coding, software risk analysis, software metrics.

**DESIGN TRANSFER AND MANUFACTURING**

Transfer to manufacturing, hardware manufacturing, software manufacturing, configuration management, documents and deliverables.

**TEXT BOOKS:**


1. Richard Fries, **"Reliable Design of Medical Devices"**, CRC Press, 2nd Edition, 2006.
2. Paul H. King, Richard C. Fries, Arthur T. Johnson, **"Design of Biomedical Devices and Systems"**, Third Edition, ISBN 9781466569133.


**REFERENCES:**


1. John G. Webster (ed), **"Medical Instrumentation: Application and Design"**, 2007.
2. Peter J. Ogrodnik, **"Medical Device Design: Innovation from Concept to Market"**, Academic Press Inc; 1st Edition (2012), ISBN-10: 0123919428


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| 17BMEC02 | BIOTELEMETRY | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC-PS | 3 | 0 | 0 | 3 |

**PREAMBLE**

To study the overall concept of a Biotelemetry system and the concept of signal transmission.

**PREREQUISITE – NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To study the basic concepts and the principles used in a Telemetry system. |
| 2 | To study the building blocks used to make a electrical telemetry system. |
| 3 | To study the basic components of transmitting and receiving techniques. |
| 4 | To know about how optical fibers are used in signal transmission. |
| 5 | To understand the real time application in biotelemetry. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1.** Discuss about the basic information about Telemetry system. | Understand |
| **CO2.** Describe the knowledge about design of Electrical Telemetry Systems. | Understand |
| **CO3.** Demonstrate the different types of modulation techniques. | Apply |
| **CO4.** Analyze the implementation of optical fibers in telemetry system. | Analyze |
| **CO5.** Validate the healthcare system using Telemetry system. | Evaluate |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | -- | -- | -- | -- | -- | -- | -- | -- | L | -- | M | M | M | M |
| CO2 | M | -- | -- | -- | -- | -- | -- | -- | -- | L | -- | M | M | M | M |
| CO3 | S | -- | L | L | -- | L | -- | -- | M | M | -- | S | M | M | S |
| CO4 | S | M | L | L | M | M | L | M | M | S | -- | S | S | S | S |
| CO5 | S | S | M | L | M | S | M | M | S | S | -- | S | S | S | S |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**INTRODUCTION**

Fundamental concepts – Significance, Principle, functional blocks of Telemetry and Telecontrol system- Methods of telemetry – Electrical, Pneumatic, Hydraulic and Optical Telemetry – State of the art-Telemetry standards.

**ELECTRICAL TELEMETRY**

Electrical Telemetry – Current Systems – Voltage Systems – Synchro Systems – Frequency systems – Position and Pulse systems – Example of a landline telemetry system.

**RADIO TELEMETRY SYSTEM**

Block diagram of a Radio Telemetry system – Transmitting and receiving techniques – AM, FM, PM, Multiplexing and demultiplexing – Transmitting and receiving techniques – Digital coding methods – Advantages of PCM, PWM, PM, FSK – Delta modulation – coding and decoding equipment – Example of a radiotelemetry system.

**OPTICAL TELEMETRY SYSTEM**

Optical fibers for signal transmission – Sources for fiber optic transmission – Optical detectors – trends in fiber– optic device development – Example of an optical telemetry System.

**APPLICATION OF BIOTELEMETRY**

Use of computers in distance mode of healthcare delivery, Web technology, Satellite communication systems; hypertext, voice & image transfer protocols, Medical image scanning, Data compression and Transfer, Capturing of medical signals, Analog to digital conversion, Video conferencing, Remote sensing, Rural primary setups, Referral and Super specialty centers, Societal medico legal aspects, Networking (local, national & global).

**TEXT BOOKS**


1. D.Patranabis, **"Telemetry principles"**, Tata Mcgraw Hill Publishers.
2. Marilyn J. Field, **"Telemedicine: A Guide to Assessing Telecommunications for Health Care"**, National Academic Press, 1996.


**REFERENCE**


1. Charles J. Amlaner, David W. Macdonald, **"A Handbook on Biotelemetry and Radio Tracking"**, Pergamon Press; 1st Edition (January 1, 1980).


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| 17BMEC21 | MEDICAL SIMULATION IN LIFE SUPPORTING DEVICES | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC-PS | 3 | 0 | 0 | 3 |

**PREAMBLE**

The purpose of the course on medical simulation and life supporting device for biomedical engineering students is to get practical knowledge in operating basic life supporting devices under emergency condition.

**PREREQUISITE:NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To understand the structure and function of heart and brain. |
| 2 | To learn the various techniques available for deployment in patient suffering from respiratory emergency. |
| 3 | To operate and trouble shoot mechanical ventilator in a patient. |
| 4 | To provide hands on training on life supporting instruments. |
| 5 | Explain the use of ultrasound in critical cardiovascular and respiratory diseases and trauma diagnosis. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1.** Explain anatomy and physiology of the heart and demonstrate various lifesaving technique used under cardiac arrest | Understand |
| **CO2.** Describe various techniques available for deployment in patient suffering from respiratory emergency | Understand |
| **CO3.** Illustrate the Initiate, operate and troubleshoot the ventilator. | Apply |
| **CO4.** Outline various arrhythmias that can be treated by life supporting device and approach algorithmically towards management of these patients | Analyze |
| **CO5.** Analyze life supporting devices | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | -- | L | L | -- | L | -- | M | L | -- | -- | L | M | -- | M |
| CO2 | M | -- | L | L | -- | L | -- | M | L | -- | -- | L | M | -- | M |
| CO3 | S | M | M | M | M | M | -- | M | M | -- | -- | M | S | -- | S |
| CO4 | S | M | M | S | M | M | -- | M | S | -- | -- | M | S | M | S |
| CO5 | S | M | M | S | M | S | -- | M | S | -- | -- | M | S | M | S |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**BASIC LIFE SUPPORT**

Anatomy and physiology of heart, Cardiogenic shock complicating acute coronary syndrome, CPR practice using mannequin, AHA BLS guidelines and practice, Automatic external Defibrillator, Defibrillator practice and troubleshooting.

**ANALYZING ARRHYTHMIAS FOR LIFE SUPPORT**

Description of ECG arrhythmias-an overview, Tachycardia and Bradycardia algorithm and practice, ECG arrhythmia simulator and practice, ACLS guidelines and practice using mannequins.

**BASIC AIRWAY MANAGEMENT**

Ventilation failure and oxygenation failure, Inserting airway adjunct (OPA – Oropharyngeal airway and NPA - Nasopharyngeal airway), Oxygen therapy, LMA and insertion Technique, AMBUBAG indication and practice.

**VENTILATOR FOR LIFE SUPPORT**

Basic anatomy of lung and mechanism of breathing, Mechanical ventilator history and classification, Pressure –volume flow diagram, Different modes of ventilator, Ventilator alarm and trouble shooting, Indication and disease specific ventilation, Weaning from ventilator.

**ROLE OF ULTRASOUND IN LIFE SUPPORT**

Basic principle of ultrasound and different modes of display, Different transducers used in ultrasound, Ultrasound doppler blood flow meter, Ultrasonography in emergency cardiovascular care, Lung ultrasound, Fast scan.

**TEXT BOOKS:**


1. Arthur C. Guyton, John Edward Hall, **"Textbook of Medical Physiology"**,13th Edition Elsevier Inc 2016.
2. John M. Field, Peter J. Kudenchuk, Robert O'Connor, Terry Vanden Hoek, **"The Textbook of Emergency Cardiovascular Care and CPR"**, lippinocot William and wilkins, 1st Edition, 2009.
3. James G. Adams, **"Emergency Medicine: Clinical Essentials"**, Saunders an imprint of Elsevier Inc, 2nd Edition, 2013.
4. Khandpur R.S, **"Hand-book of Biomedical Instrumentation"**, Tata Mc Graw Hill, 2nd Edition, 2003.


**REFERENCES:**


1. Peter Papadakos, Burkhard Lachmann, **"Mechanical Ventilation: Clinical Applications and Pathophysiology"**, sunders an imprint of Elsevier, 1st Edition 2008.
2. Ashfaq Hasan ,**"Understanding Mechanical Ventilation: A Practical Handbook"**, Springer verlag London limited, 2nd Edition 2010.
3. Matthias Hofer, **"Ultrasound Teaching Manual: The Basics of Performing and Interpreting"**, thieme newyork Stuttgart, 3rd Edition, 2013.


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| 17BMSE07 | MEDICAL RADIATION SAFETY ENGINEERING | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | PS-SE | 3 | 0 | 0 | 3 |

**PREAMBLE**
To impart sufficient information on the various precautionary and safety measures for radiation protection in medicine.

**PREREQUISITE – NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To provide an insight to the basics of radiation physics. |
| 2 | To enable them understand the guidelines of radiation protection and radiation detectors. |
| 3 | To provide information on safety measures related to UV, laser and nuclear medicine. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1.** Explain the Radio frequency and Microwave radiations. | Understand |
| **CO2.** Examine the Laser and UV radiation control measure. | Apply |
| **CO3.** Outline the protective measures and radiation hazards in nuclear medicine and radiotherapy. | Analyze |
| **CO4.** Assess the various monitoring methods & Hazard in radiation protection | Evaluate |
| **CO5.** Designing to reduce the radiation hazards. | Create |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | -- | -- | -- | -- | L | -- | L | -- | -- | -- | M | M | M | M |
| CO2 | S | M | M | -- | -- | M | M | M | L | -- | -- | M | M | M | M |
| CO3 | S | S | M | M | -- | M | S | M | M | -- | -- | M | M | M | M |
| CO4 | S | S | S | S | -- | S | S | S | S | -- | M | S | M | S | S |
| CO5 | S | S | S | S | M | S | S | S | S | -- | S | S | S | S | S |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**INTRODUCTION TO RF AND MICROWAVE RADIATION**
Sources of radio frequency radiation – Effects of radio frequency radiation – Development of standards for human safety – Calculation of RF field quantities – RF radiation measuring instruments and methods.

**RADIATION DETECTION AND MEASUREMENT**
Fundamentals of radiation detection – Conducting radiation measurements and surveys – Gas detectors – Designing to reduce radiation hazards – Radio frequency radiation safety management and training – Scintillation detectors – Statistics of Counting – minimum detectable activity – Quality assurance of radiation counters.

**RADIATION SAFETY IN NUCLEAR MEDICINE AND RADIOTHERAPY**

Design and description of NM department – Radiation protection in nuclear industry – Guidelines for radiation protection- Molecular medicine and radiation safety program procedures for safe operation of radiation equipment – Radiation protection in external beam radiotherapy – Radiation protection in brachytherapy – Radioactive wastes.

**LASER AND ULTRAVIOLET RADIATION SAFETY**

Classification of UV radiation – Sources of UV – Biological effects of UV – Hazards associated with UV radiation – UV control measures – Safety management of UV Classifications of LASER and its radiation hazards – control measures – Emergencies and incident procedures.

**MONITORING AND INTERNAL DOSIMETRY**

Monitoring methods – personal radiation monitoring – Records of personal dosimetry – ICRP method – MIRD method – Internal doses from radiopharmaceuticals – Bioassay of radioactivity –Hazard and risk in radiation protection – radiological incidents and emergencies – Regulation to radiation protection.

**TEXT BOOKS:**


1. Jamie V Trapp, Thomas Kron, **"An introduction to radiation protection in medicine"**, CRC press Taylor & Francis group, 2008
2. Alan Martin, Samuel Harbison, Karen Beach, Peter Cole, Hodder Arnold, **"An introduction to radiation protection"**, 6th Edition 2012.


**REFERENCES:**


1. Max Hlombardi, **"Radiation safety in nuclear medicine"**, CRC Press Taylor & Francis group, 2nd Edition, 2007.
2. Aruna Kaushik, Anupam mondal, B.S. Dwarakanath, R.P.Tripathi, **"Radiation protection manual"**, INMAS, DRDO, 2010.
3. Ronald kitchen, **"RF and microwave radiation safety"**, Newness publishers, 2nd Edition, 2001.


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| 17ATEC13 | COMPUTER SIMULATION OF IC ENGINE PROCESSES | Category | L | T | P | C |
|---|---|---|---|---|---|---|
| | | EC(PS) | 3 | 0 | 0 | 3 |

**Preamble**

This course includes the study of adiabatic flame temperature, analysis of actual and ideal cycles and simulation of S.I, and C.I engine performance

**Prerequisite**

Nil

**Course Objectives**

| | |
|---|---|
| 1 | To describe the methods of measurement of HRR and calculation of adiabatic flame temperature of IC engines. |
| 2 | To explain the methods of simulation of IC Engines. |
| 3 | To learn the simulation of IC engines with gas exchange processes and engine performance simulation |
| 4 | To know the Simulation of S.I engine with intake and exhaust charging |
| 5 | To study the simulation of C.I engine performance |

**Course Outcomes:**

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

| | | |
|---|---|---|
| CO1. | Summarize the measurement of HRR and calculation of Adiabatic flame temperature | Understand |
| CO2. | Apply the I.C engine simulation with Adiabatic combustion | Apply |
| CO3. | Apply the simulation of IC engines with gas exchange processes and engine performance simulation | Apply |
| CO4. | Examine Simulation of S.I engine with intake and exhaust charging | Analyze |
| CO5. | Analyze Simulation of C.I engine performance | Analyze |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | M | M | -- | -- | -- | M | -- | -- | -- | M | M | L | -- |
| CO2 | S | M | M | M | -- | -- | M | M | M | -- | -- | M | M | -- | -- |
| CO3 | S | S | S | M | -- | -- | M | M | M | -- | -- | M | M | L | M |
| CO4 | S | S | S | M | -- | -- | M | M | M | -- | -- | M | M | -- | -- |
| CO5 | S | S | S | M | -- | -- | M | M | M | -- | -- | M | M | -- | M |

S- Strong; M-Medium; L-Low

**Syllabus**

| **INTRODUCTION** |
|---|
| Introduction – Heat of reaction – Measurement of URP – Measurement of HRR – Adiabatic flame temperature: Complete combustion in C/H/O/N Systems, Constant volume adiabatic combustion, constant pressure adiabatic combustion. Calculation of adiabatic flame temperature – Isentropic changes |
| **ENGINE SIMULATION WITH AIR AS WORKING MEDIUM** |
| Deviation between actual and ideal cycle – problems, SI engine simulation with adiabatic combustion, temperature drop due to fuel vaporization, full throttle operation – efficiency calculation, part – throttle operation, super charged operation. |
| **PROGRESSIVE COMBUSTION** |
| SI Engines simulation with progressive combustion with gas exchange process, Heat transfer process, friction calculation, compression of simulated values, validation of the computer code, engine performance simulation, pressure crank angle diagram and other engine performance. |
| **SIMULATION OF SI ENGINE** |
| Intake – Exhaust - Charging and Combustion Simulation for two stroke and four stroke spark ignition Engine |
| **DIESEL ENGINE SIMULATION** |
| Zero, one and multi zone model for combustion, different heat release and heat transfer models, equilibrium calculations, simulation of engine performance. |

**TEXT BOOK:**

1. Ganesan. V - "InternalCombustion Engines" - Tata McGraw-Hill, 2013.
2. Ganesan.V. – Computer Simulation of compression ignition engines – Orcent

**REFERENCES:**

1. Ramoss A.L. Modeling of Internal Combustion Engines process, McGraw Hill Publishing Co., 1992
2. Ashley Cambel, Thermodynamics analysis of combustion engines, John Wiley & Son, New York, 1986.
3. Benson, R.S., Whitehouse, N.D., Internal Combustion Engines, Pergamon Press, Oxford, 1979.

**CourseDesigners:**

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gma

| 17ATEC14 | COMPUTER CONTROLLED VEHICLE SYSTEMS | Category | L | T | P | C |
|---|---|---|---|---|---|---|
| | | EC(PS) | 3 | 0 | 0 | 3 |

**Preamble**

This course introduces the role of sensors and actuators for controlling the engine, drive line. It also provide knowledge about the transportation and safety devices controlled by computer

**Prerequisite**

Nil

**Course Objectives**

| | |
|---|---|
| 1 | To explain the concepts of speed control, suspension for autonomous vehicles . |
| 2 | To detail on the advanced methods of control of management systems towards adaptive cruise control automotive vehicles. |
| 3 | To describe about intelligent transportation system. |
| 4 | To detail on the smart safety devices for automotive vehicles. |

**Course Outcomes:**

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

| | | |
|---|---|---|
| CO1. | Apply the concepts of control systems of vehicles towards autonomous driving. | Apply |
| CO2. | Apply the different components for developing an adaptive cruise control. | Apply |
| CO3. | Appraise on the intelligent transportation system. | Apply |
| CO4. | Recommend smart safety devices for automotive vehicles | Analyze |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | M | M | -- | -- | -- | - | - | -- | -- | - | S | -- | -- |
| CO2 | S | M | M | M | M | -- | - | - | - | -- | -- | - | S | M | -- |
| CO3 | S | S | S | M | M | -- | - | - | - | -- | -- | - | S | -- | L |
| CO4 | S | S | S | M | M | -- | - | - | - | -- | -- | - | S | M | -- |

S- Strong; M-Medium; L-Low

**Syllabus**

| **INTRODUCTION** |
|---|
| Understanding autonomy – Review of the role of control in autonomy (speed control, suspension control & integrated vehicle dynamics) - Role of sensors and actuators. Examples of autonomy cruise control |
| **ENGINE CONTROL SYSTEM** |
| Fuel control-Ignition control in SI engines- Lambda control- idle speed control- Knock control- cylinder balancing |
| **DRIVE LINE CONTROL SYSTEM** |
| Speed control – gear shifting control – traction /braking- steering- suspension – vehicle handling and ride characteristics of road vehicles- adaptive cruise control |
| **INTELLIGENT TRANSPORTATION SYSTEM** |
| Overview – control architecture – collision avoidance, pitch, yaw, bounce control – traffic routing system- automated high way systems- lane warning system- driver information system- data |
| **SAFETY IMPACTING DEVICES** |
| Vision enhancement- driver conditioning warming- anti-lock braking systems – route guidance and navigation systems – in-vehicle computing – commercial vehicle diagnostic/ prognostics – hybrid/ electric and future cars- case study. |

**TEXT BOOK:**

1. Automotive control systems, U.Kienckeand L. Nielson, SAE and springer-Verlag, 2000

**REFERENCES:**


1. Crouse, W.H. & Anglin, D.L., Automotive Mechanics, Intl. Student edition, TMH, New Delhi.
2. Artamonov, M.D., Harionov, V.A. & Morin, M.M. Motor Vehicle, Mir Publishers, Moscow 1978.,
3. Heitner, J., Automotive Mechanics, CBS Publishers, New Delhi 1987.
4. Stockel Martin W and Stocker Martin T., Auto Mechanics Fundamentals, Goodheart Wilcox,


**CourseDesigners:**


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| 17MESE18 | METAL FORMING AND JOINING PROCESS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |

**Preamble**

This course aims to provide the basic knowledge on plasticity taught in mechanical metallurgy is extended to theory and applications of metal forming. Various metal forming processes and their analysis are studied in detail and also the students can understand the process used and the allied welding metallurgy in order to make a successful weld.

**Prerequisite**

**NIL**

**Course Objective**

| | |
|---|---|
| 1 | To Acquire basic knowledge on fundamentals of metal forming |
| 2 | To Understand the various forming processes and its application |
| 3 | To Acquire basic knowledge on metal joining processes |
| 4 | To Understand the various metal joining processes and its application |
| 5 | To Understand the welding of alloy steels and non-ferrous metals |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO1. | Explain basic knowledge on fundamentals of metal forming | Understand |
| CO2. | Explain the various forming processes and its application | Understand |
| CO3. | Apply basic knowledge on metal joining processes | Apply |
| CO4. | Experiment with various metal joining processes and its application | Apply |
| CO5. | Experiment with the welding of alloy steels and non-ferrous metals | Apply |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | L | M | S | | | | | | | | | L | | |
| CO2 | S | | M | | | | | | | | | | L | | |
| CO3 | S | L | L | L | | | | | | | | | L | | |
| CO4 | S | | M | M | | | | | | | | | L | | |
| CO5 | S | L | L | M | | | | | | | | | L | | |

**S- Strong; M-Medium; L-Low**

**SYLLABUS**

**FUNDAMENTALS OF METAL FORMING**

Fundamentals of metal forming- Effect of temperatures, speed and metallurgical microstructure on forming processes - Mechanics of Metal Forming.
Yield criteria for ductile metals - Flow theories – strain hardening – recrystallization.

**METAL FORMING PROCESSES**

Forging Processes Forging Equipment, Forging defects - Types of Rolling mill – process variables – defects.
Types of extrusion - Process variables - Wire drawing - Drawing and Deep drawing – Sheet metal working . High energy rate forming processes..

**FUNDAMENTALS OF METAL JOINING**

Classification of welding processes: Arc welding power sources, power source characteristic curves, flux covering, different types of electrodes and their applications, gas welding and cutting, flame characteristics

**METAL JOINING PROCESSES**

Gas tungsten arc welding process**,** electrode polarity, shielding gas, use of pulsed arc welding process; gas metal arc welding**,** mode of metal transfers, pulsed MIG welding process.
Submerged arc welding, advantages and limitations.
Orbital welding of tubes / pipes; Plasma-arc welding process, transferred and non- transferred arc welding and their applications, plasma cutting, surfacing and applications
Working Principle of resistance welding process-spot, seam, projection, upset and flash butt Welding, electro slag and electro gas welding.
Radiant energy welding processes - equipment -electron beam welding (EBW) - laser beam Welding (LBW) - applications of EBW and LBW- Friction Steel Welding.

**WELDING OF ALLOY STEELS AND NON-FERROUS METALS**

Welding of stainless steels, types of stainless steels, overview of joining ferritic and martensitic types, welding of austenitic stainless steels, Sensitisation, hot cracking, sigma phase and chromium carbide formation, ways of overcoming these difficulties, welding of cast iron. Welding of non-ferrous materials: Joining of aluminium, copper, nickel and titanium alloys, problems encountered and solutions. Defects in welding. Introduction to International Standards and Codes

**Text Books**


1. Narayanasamy,R., "Metal forming technology"2nd Edition, Ahuja Pub.
2. R. S.Parmar, "Welding Engineering and Technology" 2nd edition M/s. Khanna Publishers.


**Reference Books**


1. George E.Dieter , "Mechanical Metallurgy",1 edition McGraw Hill book Co.- Koga,.
2. William F Hosford and Robert M Caddell " Metal Forming Mechanics and Metallurgy" Third Edition, Cambridge University Press.
3. ASM Handbook on Forming and Forging, Vol.14, 9th Edition ,ASM International
4. Baldev Raj,Shankar V,Bhaduri A K".Welding Technology for Engineers" Narosa Publications.

5. "AWS Welding Hand book", 9th edition, Vol-1,"Welding Science and Technology".
6. Nadkarni S.V., „Modern Arc Welding Technology", 1st Edition, IBH Publishing.
7. Kearns W. H, „Welding Hand Book (Welding Processes)", Volume II and III, 7th Edition,AWS.

**Course Designers**

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| 17MESE19 | PROCESS PLANNING AND COST ESTI MATION | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC(SE) | 3 | 0 | 0 | 3 |

**PREAMBLE**

This course reviews the various steps involved in process planning concepts and cost estimation for various products after process planning.

**PREREQUISITE -** NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To know about Work study, Ergonomics |
| 2 | To demonstrate about process planning and its approaches. |
| 3 | To illustrate about elements of cost estimation. |
| 4 | To calculate the various Cost Estimation methods. |
| 5 | To analyze the total production cost estimation. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | | |
|---|---|---|
| CO1 | Understand the work study and ergonomics. | Understand |
| CO2 | Demonstrate the various steps involved in process planning | Apply |
| CO3 | Illustrate the various elements of cost estimation. | Apply |
| CO4 | Apply the various cost estimation methods in production. | Apply |
| CO5 | Analyze the cost estimation of various jobs involved in production | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO 1 | PO 2 | PO 3 | PO4 | PO 5 | PO6 | PO 7 | PO8 | PO 9 | PO1 0 | PO11 | PO1 2 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | L | L | L | - | - | - | - | - | - | L | - | M | - | - |
| CO2 | S | M | M | M | - | - | - | - | - | - | M | - | M | - | - |
| CO3 | S | M | M | M | - | - | - | - | - | - | M | - | M | - | -- |
| CO4 | S | M | M | M | - | - | - | - | - | - | S | - | M | - | - |
| CO5 | S | M | M | M | - | - | - | - | - | - | S | - | M | - | - |

**S- Strong; M-Medium; L-Low**

**SYLLABUS**

**WORK STUDY AND ERGONOMICS:**

Method study – Definition – Objectives-Motion economy- Principles – Tools and Techniques-Applications – Work measurements- purpose – use – procedure – tools and techniques- Standard time –Ergonomics –principles – applications.

**PROCESS PLANNING :**

Definition – Objective – Scope – approaches to process planning- Process planning activities – Finished part requirements operating sequencesmachine selection material selection parameters- Set of documents for process planning Developing manufacturing logic and knowledge production time calculation – selection of cost optimal processes.

**INTRODUCTION TO COST ESTIMATION:**

Objective of cost estimation- costing – cost accounting- classification of cost-Elements of cost.

**COST ESTIMATION:**

Types of estimates – methods of estimates – data requirements and sources- collection of cost- allowances in estimation.

**PRODUCTION COST ESTIMATION**

Estimation of material cost, labour cost and over heads, allocation of overheads – Estimation for different types of jobs

**TEXT BOOKS:**

1. Sinha.B.P., "Mechanical Estimating and Costing", Tata McGraw-Hill, Publishing Co.2002

**REFERENCES:**

2. Russell.R.S and Tailor, B.W, "Operations Management", PHI, 4th Edition.
3. Chitale.A.V. and Gupta.R.C., "Product Design and Manufacturing", PHI, 2nd Edition.

**COURSE DESIGNERS**



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| 17CVEC07 | DISASTER MITIGATION AND MANAGEMENT | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EC (OE) | 3 | 0 | 0 | 3 |

**PREAMBLE**

This course deals with the various disasters and to expose the students about the measures, its effect against built structures, and Hazard Assessment procedure in India. This course also deals with the methods of mitigating various hazards such that their impact on communities is reduced.

**PREREQUISITE**

NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To Understand basic concepts in Disaster Management |
| 2 | To Understand Definitions and Terminologies used in Disaster Management |
| 3 | To Understand the Challenges posed by Disasters |
| 4 | To understand Impacts of Disasters |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Understand the various types of disaster viz Hydrological, Coastal and Marine Disasters, Atmospheric Disasters, Geological, Mass Movement and Land Disasters, Wind and Water Driven Disasters. | Understand |
| CO2. Identify the potential deficiencies of existing buildings for Earthquake disaster and suggest suitable remedial measures. | Understand |
| CO3.Derive the guide lines for the precautionary measures and rehabilitation measures for Earthquake disaster. | Apply |
| CO4. Derive the protection measures against floods, cyclone, land slides | Apply |
| CO5. Understand the effects of disasters on built structures in India | Understand |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | - | - | L | - | - | - | - | - | - | - | - | L | - | M |
| CO2 | M | M | L | L | - | M | - | - | - | - | - | - | L | - | M |
| CO3 | S | M | S | M | - | L | - | M | - | - | - | - | M | L | M |
| CO4 | S | M | S | - | L | - | - | - | - | - | - | - | M | L | M |
| CO5 | L | L | - | L | - | - | - | - | - | - | - | - | L | - | L |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**INTRODUCTION**: Concept of disaster; Different approaches; Concept of Risk; Levels of disasters; Disaster phenomena and events (Global, national and regional); Natural and man-made hazards

**RISK ASSESSMENT AND VULNERABILITY ANALYSIS:** Response time, frequency and forewarning levels of different hazards; Characteristics and damage potential of natural hazards; hazard assessment ;Dimensions of vulnerability factors; vulnerability assessment; Vulnerability and disaster risk; Vulnerabilities to flood and earthquake hazards

**DISASTER MANAGEMENT MECHANISM**: Concepts of risk management and crisis management ; Disaster management cycle ;Response and Recovery ; Development, Prevention, Mitigation and Preparedness; Planning for relief

**DISASTER RESPONSE:** Mass media and disaster management; Disaster Response Plan; Communication, Participation, and Activation of Emergency Preparedness Plan; Logistics Management; Psychological Response; Trauma and Stress Management; Rumour and Panic Management ;Minimum Standards of Relief; Managing Relief; Funding.

**DISASTER MANAGEMENT IN INDIA:** Strategies for disaster management planning; Steps for formulating a disaster risk reduction plan; Disaster management Act and Policy in India; Organisational structure for disaster management in India; Preparation of state and district disaster management plans.

**TEXT BOOKS:**

Alexander, D. Natural Disasters, ULC press Ltd, London, 1993.

Carter, W. N. Disaster Management: A Disaster Management Handbook, Asian Development Bank, Bangkok, 1991.

Chakrabarty, U. K. Industrial Disaster Management and Emergency Response, Asian Books Pvt. Ltd., New Delhi 2007.

**REFERENCES:**

Abarquez I. &Murshed Z. Community Based Disaster Risk Management: Field Practitioner's Handbook, ADPC, Bangkok, 2004.

Goudie, A. Geomorphological Techniques, Unwin Hyman, London 1990.

Goswami, S. C. Remote Sensing Application in North East India, PurbanchalPrakesh, Guwahati, 1997.

Manual on Natural Disaster Management in India, NCDM, New Delhi, 2001.

Disaster Management in India, Ministry of Home Affairs, Government of India, New Delhi, 2011.

National Policy on Disaster Management, NDMA, New Delhi, 2009.

Disaster Management Act. (2005), Ministry of Home Affairs, Government of India, New Delhi, 2005.

**COURSE DESIGNERS**


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| 17SACC10 | ENERGY CONSERVATION AND MANAGEMENT | Category | L | T | P | C |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |
| | **PREREQUISITE** – NIL | | | | | |

**Preamble**

To enable the students to acquire the knowledge of energy conservation measures in thermal and electrical energy

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To impart knowledge on energy management and facilitate application of energy conservation techniques in process industries. |
| 2 | To impart knowledge on thermal and electrical utilities for evaluating energy saving potential. |
| 3 | To learn the positions of energy management in energy intensive industries using various model and chart. |
| 4 | To inculcate knowledge and skills about assessing the energy efficiency of an entity/ establishment. |
| 5 | To bring out Energy Conservation Potential and Business opportunities across different user segments under innovative. |

**COURSE OUTCOMES**

**On successful completion of the course, the students will be able to**

| | | |
|---|---|---|
| CO 1 | Acquaintance with conservation of energy and its management, energy planning, and energy economics. | Analyze |
| CO 2 | Recognize - How of energy efficient machinery systems, energy losses and their management | Evaluate |
| CO 3 | Ability in Energy analysis techniques and methods & Energy conservation planning and practices. | Understand |
| CO 4 | Estimate the techno economic feasibility of the energy conservation technique adopted. | Apply |
| C0 5 | Evaluate the performance of thermal utilities like furnace, boilers and steam distribution systems to improve efficiency | Creating |
| CO6 | Takeout performance assessment and suggest methods to improve the overall efficiency for different energy intensive industries | Analyze |

Mapping with Programme outcomes and Programme Specific Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | - | L | M | S | - | - | - | - | L | - | - | L | L | - | - |
| CO2 | L | - | M | L | - | L | - | L | - | - | - | - | L | - | - |
| CO3 | L | - | L | - | - | - | - | - | - | - | - | - | - | M | - |
| CO4 | S | - | L | - | - | M | - | - | L | - | - | - | - | L | - |
| CO5 | L | M | S | M | | - | - | - | - | - | - | - | - | - | L |
| CO6 | M | - | L | - | - | M | - | - | - | - | - | L | - | M | - |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**ENERGY CONSERVATION PRINCIPLES**

Energy scenario, principles of energy conservation, resource availability, energy savings, current energy consumption in India, roles and responsibilities of energy managers in industries.

**ELECTRICAL SYSTEMS**

Components of EB billing – HT and LT supply, Transformers, Cable Sizing, Concept of Capacitors, Power Factor Improvement, Harmonics, Electric Motors – Motor Efficiency Computation, Energy Efficient Motors, Illumination – Lux, Lumens, Types of lighting, Efficacy, LED Lighting and scope of Encon in Illumination.

**ENERGY CONSERVATION IN THERMAL SYSTEMS**

Energy conservation in thermal utilities like boilers, furnaces, pumps and fans, compressors, cogeneration - steam and gas turbines. Heat exchangers, lighting system, motors, belts and drives, refrigeration system.

**ENERGY CONSERVATION IN ELECTRICAL SYSTEMS**

Potential areas for electrical energy conservation in various industries, conservation methods, energy management opportunities in electrical heating, lighting system, cable selection, energy efficient motors, factors involved in determination of motor efficiency, adjustable AC drives, variable speed drives, energy efficiency in electrical system

**ENERGY MANAGEMENT**

Organizational background desired for energy management persuasion, motivation, publicity role, tariff analysis, industrial energy management systems, energy monitoring, auditing and targeting, economics of various energy conservation schemes – energy policy and energy labeling.

**TEXTBOOK**


1. Reay .D.A, "Industrial Energy Conservation", Pergamon Press, 1st edition, 2003.
2. White .L. C, "Industrial Energy Management and Utilization", Hemisphere Publishers, 2002.


**REFERENCES**


1. Beggs, Clive, "Energy – Management, Supply and Conservation", Taylor and Francis, 2nd edition, 2009.
2. Smith .C.B, "Energy "Management Principles", Pergamon Press, 2006.
3. Hamies, "Energy Auditing and Conservation; Methods, Measurements, Management and Case study", Hemisphere, 2003.
4. Trivedi .P.R and Jolka .K.R, "Energy Management", Common Wealth Publication, 2002..


**COURSE DESIGNERS**


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| 17MTPI01 | PROJECT WORK AND VIVA VOCE | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | PI | 0 | 0 | 18 | 9 |

**PREAMBLE**

This course introduces the fundamental concepts, principles, analysis and design of hybrid, electric vehicles.

**PREREQUISITE:**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To create the model based on innovative Concepts |
| 2 | To design and develop advanced electrical circuits. |
| 3 | To analyze the working of created systems. |
| 4 | To. Investigate the model which is developed with Innovative Concept. |
| 5 | To. Compare the Existing system with newly developed System. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1: Create the innovative concepts of electro mechanical systems. | Create |
| CO2: Design the automated system for Industrial Applications. | Design |
| CO3: Construct the designed circuit as an Innovative model | Create |
| CO4: Analyse the parameters of newly developed Model | Analyze |
| CO5: Compare the operations of Developed System with Existing System.. | Evaluate |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | - | - | - | M | - | M | L | S | L | M | M | M | S | M |
| CO2 | S | M | S | - | S | - | - | M | S | L | M | - | M | M | M |
| CO3 | S | S | M | M | S | - | L | - | M | L | M | S | M | S | M |
| CO4 | S | M | M | - | L | - | - | - | M | L | M | - | M | S | M |
| CO5 | S | - | - | M | - | L | - | - | S | L | M | - | S | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

- The objective of the project work is to enable the students to form the groups of not more than 3 members on a project involving theoretical and experimental studies related to the branch of study.
- Formation of Group as follows

- Group A : 8.5CGPA and above
- Group B : 7 to 8.49 CGPA
- Group C : 5 to 6.9 CGPA
- Group A Student will have a choice to take 2 students from Group B&C

- Every project work shall have a guide who is the member of the faculty of the institution. Six periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project.

- The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.

- The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department.

- Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusion.

- This final report shall be typewritten form as specified in the guidelines.

- The continuous assessment shall be made as prescribed in the regulations.

**COURSE DESIGNERS**

| S.No. | Name of the Faculty | Designation | Department | Mail ID |
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| 2 | | | | |

| 17MTPI02 | MINI PROJECT | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | PI | 0 | 0 | 6 | 3 |

**PREAMBLE**

This course introduces the fundamental concepts, principles, analysis and design of hybrid, electric vehicles.

**PREREQUISITE:**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To create the model based on innovative Concepts |
| 2 | To design and develop advanced electrical circuits. |
| 3 | To analyze the working of created systems. |
| 4 | To. Investigate the model which is developed with Innoative Concept. |
| 5 | To. Compare the Existing system with newly developed System. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1: Create the innovative concepts of robotic systems. | Create |
| CO2: Design the Small automated system for Industrial Applications. | Design |
| CO3: Construct the designed circuit as a Miniature Innovative model | Create |
| CO4: Analyse the parameters of newly developed Miniature Model | Analyze |
| CO5: Compare the operations of Developed System with Existing System.. | Evaluate |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | - | - | - | M | - | M | L | S | L | M | M | M | S | M |
| CO2 | S | M | S | - | S | - | - | M | S | L | M | - | M | M | M |
| CO3 | S | S | M | M | S | - | L | - | M | L | M | S | M | S | M |
| CO4 | S | M | M | - | L | - | - | - | M | L | M | - | M | S | M |
| CO5 | S | - | - | M | - | L | - | - | S | L | M | - | S | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

. The students in batches (not exceeding three in a batch) have to take up a project inthe area of their own interest related to their specialization.

2. Each batch is guided by a faculty member. The students have to select a suitable problems, design, prepare the drawings, produce the components, assemble andcommission the project.

3. The students have to prepare and present a detailed project report at the end of the VI semester.

4. The evaluation will be made for the continuous internal assessment for the Project bya committee nominated by the Head of the Department.

| **COURSE DESIGNERS** | | | | |
|---|---|---|---|---|
| **S.No.** | **Name of the Faculty** | **Designation** | **Department** | **Mail ID** |
| 1 | Mr.G.Murali | Assistant Professor | ECE | muarlig@vmkvec.ac.in |
| 2 | | | | |

| 17CSPI04 | BUSINESS INTELLIGENCE AND ITS APPLICATIONS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | PI | 3 | 0 | 0 | 3 |

**PREAMBLE**

Business Intelligence (BI) refers to the tools, technologies, applications and practices used to collect, integrate, analyze, and present an organization's raw data in order to create insightful and actionable business information in Data mining.

**PREREQUISITE** – NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To Introduce students to various business intelligence concepts |
| 2 | To learn the concepts of data integration used to develop intelligent systems for decision support |
| 3 | To introduce visualization tool for prepare the enterprise reporting |
| 4 | To learn analytical components and technologies used to create dashboards and scorecards, data/text/Web mining methods |
| 4 | To gain new insights into organizational operations in implementation of systems for Business Intelligence (BI) |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1. Learn about the concepts of OLTP and OLAP for BI infrastructure development | Understand |
| CO2. Gained an understanding of how business professionals can use analytics techniques to formulate and solve relevant problems and how they use analytics to support decision making | Analyze |
| CO3. Apply Clustering, Association and Classification techniques for Data Integration | Apply |
| CO4. Assess BI tools to solve problems, issues, and trends using predictive analysis | Apply |
| CO5. Develop systems to measure, monitor and predict the enterprise variables and performance indicators for business decision-making process | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | L | - | M | - | - | - | - | - | - | M | M | M | M |
| CO2 | S | M | L | - | M | - | - | - | - | - | - | M | M | M | M |
| CO3 | S | M | L | - | M | - | - | - | - | - | - | M | M | M | M |
| CO4 | S | M | L | - | M | - | - | - | - | - | - | M | M | M | M |
| CO5 | S | M | L | - | M | - | - | - | - | - | - | M | M | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**INTRODUCTION TO BUSINESS INTELLLIGENCE**

Introduction to OLTP AND OLAP – BI Definition and BI Concepts – Business Applications of BI - BI Framework- Role of Data Warehousing in BI –BI Infrastructure Components- BI Process – Developing Data Warehouse – Management Framework – Business driven approach –BI Technology — BI Roles & Responsibilities.

**BASICS OF DATA INTEGRATION**

Concepts of Data Integration need and advantages of using Data Integration – Introduction to common data integration approaches – Introduction to ETL using SSIS – Introduction to Data Quality – Data Profiling Concepts and Applications.

**INTRODUCTION TO MULTIDIMENSIONAL DATA MODELING**

Introduction to Data and Dimensional Modeling – Multi Dimensional Data Model – ER modeling Vs Multi Dimensional Model – Concepts of Dimensions - facts - cubes- attributes- hierarchies- star and snowflake schema – Introduction to Business Metrics and KPIs – Creating Cubes using SSAS.

**BASICS OF ENTERPRISE REPORTING**

Introduction to Enterprise Reporting - Concepts of dashboards - balanced scorecards – Introduction to SSRS Architecture– Enterprise Reporting using SSRS reporting service

**BI ROAD AHEAD**

BI and Mobility – BI and cloud computing – BI for ERP systems - Benefits of BI in ERP-NorthWind_Traders Data-Data Analyses through Excel-Kettle Tool – Conversion of data using Kettle Tool.

**TEXT BOOKS**

1.RN Prasad, Seema Acharya, ”Fundamentals Of Business Analytics” Wiley India,2011

**REFERENCES**

1.Soumendra Mohanty, “Data Warehousing Design, Development and Best Practices”, Tata McGraw-Hill, New Delhi, 2007.

2.David Loshin, “Business Intelligence”, Morgan Kaufmann Publishsers, San Francisco, Fifth edition, 2007.

3.Larissa Terpeluk Moss and Shaku Atre, “Business Intelligence Roadmap”, Pearson Education, 2007

**COURSE DESIGNERS**



| S.No. | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
| 1. | Dr. K. Sasikala | Associate Professor | CSE | sasikalak@vmkvec.edu.in |
| 2. | Mrs. S. Leelavathy | Assistant Professor(G-II) | CSE | leelavathy@avit.edu.in |

| 17MEP103 | NOISE VIBRATION & HARSHNESS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | PI | 3 | 0 | 0 | 3 |

**PREAMBLE**

This course reviews the fundamental concepts of acoustics, noise propagation and vibrations. Focus is given to the theory and equipments pertaining to the measurement of automotive acoustics, sound quality and vibrations.

**PREREQUISITE**

NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To introduce source of noise and vibration |
| 2 | To broaden the understanding of sound measurement and human sensitivity |
| 3 | To underline the importance of simulation, anechoic chamber and acoustic holography |
| 4 | To broaden the importance of statistical and frequency analysis |
| 5 | To introduce active control techniques |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1.**Understand the sources of noise and vibration | Understand |
| **CO2.** Illustrate sound intensity and human sensitivity | Apply |
| **CO3**. Apply methods to model the advanced acquisition techniques | Apply |
| **CO4**. Demonstrate active control techniques | Apply |
| **CO5**. Demonstrate the automotive noise sources | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | M | L | -- | L | L | -- | -- | -- | -- | -- | L | | |
| CO2 | S | M | M | M | M | L | L | -- | -- | -- | -- | -- | L | | |
| CO3 | S | S | S | S | S | M | M | -- | -- | -- | -- | -- | L | | |
| CO4 | S | S | S | S | S | M | M | -- | -- | -- | -- | -- | L | | |
| CO5 | S | S | S | S | S | S | S | -- | -- | -- | -- | -- | L | | |

**S- Strong; M-Medium; L-Low**

**SYLLABUS**

**BASICS OF VIBRATION ANALYSIS:** Basic Concepts, Formulating the Equations of Motion, Free Undamped Vibrations- Free Damped Vibrations - Logarithmic Decrement, Forced Vibrations, Magnification Factor - Torsional System Characteristics, Single Disc And Two Disc- Two Degree of Freedom Systems under Harmonic Force, Modal Analysis- Coordinate Coupling.

**NVH IN THE AUTOMOTIVE INDUSTRY:** Sources of noise and vibration. Design features. Common problems. Marque values. Noise quality. Pass-by noise requirements. Target vehicles and objective targets. Development stages in a new vehicle programme and the altering role of NVH engineers.

**SOUND AND VIBRATION THEORY:** Sound measurement. Human sensitivity and weighting factors. Combining sound sources. Acoustical resonances. Properties of acoustic materials. Transient and steady state response of one degree of freedom system applied to vehicle systems. Transmissibility. Modes of vibration.

**NVH MEASUREMENTS:** Vibration and Noise Standards – Pass/Drive by Noise-Test Site- Meteorological Condition-Constant Speed Test- Wide Open Throttle Test - Interior Noise Test- Standards – Test Track Condition – Vehicle Operating Condition –Steady Speed – Full Throttle Test –Stationery Test- Microphone Positions.- Stationery Vehicle Test- Standards- Test Site- Preparation of The Vehicle-Vehicle Operating Condition.- NVH Measurement Tools And Techniques- Vibration and Noise Measurement Transducers.- Advanced Acquisition Techniques.

**AUTOMOTIVE NOISE SOURCES AND CONTROL TECHNIQUES:** Methods for Control of Engine Noise-Control Measures- Mufflers, Transmission Noise- Control Methods.- Intake And Exhaust Noise – Attenuation Of Intake and Exhaust Noise- Dissipative Silencers – Reactive Silencers – Resonators - Aerodynamic Noise, Its Sources And Control Methods- Tire Noise And Their Control Methods, Brake Noise.- Noise Control Strategy, Noise Control At Source.- Noise Control Along The Transmission Path- Barriers, Enclosures, Resonators.

**TEXT BOOKS:**

1. Singiresu S. Rao, "*Mechanical Vibrations*" 5th Edition, Pearson, September , 2010
2. Ambekar, A. G., "*Mechanical Vibrations and Noise Engineering*", Prentice Hall of India, New Delhi, 2006
3. Manasi P. Joshi, "*Noise &Vibration Measurement Techniquesin Automotive NVH*"2012

**REFERENCES:**

1. Beranek, L. L. and Ver, I, L., "*Noise and Vibration Control Engineering –Principles and Application*", John Wiley & Sons, Inc, 1992.
2. Malcolm J. Crocker, *"Handbook of Noise and Vibration Control"* John Wiley & Sons, Inc 2007

**COURSE DESIGNERS**



| S. No. | Name of the Faculty | Designation | Department / Name of the College | Mail ID |
|---|---|---|---|---|
| 1 | SHIVAKUMAR N | Asst. Prof. - II | Mechanical, AVIT | shiva.thermal@gmail.com |
| 2 | N. Rajan | Assoc. Prof. | Mech/VMKVEC | rajan@vmkvec.edu.in |

| 17MEPI04 | NON-DESTRUCTIVE TESTING | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 3 | 0 | 0 | 3 |

**Preamble**

To study and understand the various Non Destructive Evaluation and Testing methods, theory and their industrial applications.

**Prerequisite**

**NIL**

**Course Objective**

| | |
|---|---|
| 1 | To expose to the concept of overview of NDT |
| 2 | To familiarize with the applications of differential equations, surface NDE Methods |
| 3 | To understand the concept of thermography and Eddy current testing |
| 4 | To understand the concept of ultrasonic testing and acoustic emission |
| 5 | To understand the concept of Radiography (RT) |

**Course Outcomes: On the successful completion of the course, students will be able to**

| | | |
|---|---|---|
| CO1. | Explain the concept of overview of NDT | Understand |
| CO2. | To familiarize with the applications of differential equations, surface NDE Methods | Understand |
| CO3. | Experiment with the concept of thermography and Eddy current testing | Apply |
| CO4. | Experiment with the concept of ultrasonic testing and acoustic emission | Apply |
| CO5. | Experiment with the concept of Radiography (RT) | Apply |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | | L | M | | | | | | | | | S | L | |
| CO2 | S | M | M | M | L | | | | | | | | M | L | |
| CO3 | S | L | M | M | M | | | | | | | | L | L | |
| CO4 | S | | S | S | M | | | | | | | | M | L | |
| CO5 | S | M | L | M | | | | | | | | | M | L | |

**S- Strong; M-Medium; L-Low**

**SYLLABUS**

**OVERVIEW OF NDT**

NDT Versus Mechanical testing, Overview of the Non Destructive Testing Methods for the detection of manufacturing defects as well as material characterization. Relative merits and limitations, Various physical characteristics of materials and their applications in NDT., Visual inspection – Unaided and aided

**SURFACE NDE METHODS**

Liquid Penetrant Testing – Principles, types and properties of liquid penetrants, developers, advantages and limitations of various methods, Testing Procedure, Interpretation of results. Magnetic Particle Testing- Theory of magnetism, inspection materials Magnetisation methods, Interpretation and evaluation of test indications, Principles and methods of demagnetization, Residual magnetism.

**THERMOGRAPHY AND EDDY CURRENT TESTING**

Thermography- Principles, Contact and non contact inspection methods, Techniques for applying liquid crystals, Advantages and limitation – infrared radiation and infrared detectors, Instrumentations and methods, applications.Eddy Current Testing-Generation of eddy currents, Properties of eddy currents, Eddy current sensing elements, Probes, Instrumentation, Types of arrangement, Applications, advantages, Limitations, Interpretation/Evaluation.

**ULTRASONIC TESTING (UT) AND ACOUSTIC EMISSION (AE)**

Ultrasonic Testing-Principle, Transducers, transmission and pulse-echo method, straight beam and angle beam, instrumentation, data representation, A/Scan, B-scan, C-scan. Phased Array Ultrasound, Time of Flight Diffraction. Acoustic Emission Technique –Principle, AE parameters, Applications

**RADIOGRAPHY (RT)**

Principle, interaction of X-Ray with matter, imaging, film and film less techniques, types and use of filters and screens, geometric factors, Inverse square, law, characteristics of films – graininess, density, speed, contrast, characteristic curves, Penetrameters, Exposure charts, Radiographic equivalence. Fluoroscopy- Xero-Radiography, Computed Radiography, Computed Tomography

**Text Books**

1. Baldev Raj, T.Jayakumar, M.Thavasimuthu "Practical Non-Destructive Testing", Narosa Publishing House.
2.Ravi Prakash, "Non-Destructive Testing Techniques", 1st revised edition, New Age International Publishers.

**Reference Books**

1.ASM Metals Handbook,"Non-Destructive Evaluation and Quality Control", American Society of Metals, Metals Park, Ohio, USA, 200, Volume-17.
2.Paul E Mix, "Introduction to Non-destructive testing: a training guide", Wiley, 2nd Edition New Jersey
3.Charles, J. Hellier," Handbook of Nondestructive evaluation", McGraw Hill, New York.

**Course Designers**



| S.No | Faculty Name | Designation | Department/ Name of the College | Email id |
|---|---|---|---|---|
| 1 | S.ASHOKKUMAR | Asst.Professor G-II | Mech / Avit | ashokkumar@avit.ac.in |

| 17EEPI04 | **INTRODUCTION TO INDUSTRIAL INSTRUMENTATION** | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | PI | 3 | 0 | 0 | 3 |

**PREAMBLE**

This course is designed to cover all aspects of industrial instrumentation, such as sensing a wide range of variables, the transmission and recording of the sensed signal, controllers for signal evaluation, and the control of the manufacturing process for a quality and uniform product. Instrumentation and process control involve a wide range of technologies and sciences, and they are used in an unprecedented number of applications. Examples range from the control of heating, cooling, and hot water systems in homes and offices to chemical and automotive instrumentation and process control.
Today's technological evolution has made it possible to measure parameters deemed impossible only a few years ago. Improvements in accuracy, tighter control, and waste reduction have also been achieved

**PREREQUISITE**

17EECC04 Measurements and Instrumentation

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To provide fundamental background in theory of Industrial Instrumentation system |
| 2 | To teach the knowledge for the measurement of length, angle and area. and familiarize with motion and vibration measurement, explain different methods for pressure and flow measurement. |
| 3 | To give a detailed knowledge on transducer characteristics and uncertainties in measurement, application of different sensors / transducers their signal conditioning and final control elements for instrumentation and control systems |
| 4 | To elaborate different types of Level & viscosity measurement |
| 5 | To give an overview of the features associated with temperature measurement and pyrometers |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | | |
|---|---|---|
| CO1 | Explain the different types of load cell and different types of torque Measurement. . | Understand |
| CO2 | Describe the principle, operation and different types of accelerometer | Understand |
| CO3 | Evaluate the measurement of Flow and Level for a respective application | Analyze |
| CO4 | Explain the principle and operating characteristics of Viscosity measuring techniques | Understand |
| CO5 | Apply suitable technique for measurement of high temperature and Pressure for a required application | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | L | L | L | | | L | L | M | S | M | | L | L | M | S |
| CO2 | M | L | | L | | | | | | L | | | | L | L |
| CO3 | S | S | S | | | L | M | M | M | | S | L | S | S | |
| CO4 | M | M | | M | | M | | L | M | L | M | L | L | S | |
| CO5 | S | S | M | M | | S | M | S | S | S | S | M | S | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

## MEASUREMENT OF FORCE, TORQUE

Different types of load cells - Hydraulic, Pneumatic, strain gauge- Magneto-elastic and Piezoelectric load cells - Different methods of torque measurement: - Strain gauge-Relative angular twist

## MEASUREMENT OF ACCELERATION, VIBRATION

Accelerometers LVDT, Piezoelectric, Strain gauge and Variable reluctance type accelerometers - Mechanical type vibration instruments - Seismic instruments as accelerometer - Vibration sensor - Calibration of vibration pickups

## FLOW MEASUREMENTS

Orifice plate different types of orifice plates , Difference between area flow and mass flow meters, Venturi tube — Flow nozzle - Principle and construction and details of Electromagnetic flow meter — Ultrasonic flow meters

## LEVEL & VISCOSITY MEASUREMENT

Float gauges - Electrical types: Conductivity sensors, Boiler drum level measurement - Differential pressure method. Viscosity — Saybolt viscometer-Rota meter type viscometer

## HIGH TEMPERATURE MEASUREMENTS & PRESSURE MEASUREMENT

Special techniques for measuring high temperature using thermocouple –Radiation fundamentals - Radiation methods of temperature measurement - Total radiation pyrometers -Optical pyrometers. Units of pressure - Manometers, different types, Elastic type pressure gauges Capacitive type pressure gauge.

Case Study on application of above discussed measurement in Boiler, Furnace process.

**TEXT BOOK**

1. Patranabis, D. Principles of Industrial Instrumentation, 3rd Edition, Tata McGraw Hill, New Delhi, 2010.
2. Doebelin, E.O. and Manik, D.N., Measurement Systems Application and Design, Special Indian Edition, Tata McGraw Hill Education Pvt. Ltd., 2007.

**REFERENCES**

1. Liptak, B.C., Instrumentation Engineers Handbook (Measurement), CRC Press, 2005.
2. Singh,S.K., Industrial Instrumentation and Control, 3rd edition, McGrawHill Education., New Delhi, 2015.
3. Jain, R.K., Mechanical and Industrial Measurements, 12th edition, Khanna Publishers, Delhi, 2011.
4. A. K. Sawhney, PuneetSawhney Course in Mechanical Measurements and Instrumentation and Control, Dhanpat Rai & Sons, New Delhi, 1997.
5. Lessons in Industrial Instrumentation 2/3, Volume 2 of Lessons in Industrial Instrumentation Series, Tony R. Kuphaldt, Samurai Media Limited, 2017, ISBN : 9888407090, 9789888407095

**COURSE DESIGNERS**


| S.No. | Name of the Faculty | Designation | Department | e-Mail ID |
|---|---|---|---|---|
| 1 | P. LOGANATHAN | Assistant Professor | EEE / VMKVEC | loganathan@vmkvec.edu.in |
| 2 | S. JENSIE ANITA | Assistant Professor | EEE / AVIT | jensiepresely@avit.ac.in |

| 17CSPI07 | LEARNING IT ESSENTIALS BY DOING | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | PI | 3 | 0 | 0 | 3 |

**PREAMBLE**

The proposed elective course exposes the non-CS/IT students to IT Essentials. The core modules of this Elective includes programming , Database and web Technology amongst other related topics. This course refers to the basic tools and technologies for the right type of website development and enable student to create simple web applications

**PREREQUISITE –** NIL

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To learn about the essentials of Information Technology |
| 2 | To get an idea about the scripting languages. |
| 3 | To get an idea about the internet protocols |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1 Understand the networking concept internet protocols, network routing | Understand |
| CO2. Understand the fundamentals of web applications and its modeling | Understand |
| CO3. Understand and learn the scripting languages with design of web applications | Understand |
| CO4. Analyze the process of mobile communication and network technologies | Analyze |
| CO5. Build simple interactive applications, database applications and multimedia applications. | Analyze |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | M | M | - | - | - | - | - | - | - | M | M | M | - |
| CO2 | S | M | M | M | - | - | - | - | - | - | - | M | M | M | - |
| CO3 | S | M | M | M | - | - | - | - | - | - | - | M | M | M | - |
| CO4 | M | M | M | M | M | - | - | - | - | - | - | M | M | - | - |
| CO5 | M | M | M | M | S | - | - | - | - | - | - | M | S | M | - |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**Fundamentals of Computer architecture**

introduction-organization of a small computer -Central Processing Unit - Execution cycle – Instruction categories – measure of CPU performance Memory – Input/output devices - BUS-addressing modes. System Software – Assemblers – Loaders and linkers – Compilers and interpreters

**Operating system**

Introduction – memory management schemes Process management Scheduling – threads.
Problem solving with algorithms- Programming styles – Coding Standards and Best practices - Introduction to C -Programming Testing and Debugging. Code reviews -System Development Methodologies – Software development Models -User interface Design – introduction – The process – Elements of UI design & reports.

**RDBMS**

Data processing – the database technology – data models-ER modeling concept –notations – Extended ER features -Logical database design - normalization -SQL – DDL statements – DML statements – DCL statements
Writing Simple queries – SQL Tuning techniques – Embedded SQL - OLTP

**Objected oriented concepts**

Object oriented programming -UML Class Diagrams– relationship – Inheritance – Abstract classes – polymorphism-Object Oriented Design methodology - Common Base class -Alice Tool – Application of OOC using Alice tool.

**Client server computing**

Internetworking – Computer Networks – Working with TCP/IP – IP address – Sub netting – DNS – VPN – proxy servers World Wide Web – Components of web application - browsers and Web Servers
URL – HTML – HTTP protocol – Web Applications - Application servers – Web Security.

**REFERENCES**


1. Andrew S. Tanenbaum, Structured Computer Organization, PHI, 3rd ed., 1991
2. Silberschatz and Galvin, Operating System Concepts, 4th ed., Addision-Wesley, 1995
3. Dromey R.G., How to solve it by Computers, PHI, 1994
4. Kernighan, Ritchie, ANSI C language PHI,1992
5. Wilbert O. Galitz, Essential Guide to User Interface Design, John Wiley, 1997
6. Alex Berson, Client server Architecture, Mc Grew Hill International, 1994
7. Rojer Pressman, Software Engineering-A Practitioners approach, McGraw Hill, 5th ed., 2001
8. Alfred V Aho, John E Hopcroft, Jeffrey D Ullman, Design and Analysis of Computer Algorithms, Addison Wesley Publishing Co., 1998
9. Henry F Korth, Abraham Silberschatz, Database System Concept, 2nd ed. McGraw-Hill International editions, 1991
10. Brad J Cox, Andrew J.Novobilski, Object – Oriented Programming – An evolutionary approach, Addison – Wesley, 1991


**Course Designers:**


| S.No. | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
| 1. | Dr.K.Sasikala | Associate Professor | CSE | sasikalak@vmkvec.edu.in |
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| 17APEE01 | PERSONALITY SKILLS DEVELOPMENT - I | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EE | 2 WEEKS TRAINING | 0 | 0 | 1 |

**PREAMBLE**

To enhance holistic development of students and improve their employability skills

**PREREQUISITE - Nil**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To improve aptitude, problem solving skills and reasoning ability |
| 2 | To collectively solve problems in teams & group |
| 3 | To know the concept of Quantitative analysis |
| 4 | To have a good knowledge in reasoning |
| 5 | To identify and solving the Mathematical Puzzles |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| **CO1.** Identify, formulate and solve aptitude problems | Apply |
| **CO2.** Apply the knowledge of Mathematics, Science and Engineering in mathematical problems | Apply |
| **CO3.** Use the Techniques & skills. | Apply |
| **CO4.** Engage in Life-Long Learning. | Apply |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | S | -- | -- | -- | -- | -- | -- | -- | -- | -- | S | -- | -- | -- |
| CO2 | S | S | -- | -- | -- | -- | -- | -- | -- | -- | -- | S | -- | -- | -- |
| CO3 | S | S | -- | -- | -- | -- | -- | -- | -- | -- | -- | S | -- | -- | -- |
| CO4 | S | S | -- | -- | -- | -- | -- | - | -- | -- | -- | S | -- | -- | -- |

S- Strong; M-Medium; L-Low

**SYLLABUS**

**NUMBERS-I**

Types and Properties of Numbers, LCM, GCD, Surds and indices

**ARITHMETIC – I**

Percentages, Profit & Loss, Area and volume

**QUANTITATIVE ANALYSIS-I**.
Time and works ,Pipes and cistern, Calendar and Clocks

**REASONING-I**
Mathematical operations, Coding and decoding , Blood relationship

**PUZZLES-I**
Classification type, Seating arrangements and Comparison types

**TEXTBOOKS:**
Agarwal.R.S – Quantitative Aptitude for Competitive Examinations, S.Chand Limited 2011

**REFERENCES:**

1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Tata McGraw Hill, 3rd Edition, 2011
2. Edgar Thrope, Test Of Reasoning for Competitive Examinations, Tata McGraw Hill, 4th Edition, 2012


**COURSE DESIGNERS**


| S.No | Name of the Faculty | Designation | Name of the college | Mail ID |
|---|---|---|---|---|
| 1 | Dr. M.Vijayarakavan | Asso.Prof | VMKVEC | vijayarakavan@vmkvec.edu.in |
| 2 | Dr.A.K.Thamizhsudar | Asso.Prof. grade II | AVIT | thamizhsudar@avit.ac.in |

| 17APEE02 | PERSONALITY SKILL DEVELOPMENT - II | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | HSS | 2 WEEKS TRAINING | 0 | 0 | 1 |

**PREAMBLE: SM & S**

Personality Skill Development provides a professional approach and makes the students ready for the industry as well as to make them to understand the entrepreneurial approach through various actions. It also breaks down the barriers between the institute and industry by anticipating the technology update.

**PREREQUISITE:** Not Required

**COURSE OBJECTIVES:**

1. To learn and practice the Soft skills.
2. To assess the importance of social skills.
3. To practice SWOT analysis for individual and group.
4. To build and enhance the self confidence
5. To apply and observe various personality skills for personality development.

**COURSE OUTCOMES:**

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

| | |
|---|---|
| CO1: Understand the importance of Personality related to the working environment. | Understand |
| CO2: Inculcate relevant interpersonal skills for survival. | Apply |
| CO3: Analyse various skills of SWOT analysis. | Analysing |
| CO4: Applying assortment of soft skills for self assessment for both organisationally and socially. | Evaluate |
| CO5: Build self esteem and relevant personality skills according to goal. | Evaluate |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | | | L | | L | | | L | M | L | L | | | M |
| CO2 | | M | M | L | | | L | M | M | | | L | | | |
| CO3 | | | | | | M | | | | L | L | M | M | | M |
| CO4 | | M | | | | | | L | M | L | L | M | M | | M |
| CO5 | | | | L | | M | S | M | | S | M | S | | | M |

**S- Strong; M-Medium; L-Low**

**SYLLABUS:**

- ❖ Importance of Personality and Skill Development.
- ❖ Interpersonal Vs Intrapersonal skill.
- ❖ Communication and barriers in Communication.
- ❖ SWOT analysis for identifying individual, group and organisation.
- ❖ Skills required to Win and influence people
- ❖ Seven essential habits of Effective people followed.
- ❖ Goal setting – Individual skill to act in a group dynamics.
- ❖ Team Building
- ❖ Group Discussion
- ❖ Role Play
- ❖ Time management
- ❖ Corporate Etiquettes.
- ❖ Personality Grooming
- ❖ Body Language
- ❖ Career Guidance.
- ❖ Resume preparation
- ❖ Interview Skill
- ❖ Self Assessment

**TEXT BOOK:**

1. Sharma. P.C., Communication Skills and Personality Development, Nirali Prakashan Pub. Pune

**REFERENCE BOOK:**

1. Narula S. S, Personality Development and Communication Skills, Taxmann Publications Pvt Ltd

**COURSE DESIGNERS:**

| S.No | Name of the Faculty | Designation | Department | mail id |
|---|---|---|---|---|
| 1 | A.Mani | Associate Professor | Management Studies | mani@vmkvec.edu.in |
| 2 | Dr.P. Saradha | Associate Professor | English | saradhap@vmkvec.edu.in |
| 3 | Dr.V.Sheelamary | Associate Professor | Management Studies | sheelamary@avit.ac.in |

| 17MTEE01 | TRAINING ON PLC (HANDS ON TRAINING) | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EEC | 0 | 0 | 4 | 2 |

**PREAMBLE**

This course introduces the fundamentals of PLC and systematically designed in synchronous with industry needs.

**PREREQUISITE:** Programmable Logic Controllers.

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To understand the basic of PLC. |
| 2 | To study and familiarize about microcontroller & Embedded systems. |
| 3 | To study and design of PLC Ladder diagram . |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | |
|---|---|
| CO1: Describe the basic concepts of software tools used in PLC. | Understand |
| CO2: Realize the various types of control in PLC applications . | Analyze |
| CO3: Design of various automatic control systems using ladder diagram. | Create |

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | M | - | - | - | - | - | - | - | - | - | - | M | - | - |
| CO2 | S | M | - | - | - | - | - | L | - | - | - | - | M | L | - |
| CO3 | S | S | S | M | M | L | L | L | - | - | - | - | S | M | M |

S- Strong; M-Medium; L-Low

**SYLLABUS**

- Basic Principles of PLC Ladder Diagram
- Basic Instructions and Step Ladder Instructions
- Step Ladder Instructions
- Categories & Use of Application Instructions
- Analog IO Configuration
- Digital IO Configuration
- Application Instructions
- Loop Control / Transmission Comparison / Four Arithmetic Operation / PID
- Flow Control / Pressure Control
- Traffic light control / Logical Ladder Diagram

**Reference Books:**

Reference Manual

**COURSE DESIGNERS**

| S. No. | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
| 1 | Mr.S.Kannan | Assistant Professor | ECE/VMKVEC | kannan@vmkvec.edu.in |
| 2 | Mr. B.Rajasekaran | Associate Professor | ECE/VMKVEC | rajasekaran@vmkvec.edu.in |

| 17APEE03 | NATIONAL CADET CORPS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EEC | 0 | 0 | 4 | 2 |

**PREAMBLE**

The training curriculum of the NCC is primarily focused towards character building, inculcating leadership qualities and skill enhancement through structured academic syllabi, practical training and opportunity of exposure/interaction beyond a cadet's immediate environment and thereby enabling them for a brighter and progressive future.

**PREREQUISITE - NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To develop character, comradeship, discipline, secular outlook, spirit of adventure and the ideals of selfless service amongst the youth of the country. |
| 2 | To create a human resource of organized, trained and motivated youth, to provide leadership in all walks of life and always available for the service of the nation. |
| 3 | To provide a suitable environment to motivate the youth to take up a career in the Armed Forces. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

CO1. Explore the importance of NCC in nation building.

CO2. Develop an insight into the religion, cultural and tradition of India.

CO3. Acquaint themselves with the different types of leadership.

CO4. Analyses the need for social service for the development of a society.

CO5. Basic understanding of map sheets and map reading instruments and development of capability to use them to carry out simple map reading.

**SYLLABUS**

Aims and objectives of NCC, Organization, training and the NCC Song, Incentives.
**Drill** - Foot Drill, Arms Drill, Ceremonial Drill and Weapon Training
**National Integration** - Religions, culture, traditions and customs of India, National Integration: Importance and necessity, Freedom struggle and nationalist movements in India.
**Personality Development and Leadership** - Introduction to personality development, Self-awareness, Communication skills, Leadership traits, Time management.
**Disaster Management and Civil Affairs** - Civil defense organization and NDMA, Types of emergencies and natural disasters, Assistance during natural and other calamities: Floods, cyclones, earth quakes, and accidents.
**Social Awareness and Community Development** - Basics of social service and Its need, Rural development programmes, Contribution of youth towards social welfare, Civic responsibility, Causes and prevention of HIV AIDS.
**Health and Hygiene** - Structure and function of the human body, Hygiene and sanitation, Infectious and contagious diseases and its prevention.

**Environment Awareness and Conservation** - Natural resources- conservation and management, Water conservation and rain water harvesting

**Armed Forces** - Basic organization of Armed Forces, Organisation of the Army, Badges and Ranks. Map Reading- Introduction to types of maps and conventional signs.

**Map Reading** -0 Scales and grid system, Topographical forms and technical terms Relief, contours and gradients, Cardinal points and types of North, Types of bearings and use of service protractor, Prismatic compass and its use and GPS.

**Field Craft and Battle Craft** - Judging distance, Description of ground, Recognition, description and indication of land marks and targets.

**Introduction to Infantry Weapons and Equipment** - Characteristics of 7.62mm SLR rifle, ammunition, fire power, Stripping, assembling and cleaning.

**Military History** - Biographies of renowned generals (Carriappa/Manekshaw),Indian Army war heroes.

**Communication** - Types of communication, Characteristics of wireless technology (mobile, Wi Fi, etc.)

**TEXTBOOKS**

1. Cadet Hand Book (Common Subjects), Published by DG NCC.
2. Cadet Hand Book (Specialized Subjects), Published by DG NCC.

**REFERENCE BOOKS**

1. Grooming Tomorrow's Leaders, Published by DG, NCC.
2. Youth in Action, Published by DG, NCC.
3. The Cadet, Annual Journal of the NCC.
4. Précis Issued by respective Service Headquarters on specialized subject available to PI Staff as reference material.

**COURSE DESIGNERS**

| S.No | Name of the Facility | Designation | Department | Mail Id |
|---|---|---|---|---|
| 1. | Lt.S.Kannan | Assistant Professor / Lieutenant | ECE | nccofficer@vmkvec.ac.in |
| 2. | Mr.S.Muthu Selven | Assistant Professor | CSE | muthuselven@avit.ac.in |

| 17APEE04 | NATIONAL SERVICE SCHEME | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | EEC | 0 | 0 | 4 | 2 |

**PREAMBLE**

The service curriculum of the NSS is primarily focused towards character building, inculcating social responsibilities and human values through structured academic syllabi, practical training and opportunity of exposure/interaction beyond a volunteer's thereby enabling them for a brighter and progressive future.

**PREREQUISITE - NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | To develop character, leadership, discipline and the ideals of selfless service amongst the youth of the country. |
| 2 | To create a human resource of organized, trained and motivated youth always available for the service of the nation. |
| 3. | To practice national integration and social harmony |
| 4. | To identify the needs and problems of the community and involve them in problem-solving |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

CO1. Improve the quality of educated manpower by fostering social responsibility.

CO2. Develop an insight into the religion, cultural and tradition of India.

CO3. Analyses the need of social service for the development of a society.

CO4. To utilize their knowledge in finding practical solutions to individual and community problems.

**SYLLABUS**

**INTRODUCTION TO NATIONAL SERVICE SCHEME**

History and its Objectives – Emblem, Flag, Motto, Song and badge-Organizational structure of N.S.S. at National, State, University and College Levels - Advisory committee and their functions with special reference to college principal, Programme officer, N.S.S. group leader and N.S.S. volunteers in the implementation**.**

**NATIONAL INTEGRATION AND YOUTH LEADERSHIP**

Need of National integration - Various obstacles in the way of National Integration; such as caste, religion, language and provisional problems etc. Concept of family –Human values- Meaning and role of leadership- Qualities of good leadership- Role of youth in nation building-National youth policy- Youth focused and Youth led organizations

**HEALTH, HYGIENE AND SANITATION AND COMMUNITY MOBILISATION**

Definition, need and scope of health education- Food and Nutrition-National health programme – Healthy lifestyle- Home nursing- First aid

Mapping of Community stakeholders- Designing the message in the context of the problem and the culture of the community-Identifying methods of mobilization- Youth-adult partnership

**NSS REGULAR ACTIVITIES**

Introduction - NSS Regular activities - Day campus- Basics of adaptation of village/slums- Methodology of

conducting survey- Financial pattern of the scheme- Schemes of GOI-Coordination with different agencies- Maintenance of the diary

**NSS SPECIAL CAMPING**

Nature and its objectives- Selection of camp site and physical arrangement-Organization of N.S.S. camp through various committees and discipline in the camp -Activities to be undertaken during the N.S.S. camp -Use of the mass media in the N.S.S. activities- Collection and analysis of data- Preparation of Documentation and reports- Dissemination of documents and reports.

**COURSE DESIGNERS**

| S.No | Name of the Facility | Designation | Department | Mail Id |
|---|---|---|---|---|
| 1. | Mr.S.KRISHNARAJ | Asst. Professor | Chemistry/VMKVEC | srajkrishna85@gmail.com |
| 2. | Mr.C.THANGAVEL | Asso. Professor | Mechanical/VMKVEC | ceeteemech@gmail.com |
| 3. | Dr.B. PRABASHEELA | Asso. Professor | Biotechnology/ AVIT | prabasheela@avit.ac.in |

| 17APEE05 | **SPORTS AND GAMES INTER COLLEGIATE LEVEL** | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 0 | 0 | 2 | 1 |

**PREAMBLE**

To produce good players, by providing Hi-Tech Sports facilities to the Students and to be the top college for Sports in addition to academics in several disciplines of science and engineering.

**PREREQUISITE - NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | Demonstrate an understanding of the principles and concepts related to a variety of physical activities |
| 2 | Recall and understand the importance of physical activity to a healthy lifestyle |
| 3 | Display acquired motor skills necessary to perform a variety of physical activities |
| 4 | Apply tactics, strategies and rules in both individual and group situations |
| 5 | Recognize and inspire the physical and mental benefits of sports activities. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

CO1.Respect themselves and correlate their social and physical environment

CO2.Support and encourage others (towards a positive working environment)

CO3.Develop attitudes and strategies that enhance their relationship with others

CO4.Show sensitivity to their own and different cultures.

CO5.Take responsibility for their own learning process and demonstrate engagement with the activity, showing enthusiasm and commitment

**LIST OF EVENTS ORGANIZED:**

Intramural Activities. (Inter Collegiate tournaments and open college tournaments)
Training and Coaching for inter collegiate tournaments.
Conducting Inter class, inter-department tournament.
Enrolment of students in the concerned sports and games.

**COURSE DESIGNERS**

| S.No. | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
| 1 | Mr.N.Jayaraman | Director of Physical Education | Physical Education | jayaraman@vmkvec.edu.in |
| 2 | Mr.P.Naveen | Director of Physical Education | Physical Education | naveen@vmkvec.edu.in |

| 17APEE06 | **SPORTS AND GAMES INTER UNIVERSITY LEVEL** | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 0 | 0 | 4 | 2 |

**PREAMBLE**

To produce good players, by providing Hi-Tech Sports facilities to the Students and to be the top college for Sports in addition to academics in several disciplines of science and engineering.

**PREREQUISITE - NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | Demonstrate an understanding of the principles and concepts related to a variety of physical activities |
| 2 | Recall and understand the importance of physical activity to a healthy lifestyle |
| 3 | Display acquired motor skills necessary to perform a variety of physical activities |
| 4 | Apply tactics, strategies and rules in both individual and group situations |
| 5 | Recognize and inspire the physical and mental benefits of sports activities. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

CO1.Respect themselves and correlate their social and physical environment

CO2.Support and encourage others (towards a positive working environment)

CO3.Develop attitudes and strategies that enhance their relationship with others

CO4.Show sensitivity to their own and different cultures.

CO5.Take responsibility for their own learning process and demonstrate engagement with the activity, showing enthusiasm and commitment

**LIST OF EVENTS ORGANIZED:**

Extramural Activities. (District, State & Open level Tournaments)
Training and Coaching for inter collegiate tournaments.
Conducting Inter class, inter-department tournament.
Enrolment of students in the concerned sports and games.

**COURSE DESIGNERS**

| S.No. | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
| 1 | Mr.N.Jayaraman | Director of Physical Education | Physical Education | jayaraman@vmkvec.edu.in |
| 2 | Mr.P.Naveen | Director of Physical Education | Physical Education | naveen@vmkvec.edu.in |

| 17APEE07 | SPORTS AND GAMES ALL INDIA INTER UNIVERSITY LEVEL | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | CC | 0 | 0 | 6 | 3 |

**PREAMBLE**

To produce good players, by providing Hi-Tech Sports facilities to the Students and to be the top college for Sports in addition to academics in several disciplines of science and engineering.

**PREREQUISITE - NIL**

**COURSE OBJECTIVES**

| | |
|---|---|
| 1 | Demonstrate an understanding of the principles and concepts related to a variety of physical activities |
| 2 | Recall and understand the importance of physical activity to a healthy lifestyle |
| 3 | Display acquired motor skills necessary to perform a variety of physical activities |
| 4 | Apply tactics, strategies and rules in both individual and group situations |
| 5 | Recognize and inspire the physical and mental benefits of sports activities. |

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

CO1.Respect themselves and correlate their social and physical environment

CO2.Support and encourage others (towards a positive working environment)

CO3.Develop attitudes and strategies that enhance their relationship with others

CO4.Show sensitivity to their own and different cultures.

CO5.Take responsibility for their own learning process and demonstrate engagement with the activity, showing enthusiasm and commitment

**LIST OF EVENTS ORGANIZED:**

Extramural Activities. (South Zone & All India Inter University tournaments & National level)
Training and Coaching for inter collegiate tournaments.
Conducting Inter class, inter-department tournament.
Enrolment of students in the concerned sports and games.

**COURSE DESIGNERS**

| S.No. | Name of the Faculty | Designation | Department | Mail ID |
|---|---|---|---|---|
| 1 | Mr.N.Jayaraman | Director of Physical Education | Physical Education | jayaraman@vmkvec.edu.in |
| 2 | Mr.P.Naveen | Director of Physical Education | Physical Education | naveen@vmkvec.edu.in |