# SCHEME & SYLLABUS

## *B.Tech, Mechanical Engineering*

**Choice Based Credit System**


**University Institute of Engineering and Technology**

**Sant Baba Bhag Singh University**

**2020**

# ABOUT DEPARTMENT

Mechanical Engineering is the art and science of designing, development and control of systems and components such as fluid mechanics, material science, thermodynamics, kinematics, etc. Mechanical engineers use these core concepts paired with tools like computer-aided design (CAD), and product lifecycle management to design, analyze and manufacturing of equipments.. The department offers B.Tech degree course in Mechanical Engineering . The department also offers Full time and Part time M.Tech. in Production Engineering. The department has qualified and experienced faculty . The theoretical knowledge is further supplemented by well-equipped laboratories. Department is equipped with Number of labs such as Strength of Materials, Mechanics of Machines , Fluid Mechanics ,Fluid Machinery, Design software lab, Manufacturing Process ,Heat transfer , Refrigeration and Air Conditioning and Thermodynamics . It also has latest audio – visual teaching aids. Internet facility is available for students.

## SALIENT FEATURES

1. Provides a learning environment strongly focused on collaborative and interdisciplinary research under the guidance of experienced and qualified faculty.
2. Provides 24 hours High speed Internet facility with Wi-Fi Connectivity.
3. The department provides Digital Library with access to Journals and Video lectures of Eminent Professors.
4. The department regularly organizes Conferences, Seminars, Student Symposia, Short-Term Training Program, Value Added Courses and frequent Industrial Visits to Industry for Practical Exposure and Technical Awareness.
5. The department has signed MOU with IIT Delhi, to provide remote access to Virtual Labs and has established Student Chapter of Computer Society of India.

## VISION

The Mechanical Engineering Department endeavours to be recognized globally for outstanding education and research leading to well qualified engineers, who are innovative, entrepreneurial and successful in advanced fields of mechanical engineering to cater the ever changing industrial demands and social needs

## MISSION

To imparting highest quality education to the students to build their capacity and enhancing their skills to make them globally competitive mechanical engineer

To render the students with academic environment of excellence, leadership,, ethical guidelines and lifelong learning needed for a long productive career.

### ELIGIBILITY CRITERIA

10+2 with Physics & Mathematics with Chem / Comp.Sc / Bio / Biotechnology conducted by a recognized Board/ University/Council.

Diploma in Engineering & Tech. from AICTE Approved Institions or B.Sc. (N.M) from UGC approved University at least 45% marks. (For Lateral Entry)

### DURATION

4 Years

3 Years (For Lateral Entry)

## PROGRAMME OUTCOMES (PO)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, research literature, and analyze engineering problems to arrive at substantiated conclusions using first principles of mathematics, natural, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components, processes to meet the specifications with consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge 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 teamwork: Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects 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.

## PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To be well familiar with the concepts of Mechanical Engineering for leading a successful career in industry or as entrepreneur or to pursue higher education.

PEO2: To develop techno-commercial skills for providing effective solutions to complex problems using domain knowledge of Mechanical Engineering.

PEO3: To instill lifelong learning approach towards constantly evolving technologies with innovative and ethical mindset.

## PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO1: Analyze, design, evaluate and provide solutions to the real-life mechanical engineering problems.

PSO2: Design and evaluate thermal systems including IC engines, refrigeration, air conditioning, and power generating systems.

PSO3: Engage in Planning, including methods design, process plan, process automation, and quality assurance systems to ensure optimization in manufacturing.

## ABOUT THE CHOICE BASED CREDIT SYSTEM (CBCS)

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. The basic idea is to look into the needs of the students so as to keep up-to-date with development of higher education in India and abroad. CBCS aims to redefine the curriculum keeping pace with the liberalization and globalization in education. CBCS allows students an easy mode of mobility to various educational institutions spread across the world along with the facility of transfer of credits earned by students.

1. Curriculum Structure: B.Tech degree programme will have a curriculum with Syllabi consisting of following type of courses:

| Sr. No. | Definition | Credits |
|---|---|---|
| 1 | Basic Science courses | 23 |
| 2 | Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc | 22 |
| 3 | Humanities and Social Sciences including Management courses | 6 |
| 4 | Professional core courses | 72 |
| 5 | Professional Elective courses relevant to chosen specialization/branch | 13 |
| 6 | Open subjects – Electives from other technical and /or emerging subjects | 12 |
| 7 | Mandatory Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Knowledge Tradition] | 06 units (Non Credits) |
| 8 | Project work, seminar and internship in industry or elsewhere | 29 |
| | Total | 177 |

## 2. NOMENCLATURE USED:

| Course Code | Definition |
|---|---|
| BS | Basic Science |
| ES | Engineering Science |
| HS | Humanities Science |
| PC | Professional Core |
| PE | Professional Elective |
| OE | Open Elective |
| MC | Mandatory Course |
| SI | Summer Industry Internship |
| PROJ | Project |
| T | Theory Subject |
| P | Practicals |

**INDEX**

| | | | | |
|---|---|---|---|---|
| 26 | ME206 | Mechanics of Machines - I | | |
| 27 | ME208 | Manufacturing Technology-II | | |
| 28 | EVS101 | Environmental Sciences | | |
| 29 | EVS101 ME210 | Material Science and Metallurgy | | |
| 30 | ME212 | Mechanics of Machines- I lab | | |
| 31 | ME214 | Manufacturing Process-II Lab | | |
| 32 | ME216 | Material Science and Metallurgy Lab | | |
| 33 | ME301 | Fluid Mechanics | | |
| 34 | ME303 | Machine Design-I | | |
| 35 | ME305 | Mechanics of Machines - II | | |
| 36 | SSC303 | Human values & Professional Ethics/Human Resources | | |
| 37 | PLS303 | Constitution of India | | |
| 38 | ME309 | Fluid Mechanics Lab | | |
| 39 | ME311 | Automobile Engineering | | |
| 40 | ME313 | Environmental Pollution and Abatement | | |
| 41 | ME315 | Mechanical Handling Systems and Equipment | | |
| 42 | ME302 | Heat Transfer | | |
| 43 | ME304 | Machine Design-II | | |
| 44 | ME318 | Computer Aided Design and Manufacturing | | |
| 45 | ME306 | Industrial meteorology | | |
| 46 | ME-308 | Heat Transfer Lab | | |
| 47 | ME310 | Industrial Meteorology lab | | |
| 48 | ME312 | Design Software lab | | |
| 49 | ME401 | Fluid Machinery | | |
| 50 | ME405 | Fluid Machinery lab | | |
| 51 | ME413 | Industrial Automation & Robotics | | |
| 52 | ME415 | Management of Supply chain | | |

| | | | | |
|---|---|---|---|---|
| 53 | ME417 | Introduction to Mechatronics | | |
| 54 | ME419 | Finite Element Methods | | |
| 55 | ME421 | Mechanical Vibrations | | |
| 56 | ME423 | Computational Fluid Dynamics | | |
| 57 | ME403 | Refrigeration and Air Conditioning | | |
| 58 | ME407 | Refrigeration and air conditioning Lab | | |
| 59 | ME402 | Six-Month Industrial training | | |
| 60 | ME316 | Non-Destructive Evaluation & Testing | | |
| 61 | ME314 | Advanced Manufacturing Processes | | |
| 61 | CSE371 | Basics of Database Design | | |
| 62 | CSE373 | Fuzzy Logic | | |
| 63 | ME371 | Total Quality Management | | |
| 64 | ME373 | Production Planning & Control | | |
| 65 | EE371 | Electrical Energy Conservation and Auditing | | |
| 66 | EE373 | Element of power System | | |
| 67 | ECE371 | Signal and Systems | | |
| 68 | ECE373 | Micro Controller & Applications | | |
| 69 | CE371 | Renewable Energy Sources. | | |
| 70 | CE373 | Architecture and Town Planning | | |
| 71 | CSE372 | Computer Networks | | |
| 72 | CSE374 | Computer Organization | | |
| 73 | ME372 | Industrial Engineering Management | | |
| 74 | ME374 | Management Information System | | |
| 75 | EE372 | Industrial Electrical system | | |
| 76 | EE374 | Fundamentals of Electrical Machines | | |
| 77 | ECE372 | Analog & Digital Communications | | |
| 78 | ECE374 | Analog Circuits | | |
| 79 | CE372 | Construction of Metro Systems. | | |

| | | | | |
|---|---|---|---|---|
| 80 | CE374 | Traffic Engineering | | |
| 81 | CSE471 | Concepts of Operating System | | |
| 82 | CSE473 | Data Warehouse & Data Mining | | |
| 83 | ME471 | Material Management | | |
| 84 | ME473 | Maintenance and Reliability Engineering | | |
| 85 | EE471 | Wind and solar Energy System<br>energy System | | |
| 86 | EE473 | Instrumentation Engineering | | |
| 87 | ECE471 | Biomedical Electronic | | |
| 88 | ECE473 | VLSI Design | | |
| 89 | CE471 | Rural Technology and community development | | |
| 90 | CE473 | Waste water engineering | | |
| 91 | CSE472 | Image Analysis | | |
| 92 | CSE474 | Concepts of cloud computing | | |
| 93 | ME472 | Operation Management | | |
| 94 | ME474 | Industrial Safety | | |
| 95 | EE472 | Electrical Materials | | |
| 96 | EE474 | Electrical & Hybrid Vehicles | | |
| 97 | ECE472 | Embedded System | | |
| 98 | ECE474 | Advanced Optical Communication System | | |
| 99 | CE472 | Tall Buildings | | |
| 100 | CE474 | Remote sensing and geographical information system | | |
| 101 | CSE476 | Big Data | | |
| 102 | CSE478 | Network security | | |
| 103 | ME476 | IC Engines | | |
| 104 | ME478 | Power Plant Engineering | | |
| 105 | EE476 | Electrical Measurement | | |
| 106 | EE478 | Energy Auditing & Management | | |

| | | | | |
|---|---|---|---|---|
| 107 | ECE476 | Digital System Design | | |
| 108 | ECE478 | Broadband Communication. | | |
| 109 | CE476 | Infrastructure and real estate management | | |
| 110 | CE478 | Site investigation | | |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

# Course Scheme, B.Tech Mechanical Engineering

## General Course Structure

### Course Code and Definition

| Course Code | Definition |
|---|---|
| BS | Basic Science |
| ES | Engineering Science |
| HS | Humanities Science |
| PC | Professional Core |
| PE | Professional Elective |
| OE | Open Elective |
| MC | Mandatory Course |
| PROJ | Project |

SANT BABA BHAG SINGH UNIVERSITY
KHIALA, DISTT. JALANDHAR (PUNJAB)

# SEMESTER I / II

## Scheme for B. Tech. 1st Year (Common to all disciplines) (Physics Group)

### I. Theory Subjects

| S. No. | Course area | Subject Code | Subject Name | Contact Hours (L:T:P) | Credits (L:T:P) | Total Contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|---|
| 1 | BS | PHY 105 | Engineering Physics | 3:0:0 | 3:0:0 | 3 | 3 |
| 2 | BS | MAT103/ MAT104 | Engineering Mathematics-I/ Engineering Mathematics-II | 4:1:0 | 4:1:0 | 5 | 5 |
| 3 | ES | EE101 | Basic Electrical Engineering | 2:0:0 | 2:0:0 | 2 | 2 |
| 4 | ES | CSE101 | Fundamentals of Computer Technology | 3:0:0 | 3:0:0 | 3 | 3 |

| S. No | Course area | Subject Code | Subject Name | Contact Hours (L:T:P) | Credits (L:T:P) | Total Contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|---|
| 1 | BS | PHY107 | Engineering Physics Laboratory | 0:0:2 | 0:0:1 | 2 | 1 |
| 2 | ES | EE103 | Basic Electrical Engineering Laboratory | 0:0:2 | 0:0:1 | 2 | 1 |
| 3 | ES | CSE103 | Fundamentals of Computer Technology Laboratory | 0:0:4 | 0:0:2 | 4 | 2 |
| 4 | ES | ME107 | Engineering Workshop | 0:0:6 | 0:0:3 | 6 | 3 |
| 5 | | PT101/PT103 PT105 | Physical training-I NSO/NCC/NSS | 0:0:2 | NC | 2 | NC |

- In the 2nd Semester the scheme for Physics and Chemistry group will interchange
- In the 2nd Semester Engineering Mathematics-1 will be replaced by Engineering Mathematics-II
- *Indicates that the subject will be offered in both the Semesters

**Total Contact Hours:29**
**Total credit Hours:20**

# SEMESTER I / II

**Scheme for B. Tech. 1st Year (Common to all disciplines) (Chemistry Group)**

**I. Theory Subjects**

| S. No | Course area | Subject Code | Subject Name | Contact Hours (L:T:P) | Credits (L:T:P) | Total Contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|---|
| 1 | BS | CHM105 | Engineering Chemistry | 3:0:0 | 3:0:0 | 3 | 3 |
| 2 | BS | MAT103/ MAT104 | Engineering Mathematics-1/ Engineering Mathematics-2 | 4:1:0 | 4:1:0 | 5 | 5 |
| 3 | ES | ECE101 | Basic Electronics & Communication Engineering | 2:0:0 | 2:0:0 | 2 | 2 |
| 4 | HSMC | ENG121 | Communication Skills-I | 2:0:0 | 2:0:0 | 2 | 2 |
| 5 | ES | ME103 | Engineering Drawing | 1:0:6 | 1:0:3 | 7 | 4 |

| S. No | Course area | Subject Code | Subject Name | Contact Hours (L:T:P) | Credits (L:T:P) | Total Contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|---|
| 1 | BS | CHM107 | Engineering Chemistry Laboratory | 0:0:2 | 0:0:1 | 2 | 1 |
| 2 | ES | ECE103 | Basic Electronics & Communication Engineering Laboratory | 0:0:2 | 0:0:1 | 2 | 1 |
| 3 | HSMC | ENG123 | Communication Skills-I Practical | 0:0:2 | 0:0:1 | 2 | 1 |
| 4 | | PT102/ PT104/PT106 | Physical training-II NSO/NCC/NSS | 0:0:2 | NC | 2 | NC |

- In the 2nd Semester the scheme for Physics and Chemistry group will interchange and Engineering Mathematics-1 will be replaced by Engineering Mathematics-2
- *Indicates that the subject will be offered in both the Semesters

**Total Contact Hours:27**
**Total credit Hours:19**

# SEMESTER III

**I. Theory subjects (including non-credit courses)**

| S.No | Category | Sub code | Category | Contact Hours (L:T:P) | Credits (L:T:P) | Total contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|---|
| 1 | BS | MAT205 | Engineering Mathematics-III | 3:2:0 | 3:2:0 | 5 | 5 |
| 2 | PC | ME201 | Strength of Materials–I | 3:1:0 | 3:1:0 | 4 | 4. |
| 3 | PC | ME203 | Applied Thermodynamics-I | 3:1:0 | 3:1:0 | 4 | 4 |
| 4 | PC | ME205 | Manufacturing Technology –I | 3:0:0 | 3:0:0 | 3 | 3 |
| 5 | PC | ME207 | Machine Drawing | 1:0:6 | 1:0:3 | 7 | 4 |

| S No. | Category | Sub Code | Subject Name | Contact Hours (L:T:P) | Credits (L:T:P) | Total Contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|---|
| 1 | PC | ME209 | Strength of Materials Lab | 0:0:2 | 0:0:1 | 2 | 1 |
| 2 | PC | ME211 | Manufacturing Process Lab-I | 0:0:2 | 0:0:1 | 2 | 1 |
| 3 | PC | ME213 | Applied Thermodynamics-I Lab | 0:0:2 | 0:0:1 | 2 | 1 |
| 4 | | PT101/ PT103/PT105 | Physical Training-III (NSO/NCC/NSS) | 0:0:2 | NC | 2 | NC |

**Total Contact Hours:31**

**Total credit Hours:23**

KHIALA, DISTT. JALANDHAR (PUNJAB)

## SEMESTER IV

**I. Theory subjects (including non-credit courses)**

| S No. | Category | Sub Code | Subject Name | Contact Hours (L:T:P) | Credits (L:T:P) | Total Contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|---|
| 1 | PC | ME202 | Strength of Materials –II | 3:1:0 | 3:1:0 | 4 | 4 |
| 2 | PC | ME204 | Applied Thermodynamics-II | 3:1:0 | 3:1:0 | 4 | 4 |
| 3 | PC | ME206 | Mechanics of Machines - I | 3:1:0 | 3:1:0 | 4 | 4 |
| 4 | PC | ME208 | Manufacturing Technology-II | 3:0:0 | 3:0:0 | 3 | 3 |
| 5 | MC | EVS101 | Environmental Sciences | 3:0:0 | NC | 3 | NC |
| 6 | ES | ME210 | Material Science and Metallurgy | 3:0:0 | 3:0:0 | 3 | 3 |
| 7 | | | *Educational Tour | | | | |

*At least one Educational Tour must be carried out in the semester for practical exposure of the students. The tour must augment existing or previous lesson plans and synchronize with classroom learning.

| S No. | Category | Sub Code | Subject Name | Contact Hours (L:T:P) | Credits (L:T:P) | Total Contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|---|
| 1 | PC | ME212 | Mechanics of Machines - I | 0:0:2 | 0:0:1 | 2 | 1 |
| 2 | PC | ME214 | Manufacturing Process-II Lab | 0:0:2 | 0:0:1 | 2 | 1 |
| 3 | ES | ME216 | Material Science and Metallurgy Lab | 0:0:2 | 0:0:1 | 2 | 1 |
| 4 | | PT202/PT204/PT206 | Physical Training-IV (NSO/NCC/NSS) | 0:0:2 | NC | 2 | NC |

**Note -It is Mandatory that a student undergo a 4 weeks industrial training after 4th Semester**

**Total Contact hrs: 29**
**Total Credit Hours: 21**

# SEMESTER V

**I. Theory Subjects (including non-credit courses)**

| S No . | Category | Sub Code | Subject Name | Contact Hours (L:T:P) | Credits (L:T:P) | Total Contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|---|
| 1 | PC | ME301 | Fluid Mechanics | 03:01:00 | 03:01:00 | 4 | 4 |
| 2 | PC | ME303 | Machine Design-I | 03:01:00 | 03:01:00 | 4 | 4 |
| 3 | PC | ME305 | MOM II | 03:01:00 | 03:01:00 | 4 | 4 |
| 4 | PE | | Professional Elective-I | 03:00:00 | 03:00:00 | 3 | 3 |
| 5 | HMSC | SSC303 | Human values and Professional Ethics | 03:00:00 | 03:00:00 | 3 | 3 |
| 6 | MC | PLS303 | Constitution of India | 03:00:00 | NC | 3 | NC |

**II. Practical Subjects**

| S No. | Category | Sub Code | Subject Name | Contact Hours (L:T:P) | Credits (L:T:P) | Total Contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|---|
| 1 | PC | ME309 | Fluid Mechanics Lab | 00:00:02 | 00:00:01 | 2 | 1 |
| 2 | | ME307 | 4-week Industrial Training-I | 4 weeks | | | 3 |

**PROFESSIONAL ELECTIVE-I**

| **S No.** | **Sub Code** | **Subject Name** | **Contact Hours (L:T:P)** | **Credits (L:T:P)** | **Total Contact Hours** | **Total Credit Hours** |
|---|---|---|---|---|---|---|
| 1 | ME311 | Automobile Engineering | 03:00:00 | 03:00:00 | 3 | 3 |
| 2 | ME313 | Environmental Pollution and Abatement | 03:00:00 | 03:00:00 | 3 | 3 |
| 3 | ME315 | Mechanical Handling Systems and Equipment | 03:00:00 | 03:00:00 | 3 | 3 |

**Total Contact Hours: 23**

**Total Credit Hours: 22**

KHIALA, DIST T. JALANDHAR (PUNJAB)

# SEMESTER VI

**I. Theory subjects (including non-credit courses)**

| S No. | Category | Sub Code | Subject Name | Contact Hours (L:T:P) | Credits (L:T:P) | Total Contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|---|
| 1 | PC | ME302 | Heat Transfer | 3:1:0 | 3:1:0 | 4 | 4 |
| 2 | PC | ME304 | Machine Design-II | 3:1:0 | 3:1:0 | 4 | 4 |
| 3 | PC | ME306 | Industrial Metrology | 3:0:0 | 3:0:0 | 3 | 3 |
| 4 | PE | | Professional Elective-II | 3:0:0 | 3:0:0 | 3 | 3 |
| 5 | OE | | OE-I | 3:0:0 | 3:0:0 | 3 | 3 |
| 6 | OE | | OE-II | 3:0:0 | 3:0:0 | 3 | 3 |

**II. Practical Subjects**

| S No. | Category | Sub Code | Subject Name | Contact Hours (L:T:P) | Credits (L:T:P) | Total Contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|---|
| 1 | PC | ME308 | Heat Transfer Lab | 0:0:2 | 0:0:1 | 2 | 1 |
| 2 | PC | ME310 | Industrial metrology | 0:0:2 | 0:0:1 | 2 | 1 |
| 3 | PC | ME312 | Design Software Lab | 0:0:2 | 0:0:1 | 2 | 1 |

**It is Mandatory that a student undergo a 4-weeks industrial training after 6th Semester**

**PROFESSIONAL ELECTIVE II**

| S No. | Sub Code | Subject Name | Contact Hours (L:T:P) | Credits (L:T:P) | Total Contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|
| 1 | ME314 | Advanced Manufacturing Processes | 3:0:0 | 3:0:0 | 3 | 3 |
| 2 | ME316 | Non-Destructive Evaluation & Testing | 3:0:0 | 3:0:0 | 3 | 3 |
| 3 | ME318 | Computer Aided Design and Manufacturing | 3:0:0 | 3:0:0 | 3 | 3 |

**Note -It is Mandatory that a student undergo a 4 weeks industrial training after 6th Semester**

**Total Contact Hours: 26**

**Total Credit Hours: 23**

KHIALA, DIST.T. JALANDHAR (PUNJAB)

# SEMESTER VII

**I. Theory subjects (including non-credit courses)**

| S No. | Category | Sub Code | Subject Name | Contact Hours (L:T:P) | Credits (L:T:P) | Total Contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|---|
| 1 | PC | ME401 | Fluid Machinery | 3:1:0 | 3:1:0 | 4 | 4 |
| 2 | PC | ME403 | Refrigeration and Air Conditioning | 3:1:0 | 3:1:0 | 4 | 4 |
| 3 | PE | | Professional Elective-II | 3:0:0 | 3:0:0 | 3 | 3 |
| 4 | PE | | Professional Elective-III | 3:1:0 | 3:1:0 | 4 | 4 |
| 5 | OE | | Open Elective-III | 3:0:0 | 3:0:0 | 3 | 3 |
| 6 | OE | | Open Elective-IV | 3:0:0 | 3:0:0 | 3 | 3 |
| | Educational Tour | | | | | | |

**II. Practical Subjects**

| S No. | Category | Sub Code | Subject Name | Contact Hours (L:T:P) | Credits (L:T:P) | Total Contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|---|
| 1 | PC | ME405 | Fluid Machinery Lab | 0:0:2 | 0:0:1 | 2 | 1 |
| 2 | PC | ME407 | Refrigeration and air conditioning LAB | 0:0:2 | 0:0:1 | 2 | 1 |
| 3 | | ME409 | Minor Project Work | 0:0:6 | 0:0:3 | 6 | 3 |
| 4 | | ME411 | 4-week Industrial Training-II | - | - | - | 3 |

**PROFESSIONAL ELECTIVE III**

| S No. | Sub Code | Subject Name | Contact Hours (L:T:P) | Credits (L:T:P) | Total Contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|
| 1 | ME413 | Industrial Automation & Robotics | 3:0:0 | 3:0:0 | 3 | 3 |
| 2 | ME415 | Management of Supply chain | 3:0:0 | 3:0:0 | 3 | 3 |
| 3 | ME417 | Introduction to Mechatronics | 3:0:0 | 3:0:0 | 3 | 3 |

**PROFESSIONAL ELECTIVE IV**

| S No. | Sub Code | Subject Name | Contact Hours (L:T:P) | Credits (L:T:P) | Total Contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|
| 1 | ME419 | Finite Element Methods | 3:1:0 | 3:1:0 | 4 | 4 |
| 2 | ME421 | Mechanical Vibrations | 3:1:0 | 3:1:0 | 4 | 4 |
| 3 | ME423 | Computational Fluid Dynamics | 3:1:0 | 3:1:0 | 4 | 4 |

**Total Contact Hours: 31**

**Total Credit Hours: 29**

## SEMESTER VIII

**I. Practical Subjects**

| S.No | Category | Subject code | Subject | Contact Hours (L:T:P) | Credits (L:T:P) | Total Contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|---|
| 1 | | ME402 | Six-Month Industrial Training | | | | 20 |

**Total Credit Hours: 20**

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DIST.T. JALANDHAR (PUNJAB)

# List of Open Electives

## OPEN ELECTIVE –I

| S. No | Code | Course Title | Contact Hours (L:T:P) | Credits (L:T:P) | Total Contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|
| 1 | CSE371 | Basics of Database Design | 3:0:0 | 3:0:0 | 3 | 3 |
| 2 | CSE373 | Fuzzy Logic | 3:0:0 | 3:0:0 | 3 | 3 |
| 3 | ME371 | Total Quality Management | 3:0:0 | 3:0:0 | 3 | 3 |
| 4 | ME373 | Production Planning & Control | 3:0:0 | 3:0:0 | 3 | 3 |
| 5 | EE371 | Electrical Energy Conservation and Auditing | 3:0:0 | 3:0:0 | 3 | 3 |
| 6 | EE373 | Element of power System | 3:0:0 | 3:0:0 | 3 | 3 |
| 7 | ECE371 | Signal Systems | 3:0:0 | 3:0:0 | 3 | 3 |
| 8 | ECE373 | Micro Controller & Applications | 3:0:0 | 3:0:0 | 3 | 3 |
| 9 | CE371 | Renewable Energy Resources | 3:0:0 | 3:0:0 | 3 | 3 |
| 10 | CE373 | Architecture and Town Planning | 3:0:0 | 3:0:0 | 3 | 3 |

## OPEN ELECTIVE –II

| S. No | Code | Course Title | Contact Hours (L:T:P) | Credits (L:T:P) | Total Contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|
| 1 | CSE372 | Communication Networks | 3:0:0 | 3:0:0 | 3 | 3 |
| 2 | CSE374 | Computer Organization | 3:0:0 | 3:0:0 | 3 | 3 |
| 3 | ME372 | Industrial Engineering Management | 3:0:0 | 3:0:0 | 3 | 3 |
| 4 | ME374 | Management Information SYSTEM | 3:0:0 | 3:0:0 | 3 | 3 |
| 5 | EE372 | Industrial Electrical System | 3:0:0 | 3:0:0 | 3 | 3 |
| 6 | EE374 | Fundamentals of Electrical Machines | 3:0:0 | 3:0:0 | 3 | 3 |
| 7 | ECE372 | Analog & Digital Communications | 3:0:0 | 3:0:0 | 3 | 3 |
| 8 | ECE374 | Analog Circuits | 3:0:0 | 3:0:0 | 3 | 3 |
| 9 | CE372 | Construction of Metro System | 3:0:0 | 3:0:0 | 3 | 3 |
| 10 | CE374 | Traffic Engineering | 3:0:0 | 3:0:0 | 3 | 3 |

## OPEN ELECTIVE III

| S. No | Code | Course Title | Contact Hours (L:T:P) | Credits (L:T:P) | Total Contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|
| 1 | CSE471 | Concepts of Operating System | 3:0:0 | 3:0:0 | 3 | 3 |
| 2 | CSE473 | Data Warehouse & Data Mining | 3:0:0 | 3:0:0 | 3 | 3 |
| 3 | ME471 | Material Management | 3:0:0 | 3:0:0 | 3 | 3 |
| 4 | ME473 | Maintenance and reliability engineering | 3:0:0 | 3:0:0 | 3 | 3 |
| 5 | EE471 | Wind and Solar Energy System | 3:0:0 | 3:0:0 | 3 | 3 |
| 6 | EE473 | Instrumentation Engineering | 3:0:0 | 3:0:0 | 3 | 3 |
| 7 | ECE471 | Biomedical Electronics | 3:0:0 | 3:0:0 | 3 | 3 |
| 8 | ECE473 | Principles of VLSI Design | 3:0:0 | 3:0:0 | 3 | 3 |
| 9 | CE471 | Rural Technology and Community | 3:0:0 | 3:0:0 | 3 | 3 |
| 10 | CE473 | Waste Water Engineering | 3:0:0 | 3:0:0 | 3 | 3 |

## OPEN ELECTIVE IV

| S. No | Code | Course Title | Contact Hours (L:T:P) | Credits (L:T:P) | Total Contact Hours | Total Credit Hours |
|---|---|---|---|---|---|---|
| 1 | CSE472 | Image Analysis | 3:0:0 | 3:0:0 | 3 | 3 |
| 2 | CSE474 | Concepts of Cloud Computing | 3:0:0 | 3:0:0 | 3 | 3 |
| 3 | ME472 | Operation Management | 3:0:0 | 3:0:0 | 3 | 3 |
| 4 | ME474 | Industrial Safety | 3:0:0 | 3:0:0 | 3 | 3 |
| 5 | EE472 | Electrical Materials | 3:0:0 | 3:0:0 | 3 | 3 |
| 6 | EE474 | Electrical & Hybrid Vehicles | 3:0:0 | 3:0:0 | 3 | 3 |
| 7 | ECE472 | Embedded System | 3:0:0 | 3:0:0 | 3 | 3 |
| 8 | ECE474 | Advanced Optical Comm. System | 3:0:0 | 3:0:0 | 3 | 3 |
| 9 | CE472 | Tall Building | 3:0:0 | 3:0:0 | 3 | 3 |
| 10 | CE474 | Remote Sensing and Geographical Information System | 3:0:0 | 3:0:0 | 3 | 3 |

## COURSE SCHEME SUMMARY

| Sem | L | T | P | Contact hrs/wk | Credits | HS | BS | ES | PC | PE | OE | Project (prj)/ Training (trg) /Semi | MC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 12 | 1 | 16 | 29 | 20 | - | 9 | 11 | - | -- | - | - | - |
| **2** | 12 | 1 | 14 | 27 | 19 | 3 | 9 | 7 | - | -- | -- | - | - |
| **3** | 13 | 4 | 14 | 31 | 23 | 0 | 5 | - | 18 | 0 | 0 | 0 | 0 |
| **4** | 18 | 3 | 8 | 29 | 21 | 0 | 0 | 4 | 17 | 0 | 0 | 0 | 3 unit /NC |
| **5** | 18 | 3 | 2 | 23 | 22 | 3 | 0 | 0 | 13 | 3 | 0 | 3 (Training) | 3 unit /NC |
| **6** | 18 | 2 | 6 | 26 | 23 | 0 | 0 | 0 | 14 | 3 | 6 | - | 0 |
| **7** | 18 | 3 | 10 | 31 | 29 | 0 | 0 | 0 | 10 | 7 | 6 | 3 (Training) 3 (Project) | 0 |
| **8** | | | | | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 0 |
| **Total** | **109** | **17** | **70** | **196** | **177** | **6** | **23** | **22** | **72** | **13** | **12** | **29** | **0** |

| **Course Code** | **PHY105** |
|---|---|
| Course Title | Applied Physics |
| Type of course | Theory |
| L T P | 3 0 0 |
| Credits | 3 |
| Course prerequisite | NA |
| Course Objective (CO) | To educate students to become professionals with in-depth knowledge and skills in engineering to understand physical systems; to research, design, and solve problems; and to provide the foundation for graduate study and lifelong learning. |
| **Course Outcomes (CO)** | $CO_1$ To develop the understanding of laws of thermodynamics and their application in various processes.<br>$CO_2$ To formulate and solve the **engineering** problems on Electromagnetism.<br>$CO_3$ To aware of limits of classical **physics** & to apply the ideas in solving the problems in their parent streams. |

**SYLLABUS**

**UNIT-I. Electromagnetics:** Physical significance of Gradient, Divergence & Curl, Differential approach to Gauss Law, Ampere's law and Faraday's law, Stoke'stheorm, Gauss divergence theorem, Equation of continuity, Maxwell's Equations, Dielectric polarization, displacement Current.

**Physics of Materials:** Basic ideas of Dia, Para, Ferro &Ferri, Ferrites,Domaintheory,Magnetic Anisotropy, Magnetostriction, B-H curve, Hard and Soft magnetic materials, Superconductivity, Superconductors as ideal diamagnetic materials, Meissner Effect,Type I & Type II superconductors, London Equations, Introduction to BCS theory.

**UNIT-II. Special Theory of Relativity:** Concept of Ether, Michelson Morley experiment, Einstien's postulates, Lorentz transformation equations, lengh, time and simultaneity in relativity, Addition of velocity, Variation of mass with velocity,Energy momentum relations.

**UNIT-III Lasers:** Introduction, Spontaneous & Stimulated emissions, Einstein's Coefficients, Population Inversion, Pumping Mechanisms, Components of a laser System, Lasing action, properties of laser,Ruby, He-Ne, $CO_2$ and semiconductor Lasers, Characteristics of different types of lasers, Applications of lasers, Holography.
**Fibre Optics:** Introduction, Acceptance Angle, Numerical Aperture, Normalized Frequency, Modes of propagation, Losses in Optical Fibre, Applications of Optical Fibres.

**UNIT-IV. Physics of crystallography:** Unit cell, Basis, Space lattice, Crystal Systems, Miller Indices of Planes & Directions in cubic system, Continuous & Characteristic X-Rays, X-Ray Diffraction & Bragg's law in Crystals,
**Nanophysics:** Nanoscale, Nanoparticles(1D 2D 3D), Nanomaterials and their properties,

Synthesis Methods- Ball milling and sol- gel techniques, Carbon nanotubes (Synthesis and properties), Applications of nanomaterials.

**Recommended books:-**

| S. No | Name | Author(S) | Publisher |
|---|---|---|---|
| 1 | Physics for Scientists & Engineers (Vol. I &II), | Serway& Jewett, 6thEdition | Cengage Learning. |
| 2 | Engineering Physics, | Malik; HK, Singh; AK, | Tata McGraw Hill |
| 3 | Materials Science &Engg., | Raghvan V. | Prentice Hall of India |
| 4 | Concepts of Modern Physics | Beiser; A., Mahajan; S., Choudhary; SR | Tata McGraw Hill |
| 5 | Solid State Physics | Dan Wei, | Cengage Learning |
| 6 | Introduction to Solids | Azaroff LV | Tata Mc Graw Hill |
| 7 | Introduction to Electrodynamics | Griffiths; DJ, | Prentice Hall |
| 8 | Lasers & Optical engineering | Dass; P, | Narosa Publishers |
| 9 | Optical Fibre system, Technology, Design & Applications | Kao; CK | McGraw Hill. |

SANT BABA BHAG SINGH UNIVERSITY KHIALA, DISTT. JALANDHAR (PUNJAB)

| Course Code | MAT103 |
|---|---|
| Course Title | Engineering Mathematics-I |
| Type of course | Applied Mathematics for B.Tech-1st Sem. |
| L T P | 4:1: 0 |
| Credits | 5 |
| Course prerequisite | +2 with non- medical |
| Course Objective (CO) | Mathematics is really a great tool to understand the things correctly. The aim of the course is to enable students : (1) To understand the theory knowledge as well as practical knowledge of different formulas.(2) To inculcate the skills to use different methods to solve the applied problems. (3) To check the accuracy of every formula by using different strategies. (4) To give them a sound foundation that eventually will help them in their coming technical futures. |
| Course Outcome (CO) | $CO_1$ Inculcate an ability to identify engineering problems"<br><br>$CO_2$Inculcate an ability to formulate engineering problems<br><br>$CO_3$Inculcate an ability to solveengineering problems |

## SYLLABUS

**UNIT-I**

**Matrices:**Algebra of matrices, Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, Orthogonal transformation and quadratic to canonical forms.

**UNIT-II**

**Multivariable Calculus ( Differentiation) :** Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient,curl and divergence.

**UNIT-III**

**Vector spaces**Vector Space,linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank- nullity theorem, composition of linear maps, Matrix associated with a linear map.

**UNIT-IV**

**Calculus:**Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima. Evaluation of definite and improper integrals; Beta and Gamma functions and their properties ;Applications of definite integrals to evaluate surface areas and volumes of revolutions.

**Recommended books:-**

| S. No | Name | Author(S) | Publisher |
|---|---|---|---|
| 1 | Higher Engineering Mathematics | Dr. B.S. Grewal | Khanna Publishers |
| 2 | Fourier Series and Boundary Values Problems | Churchill | McGraw Hill. |
| 3 | Complex Variables & Applications | Churchill | McGraw Hill. |
| 4 | Engineering Mathematics | Bali &lyingar | Laxmi Publication. |
| 5 | Advanced Engineering Mathematics | Wylie and Barren | Mcgrawhill,6thedition,1995 |
| 6 | Advanced Engineering Mathematics | Kreyszig, John Wiley | |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| Course Code | MAT104 |
|---|---|
| Course Title | EngineeringMathematics -II |
| Type of course | Theory (Applied Mathematics for B.Tech-2nd Sem.) |
| L T P | 4 1 0 |
| Credits | 5 |
| Course prerequisite | |
| Course Objective (CO) | Mathematics is really a great tool to understand the things correctly. The aim of the course is to enable students : (1) To understand the theory knowledge as well as practical knowledge of different formulas.(2) To inculcate the skills to use different methods to solve the applied problems. (3) To check the accuracy of every formula by using different strategies. (4) To give them a sound foundation that eventually will help them in their coming technical futures. |
| Course Outcome (CO) | $CO_1$ Enable students to use effective mathematical tools for the solutions of differential equations that model physical processes<br>$CO_2$Enable students to derive mathematical models of physical systems.<br>$CO_3$Enable students to use tools of differentiation and integration of functions of complex variable that are used in various techniques dealing engineering problems |

## SYLLABUS

**UNIT I**

**Multivariable Calculus (Integration):**Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities);Triple integrals (Cartesian), orthogonal. curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

**UNIT II**

**First order ordinary differential equations:** Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type. **Second order linear differential equations** with variable coefficients, method of variation of parameters, Cauchy-Euler equation

**UNIT III**

**Complex Variable – Differentiation:** Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties).

**UNIT IV**

**Complex Variable – Integration:**Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof).

**RECOMMENDED BOOKS**

| S. No | Name | Author(S) | Publisher |
|---|---|---|---|
| 1 | Higher Engineering Mathematics | Grewal, B.S. | Khanna Publishers, Delhi |
| 2 | Advanced Engineering Mathematics | Jain, R.K and Iyengar, S.R.K. | Narosa Publishing Company |
| 3 | Statistical Methods | S P Gupta | Sultan Chand & sons Publisher |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **EE101** |
| **Course Title** | **Basics Of Electrical Engineering** |
| **Type Of Course** | ES |
| **L T P** | 2 0 0 |
| **Credits** | 2 |
| **Course Prerequisites** | Physics & Mathematics |
| **Course objectives** | To familiarize with AC, DC circuits & their fundamentals, Magnetic circuits & Transformer, Electrical Machines and Measuring Instruments |

## SYLLABUS

**UNIT-I**

**DC Circuits**

Circuits : Identifying the Elements and the Connected Terminology, Ohm's Law- Statement , Illustration and limitation, Kirchhoff's Laws –Statement and Illustration ,Method of solving a Circuits by Kirchhoff's Laws, Computation of Resistance at Constant temperature, Temperature Dependence of resistance, Computation of Resistance at different temperatures, Units – Work, Power and Energy (Electrical, Thermal and Mechanical).

**UNIT-II**

**AC Fundamentals**

Generation of Alternating Emf, Concept of 3-phase EMF Generation, Root Mean Square or Effective Value, Average value of AC, Phasor Representation of Alternating quantities, Representation of Alternating Quantities in Rectangular and Polar forms, Introduction of Resistors, Inductors and Capacitors, R-L Series Circuits, R-C Series Circuits, R-L-C Series Circuits, Admittance and its components, Resonance in Series and Parallel, Analysis of simple 3 phase system, star-delta connections and conversion.

**UNIT-III**

**Magnetic Circuits**

Comparison between Magnetic and Electric circuits, Electromagnetic Induction, Magnetic Effects of Electric Current, Current carrying conductor in Magnetic field, Law of Electromagnetic Induction, Self Inductance, Mutual Inductance ,Coupling Coefficient between two magnetically coupled Circuits.

**UNIT-IV**

**Electrical Machines** Transformer: principle, construction, working, efficiency& applications. D.C. Generator: principle, construction, working & applications. D.C. Motor: principle, construction, working & applications. Three Phase Induction Motor: principle, construction, working & applications.

**Measuring Instruments**

Classification of Instruments, Basic Principles of indicating instruments, Moving Iron Instruments – Attraction and Repulsion Type, Moving Coil Instruments – Permanent Magnet - Dynamometer Type, Multimeters.

**Recommended Books**

| Sr.No. | Name | Author | Publisher |
|---|---|---|---|
| 1 | Basic Electrical, Electronics and Computer Engg. | R muthusubramanian,S Salivahanan,K A Muraleedharan | Tata McgrawHill |
| 2 | A Textbook of Electrical Tech | B.L Theraja.& A.K Theraja | S Chand |
| 3 | Fundamentals of Electrical Engg | Vincent Deltoro | Prentice Hall. |

| | |
|---|---|
| **Course Code** | **CSE101** |
| **Course Title** | Fundamentals of Computer Technology |
| **Type of Course** | ES |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Basics of computer and any high level language |
| **Course Objectives (CO)** | To familiarize the students of all branches in engineering with computer organization, operating systems, problem solving and programming in C++. |

**SYLLABUS**

**UNIT-I**

**Introduction to Computers:** Define a Computer System, Block diagram of a Computer System and its working, associated peripherals, memories, RAM, ROM, secondary storage devices, Computer Software and Hardware.

**Working Knowledge of Computer System and Office automation:** Introduction to the operating system, its functions and types, working knowledge of GUI based operating system, introduction to word processors and its features, creating, editing, printing and saving documents, spell check, mail merge, creating power point presentations, creating spreadsheets and simple graphs

**Problem Solving & Program Planning:** Need for problem solving and planning a program; program design tools – algorithms, flow charts, and pseudo code; illustrative examples.

**UNIT-II**

**Overview of C++ Language:** Introduction to C++ language, structure of a C++ program, concepts of compiling and linking, IDE and its features; Basic terminology - Character set, tokens, identifiers, keywords, fundamental data types, literal and symbolic constants, declaring variables, initializing variables, type modifiers.

**Operators and expressions:** Operators in C++, precedence and associativity of operators, expressions and their evaluation, type conversions.

**Beginning with C++ program:** Input/output using extraction (>>) and insertion (<<) operators, writing simple C++ programs, comments in C**++,** stages of program execution.

**UNIT-III**

**Control Structures and Functions:** Decision making statements: if, nested if, if – else. Else if ladder, switch, Loops and iteration: while loop, for loop, do – while loop, nesting of loops, break statement, continue statement, goto statement, Advantages of using functions, structure of a function, declaring and defining functions, return statement, formal and actual arguments, const argument, default arguments,

**Arrays and Strings:** Declaration of arrays, initialization of array, accessing elements of array, I/O of arrays, passing arrays as arguments to a function, multidimensional arrays. String as array of characters, initializing string variables, I / O of strings, string manipulation functions (strlen, strcat, strcpy, strcmp), passing strings to a function. Use of arrays and strings through illustrative programming examples**.**

**Classes and Objects:** Concept of classes, Declaration of classes, Defining access specifier, Public, Private, Protected derivations, defining member functions in a class, use of scope resolution operator outside the class definition. Defining objects. Friend function.

**UNIT-IV**

**CAD/CAM:** Introduction to the basics of CAD and CAM, Study 2-D sketching entities like lines, rectangle, parallelogram polygon, circle etc., under SKETCH ENTITY MENU.Evolution of Internet and its applications and service

**RECOMMENDED BOOKS**

| Sr. no. | Name | Author(s) | Publisher |
|---|---|---|---|
| 1. | Object-Oriented Programming with C++ | E. Balagurusamy | Tata McGraw Hill |
| 2. | Object-Oriented Programming with C++ | Lafore R | Waite Group |
| 3. | The C++ Programming Language | Bjarne Stroustrup | Addison Wesley |
| 4. | Fundamentals of Computers | R. S. Salaria | Salaria Publishing House |

SANT BABA BHAG SINGH UNIVERSITY
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| Course Code | **PHY107** |
| Course Title | Engg. Physics laboratory |
| Type of course | BS |
| L T P | 0 0 2 |
| Credits | 1 |
| Course prerequisite | |

## SYLLABUS

1. To study the magnetic field of a circular coil carrying current.
2. To find out polarizability of a dielectric substance.
3. To study the laser beam characteristics like; divergence using diffraction grating aperture.
4. To study laser interference using Michelson‟s Interferometer.
5. Study of diffraction using laser beam and thus to determine the grating element.
6. To determine numerical aperture of an optical fibre.
7. To determine attenuation & propagation losses in optical fibres.
8. To find out the frequency of AC mains using electric-vibrator.
9. To find the refractive index of a material using spectrometer.
10. To find the refractive index of a liquid.
11. To study B-H curve using CRO.

SANT BABA BHAG SINGH UNIVERSITY SBBSU KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| Course Code | **EE103** |
| Course Title | **Basics Of Electrical Engineering Lab** |
| Type of course | ES |
| L T P | 0 0 2 |
| Credits | 1 |
| Course prerequisite | Basics Of Electrical Engineering |

1. To find voltage, current relationship and power factor of a given R-L circuit
2. To perform open- circuit and short circuit test on a transformer and determine the following:
   a)The transformation ratio (b) the transformer efficiency.
3. To find out the line voltage, phase voltage relationship, line current and phase current relationship in case of star and delta connected 3- phase balanced load.
4. To connect 3 identical single phase transformers for three phase power transformations through following connections (a) star-delta (b) star-star(c) delta-star (d) delta-delta and to find phase and line voltage ratio.
5. To connect, start and reverse the direction of rotation of a 3- phase induction motor.
6. To perform the Block Rotor test of 3-phase induction motor test.
7. To study various measuring instruments(Moving Iron Instruments – Attraction Type, Moving Iron Instruments – Repulsion Type, Moving Coil Instruments – Permanent Magnet Type, Moving Coil Instruments – Dynamometer Type).
8. To study the speed control of characteristic of D.C. Motor.
9. To verify the rating of compact fluorescent lamp (CFL).
10. To verify Ohm's Law and its limitations
11. To verify Kirchhoff's Laws.
12. To measure the resistance and inductance of a coil by ammeter-voltmeter method.
13. To measure power and power factor in a single- phase AC circuit
14. To verify series and parallel resonance in AC circuits.

| | |
|---|---|
| **Course Code** | **CSE103** |
| **Course Title** | **Fundamental of Computer Technology Lab** |
| **Type of Course** | ES |
| **L T P** | 0 0 4 |
| **Credits** | 2 |
| **Course Prerequisites** | Basics of computer and knowledge of any high level language |
| **Course Objectives (CO)** | To familiarize the students of all branches in engineering with computer organization, operating systems, problem solving and programming in C++. |

**SYLLABUS**

**Familiarization with the Computer System:**

1) To explain the part of the computer system such as system unit, input devices, output devices connected to the computer.
2) To explore the outside view of the system unit that includes the panels on front and ports at the rear
3) To explore the inside view of the system unit that includes the motherboard, processor, expansion slots, various add-on cards, storage devices, power supply, fans.
4) To understand the booting process that includes switching on the system, execution of POST routine, then bootstrap loader, and loading of the operating system, and getting it ready for use.
5) To introduce the graphical user interface (desktop) of Windows operating System to explain the various elements of the desktop such as taskbar, icons (My Computer, Recycle Bin, etc.), short cuts, notification area.
6) To configure the desktop that includes selecting the wallpaper, selecting the screen saver with or without password protection, selecting the screen resolution and color quality.

**Explore Office automation**

1) Creating, Formatting documents with Word, explore the various toolbar options, Mail Merge, Spell Check, Word –Art.
2) Creating PowerPoint presentations with Power Point, Explore various views of PPT, Charts, Graphs, animation, multimedia.
3) Creating Sheets in Excel using formulas, chart and graphs.

**Programming using C++**

1) Implement programs using various operators in C++
2) Implement various Branch statements: if, if-else, nested if, switch
3) Implement various loop statements: for, while, do-while
4) Implement other control statements: go-to, exit function, continue
5) Implement various programs using arrays and string
6) Implement various programs classes and objects

**Computer Aided Tools and Internet**

1) Exercise with CAD/CAM

2) Internet surfing and E-mail

| RECOMMENDED BOOKS | | | |
|---|---|---|---|
| **Sr. no.** | **Name** | **AUTHOR(S)** | **PUBLISHER** |
| 1. | Object-Oriented Programming with C++ | E. Balagurusamy | Tata McGraw Hill |
| 2. | Object-Oriented Programming with C++ | Lafore R | Waite Group |
| 3. | The C++ Programming Language | Bjarne Stroustrup | Addison Wesley. |
| 4. | Fundamentals of Computers | R. S. Salaria | Salaria Publishing House |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME107** |
| **Course Title** | **Engineering Workshop** |
| **Programme** | ES |
| **L T P** | 0 0 6 |
| **Credits** | 3 |
| **Course Prerequisites** | +2 Physics and Mathematics |
| **Course Objectives (CO)** | To become aware of different manufacturing process in industry. |

## SYLLABUS

1. Carpentry and Pattern making: Various types of timber and practice boards, defects in timber, seasoning of wood, tools, wood operations and joints, exercises involving use of important carpentry tools to practice various operations and making joint.
2. Foundry Shop: Introduction to moulding material, mould, melting furnaces, foundry tools and equipment's used in foundry shops; firing of a cupola furnace, exercises involving preparation of small sand moulding and casting.
3. Forging practice: introduction to forging tools; equipment's and operations forge ability of metals; exercises on simple smithy; forging exercises.
4. Machine shop: Machines ; introduction to lathe and shaper machine and its operation performed on it.
5. Welding shop: introduction to different welding methods; welding equipment's; electrodes; welding joints; welding defects; exercises involving use of gas/electric arc welding.
6. Electrical and electronics shop: introduction to electrical wiring; preparation of PCBs involving soldering applied to electrical and electronic applications; exercises preparation of PCBs involving soldering applied to electrical and electronic applications.
7. Sheet metal shop: shop development of surfaces of various objects; sheet metal forming and joining operation, joints, soldering and brazing; exercises involving use of sheet metal forming operations for small joints.
8. Fitting shop: introduction of fitting practice and tool used in fitting shop; exercise involving marking cutting fitting practice (right angles) male female mating parts practice.

**REFERNCES**


| S. No | Name | Author(S) | Publisher |
|---|---|---|---|
| 1. | Workshop Technology | HS Bawa | McGraw-Hill Publishing Company Limited |
| 2. | Workshop Technology I,II,III | S K Hajra, Choudhary and A K Choudhary | Media Promoters and Pu blishers Pvt. Ltd., Bombay |
| 3. | Manual on Workshop Practice | K Venkata Reddy | MacMillan India Ltd. New Delhi |
| 4. | Basic Workshop Practice Manual | T Jeyapoovan | VikasPublishing House (P) Ltd., New Delhi |


SANT BABA BHAG SINGH UNIVERSITY SBBSU KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **CHM105** |
| **Course Title** | Engineering Chemistry |
| **Type of course** | BS |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course prerequisite** | NA |
| **Course Objective (CO)** | The objectives of the engineering chemistry are to relate the students with basic concepts of chemistry. Some new topics have been introduced to the syllabus for the development of the right attitudes by the engineering students to cope with new technology |
| **Course Outcomes (CO)** | $CO_1$ Students Acquired knowledge of the basic chemistry, to understand and explain scientifically the various chemistry related problems in engineering field.<br><br>$CO_2$Inculcate an ability to identify & Solve all problemsbased on different chemical reactions<br><br>$CO_3$ Enable to understand new developments in chemistry. |

**Syllabus**

**UNIT-I**

**Water and its Treatment:** Boiler feed water: Specification, Scales and sludge formation; Priming & foaming; Different methods of the water purifications and softening; Water for domestic use; Specifications; Disinfection of water.

**Corrosion and its Prevention**: Introduction; Different types of corrosion ;Wet and Dry corrosion; Mechanisms of wet & Dry corrosion;Concentration cell corrosion and differential aeration corrosion; Soil and microbial corrosions; waterline, stress corrosions; Prevention measure against corrosion.

**UNIT-II**

**Spectroscopy and its Applications**: An introduction 1). UV/Visible Spectroscopy: Selection rules; Line widths and intensities Chromophores &auxochromes; Principle and instrumentation; Electronic Transitions lines; Franck Condon principle; Applications of UV/Visible spectroscopy.

2).I.R. spectroscopy: Fundamental modes of vibrations and types; Factors affecting vibration frequency; Applications of I.R. spectroscopy.

3). NMR Spectroscopy: Principle & instrumentation; Chemical shift; Spin-Spin Splitting; applications of N.M.R. spectroscopy.

**Photochemistry**: Introduction; Photophysical& photochemical processes; Light sources in photochemistry; Beer Lambert Law; Laws of Photochemistry; Quantum yield (primary and overall); Primary and secondary photochemical reactions; Jablonski diagram; Semiconductor photochemistry, Photovoltaic cells Introduction to optical sensors.

**UNIT-III**

**Green Chemistry and its Applications**: Introductory overview Definition and concepts of Green chemistry; Twelve principles of Green Chemistry with emphasis on the use of alternative feedstock (biofuels); Design of the safer chemicals; Microwave and ultrasonic radiation in Green synthesis minimizing energy consumption.

**Polymers and Reinforced Composites**: Introduction; Functionality; Types of polymerization; Specific features of polymers; Tactility of polymers; Average molecular weights and size; polymers; Introduction: polymer reinforced composite; Effect of molecular weight on the properties of polymers; Biodegradable polymers.

**UNIT-IV**

**Nanochemistry**: Introduction; Materials self-assembly; Molecular vs. materials self assembly; Self-assembling materials; Two dimensional assemblies; Mesoscale self assembly; Coercing colloids; Nanocrystals; Super molecular structures Nanoscale materials; Future perspectives.

**Petrochemicals**: Introduction; First, second & third generation petrochemicals; Primary Raw Materials for Petrochemicals, Natural gas: Natural gas treatment processes; Natural gas liquids; Properties of natural gas; Crude oil: Composition of crude oil-Hydrocarbon compounds; Non-hydrocarbon compounds; Metallic Compounds, Crude oil classification Physical separation processes; Conversion processes; Renewable and non renewable source of energy.

**Recommended books:-**

| S. No | Name | Author(S) | Publisher |
|---|---|---|---|
| 1. | Engineering chemistry | J.C. Curiacose and J.Raja Ram | Tata Mcgraw-Hill Co. New Delhi. |
| 2. | Chemical applications of infrared spectroscopy | CNR. Rao. | Academic Pres, New York. |
| 3. | Ultra violet and visible spectroscopy chemical applications | CNR, Rao | Plenum press |

| | |
|---|---|
| Course Code | ENG121 |
| Course Title | Communication Skills-I |
| Type of Course | HS |
| L T P | 2 0 0 |
| Credits | 2 |
| Course pre-requisite | NA |
| Course Objectives | The objective of this course is to :<br>1.Assist the students to acquire proficiency, both in spoken and written language<br>2. to develop comprehension, improve writing skills, and enhance skills in spoken English. |

**UNIT-I**

**Basics of Communication Skills:**

Communication, Process of Communication, Types of Communication-Verbal and Non verbal communication, Channels of Communication- Upward, Downward, Horizontal, Barriers to Communication, Role of Communication in society.

**UNIT-II**

**Listening Skills:**

Listening Process, Hearing and Listening, Types of Listening, Effective Listening, Barriers of Effective Listening, Note Taking

**Reading Skills:**

Purpose of reading, Process of reading, reading skills Models and strategies, scanning, skimming, SQ3R, Approaches of Reading, Comprehension passages for practice.

**UNIT-III**

**Writing Skills:**

Purpose of writing, Effective writing, Types of writing, Business Correspondence, Precise writing, Memo writing, minutes of meeting.

**UNIT-IV**

**Speaking Skills:**Speech process, Skills of effective speaking, Role of audience, Feedback Skill, Oral Presentation.

**Recommended books:**

| Sr No | Title | Author(s) | Publisher |
|---|---|---|---|
| 1. | Effectual Communication Skills | Bhupender Kour | S.K. Kataria and Sons |
| 2. | Communications Skills | R. Datta Roy and K.K. Dheer | Vishal Publishing Company |
| 3 | Ludlow and Panthon | The Essence of Effective Communication | Prentice Hall of India |
| 4 | Pal and Rorualling | Essentials of Business Comunication | S. Chand and Sons. New Delhi |

SANT BABA BHAG SINGH UNIVERSITY
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ECE101** |
| **Course Title** | **Basic Electronics & Communication Engineering** |
| **Type of Course** | ES |
| **L T P** | 2 0 0 |
| **Credits** | 2 |
| **Course Prerequisite** | Knowledge of Physics |
| **Course Objectives (CO)** | To introduce basic postulates of Electronics, Boolean algebra and basic gates, and Boolean expressions, To outline the formal procedures for the analysis and design of electronics and digital circuits. Introduction to basic fundamentals of communication engineering. |

**SYLLABUS**

**UNIT-I**

Semiconductor Diodes& Applications: Introduction, Semiconductor materials, Extrinsic materials: n type and p type, Semiconductor diodes, Biasing of diodes, Breakdown mechanisms, Ideal diode,Transition and diffusion capacitance, Reverse recovery time, Diode testing, Zener diode, Light emitting diodes (LEDs).Load line analysis, Half wave rectifications, full wave rectification, Clippers, Clampers, Zener diode as a voltage regulator, Voltage multiplier.

**UNIT-II**

Digital Electronics Fundamentals: Digital and Analog Quantities, Binary digits, Logic levels, Basic logic operations, Overview of basic logic functions, Number system: Decimal numbers, Binary numbers & its arithmetic operations, octal & Hexadecimal numbers, number system conversions, Logic gates: The inverter, The AND gate, The OR gate, The NAND gate, The NOR gate, The Exclusive OR and Exclusive NOR gates.

**UNIT-III**

Basic Signals & Systems: Introduction, Signals and classification of signals, Basic continuous time signals, Basic discrete time signals, System and classification of systems, Transducers.

**RECOMMENDED BOOKS**

| S. No | Name | Author(S) | Publisher |
|---|---|---|---|
| 1 | Electronics Devices & Circuits | Robert Boylested and Louise Nashelsky | Prentice Hall of India |
| 2 | Fundamental of Analog Circuits | Thomos L. Floyd and David buchla | Prentice Hall |
| 3 | Electronic Devices and Circuits | J.B Gupta | S K Kataria& Sons |
| 4 | Wireless Communications | T. L. Singal | Tata McGraw-Hill |

| | |
|---|---|
| **Course Code** | ME103 |
| **Course Title** | Engineering Drawing |
| **Type of Course** | ES |
| **L T P** | 1 0 6 |
| **Credits** | 4 |
| **Course Prerequisites** | Basic Mathematics |
| **Course Objectives (CO)** | Main objective of the Engineering Drawing is to introduce the students to visual science in the form of technical graphics. General instructions related to Theory of Orthographic Projection of points, lines, planes and solids as per the BIS codes prevalent to drawing practice will be introduced initially. Section of solids, intersection and development of surfaces, isometric projection and orthographic projection of simple solids/blocks will further upgrade the basic understanding and visualization of geometrical objects and to certain extent the machine parts. |

## SYLLABUS

**UNIT-I**

**Introduction:** Introduction to drawing equipment and use of instruments. Symbols and conventions in drawing Practice. Types of lines and their use, BIS codes for lines, Technical lettering as per BIS codes, Introduction to Dimensioning. Basic Definition of geometrical objects: Points, lines, planes and solids.
**Scales**: Representative Fraction, Types of Scale, Plain and Diagonal Scale, Scale of chords

**Projection**: Introduction, Principle of Projection, Method of projection, Planes of projection, Four quadrant, First and Third angle projection, Reference line, symbols for methods of projection, Orthographic projection

**UNIT-II**

**Projection of Point**: Introduction, Projection of Point situated in first, second, third & fourth quadrant.

**Projection of lines**: Introduction , Line parallel to One or both the planes, Line contained by one or both the planes, Line perpendicular to one of the planes, Line inclined to one plane and parallel to other . Line inclined to both the planes, True length.

**Projection of Planes**: Introduction, Types of planes, Difference between plane and lamina, Projection of planes, Projection of planes perpendicular to both the reference planes, Perpendicular to one plane and parallel to other plane, Perpendicular to one plane and inclined to the other plane, Inclined to both planes.

**UNIT-III**

**Projection of solids**: Introduction, Type of solid, Projection of solids in first or third quadrant, with axis parallel to one and perpendicular to other, axis parallel to one inclined to other, axis inclined to both the principle plane, axis perpendicular to profile plane and parallel to both H P and V P. Visible and invisible details in the projection. Use rotation and auxiliary plane method to draw the projections.

**Section of Solids:** Definition of Sectioning and its purpose. Procedure of Sectioning, Types of sectional planes. Illustration through examples.

**Development of Surfaces**: Purpose of development, Parallel line, radial line and triangulation method. Development of prism, cylinder, cone and pyramid surface for both right angled and oblique solids, and development of surface of sphere.

**UNIT-IV**

**Isometric Projection:** Classification of pictorial views, Basic Principle of Isometric projection, Difference between isometric projection and isometric drawing. Isometric projection of solids such as cube, prism, pyramid and cylinder, and assignments on isometric projection of simple machine parts.

**Orthographic Projection**: Review of principle of Orthographic Projection, Sketch/drawing of blocks, and of simple machine parts.

**Intersection of Surfaces/Solids:** Purpose of intersection of surfaces, Intersection between the two cylinder, two prisms, prism and pyramid, pyramid and pyramid, cylinder and prism, cone and cylinder, sphere and cylinder etc., use of cutting plane and line method.

**Recommended Books**

| S.No. | Name | Author(s) | Publisher |
|---|---|---|---|
| 1. | Engineering Graphics | Narayana K L and Kanaiah P | Tata McGraw Hill Publishing Company Limited, New Delhi |
| 2. | Engineering Graphics and Drafting | P S Gill | Katria and Sons, Delhi. |
| 3. | Elementary Engineering Drawing-Plane and solid Geometry | ND Bhat | Chartotar Publishing House, Anand |
| 4. | A Text Book of Engg Drawing | R. K. Dhawan | S. Chand and Co. Ltd |
| 5. | Engineering Graphics | K.L. Narayana and P.Kannaiah | Scitech Publications (India) |

| | |
|---|---|
| Course Code | CHM107 |
| Course Title | Applied Chemistry Laboratory |
| Type of course | BS |
| L T P | 0 0 2 |
| Credits | 1 |

**SYLLABUS**

**1Analysis of Effluents**

- Determination of hardness of water by EDTA method.
- Determination of C.O.D and B.O.D in water.
- Determination of Residual Chlorine.

**2. Analysis of Fuels and Lubricants**

- Determination of Moisture, Volatile and ash content by proximate analysis.
- Determination of acid value of oil
- Determination of the viscosity.

**3. Instrumental Analysis**

- Determination of surface –tension of given liquid
- Determination of the concentration of a solution conductometerically.
- Determination of the strength of a solution pH meterically.

**4.Chromatography**

- Determination of Rf value of amino acid by TLC and identification of the amino acid present.
- Separation of metallic ions by paper chromatography.
- Separation of Ions by using complexing agents

.

**5. Synthesis & Green Chemistry experiments**

- Preparation of a polymer phenol/urea formaldehyde resin or
- Preparation of aspirin.
- Base catalyzed aldol condensation by Green Methodology
- Acetylation of primary amines using ecofriendly method.

**Recommended books:-**

| S. No | Name | Author(S) | Publisher |
|---|---|---|---|
| 1. | Engineering chemistry | J.C. Curiacose and J.Raja Ram, | Tata Mcgraw-Hill Co.New Delhi. |
| 2. | Chemical applications of infrared spectroscopy | CNR.Rao. | Acad.Pres, New York. |
| 3. | Ultra violet and visible spectroscopy chemical applications | CNR,Rao | plenum press |
| 4. | Inorganic quantitative analysis | A.I. Vogal | |

| | |
|---|---|
| **Course Code** | ECE103 |
| **Course Title** | Basic Electronics & Communication Engineering Lab |
| **Type of Course** | ES |
| **L T P** | 0 0 2 |
| **Credits** | 1 |
| **Course Prerequisites** | Basic knowledge of Electronics components |

**SYLLABUS**

**List of Experiments**

1. Identification of Basic components of Electronics.
2. Introduction to Multimeter.
3. Introduction to working of CRO & Function Generator.
4. Component Testing: Resistance, Capacitor and Inductance.
5. Component Testing: Diode, BJTs.
6. LED testing.
7. Calculate and verify the Resistance and capacitance in series and parallel combination.
8. Verification of Basic Logic gates (AND, OR, NOT).
9. Verification of Universal Logic gates (NAND, NOR).
10. Basics practice on soldering and general purpose PCB component installation.

SANT BABA BHAG SINGH UNIVERSITY
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| Course Code | ENG123 |
| Course Title | Communication Skills-1 (Practical) |
| Type of Course | HS |
| L T P | 0 0 2 |
| Credits | 1 |
| Course pre-requisite | NA |
| Course Objectives | The objective of this course is to provide the students sufficient practice for speaking and writing English efficiently. |

**SYLLABUS**

**UNIT-I**

**Speaking and Discussion Skills:**

Oral Presentation, Planning and organizing content for presentation, Use of audio /Visual Aids, Making Slides for presentation , Group Discussion ,Debate, Extempore speaking, Interview Skills, Mock interview, Mock Dialogues (Pair Speaking),Cue Card Speaking, Meeting/ Conferences.

**UNIT-II**

**Listening Skills:**

Listening to any recoded material and asking oral/written questions for listening comprehension.

**Reading Skills:**

Active Reading of passages for Reading comprehensions, paraphrase, Summary writing.

**UNIT-III**

**Writing Skills:**

Guidelines of effective writing, Paragraph Writing, Email Writing.

**UNIT-IV**

**Grammar and Vocabulary:**

Parts of Speech, Tenses, GRE words (List of 50 Words).

| **Course Code** | **MAT205** |
|---|---|
| Course Title | Applied Mathematics -III |
| Type of course | Theory |
| L T P | 3 2 0 |
| Credits | 5 |
| Course prerequisite | +2 Mathematics, Engg. Maths-1, Engg. Maths-2 |
| Course Objective (CO) | This course is an introduction to a broad range of mathematical techniques for solving problems that arise in Science and Engineering. The goal is to provide a basic understanding of the derivation, analysis and use of these techniques along with a detailed understanding ofTransforms in engineering applications. |
| Course Outcome (CO) | $CO_1$ Enable students to use Fourier Series &Laplace Transform to make Circuits in Electrical & Electronics Engineering.<br><br>$CO_2$Check the condition for a complex variable function to be analytic and/or harmonic & find complex conjugates<br><br>$CO_3$ Enable students to use **Laplace transform** techniques to solve second-order ordinary differential equations i. |

## Syllabus

**Syllabus**

**UNIT-I**

**Partial Differential Equations-First order:**First order partial differential equations, solutions of first order linear and non-linear PDEs..

**Partial Differential Equations– Higher order :** Solution to homogenous and non-homogenous linear partial differential equations second and higher order by complimentary function and particular integral method. Flows, vibrations and diffusions, second-order linear equations and their classification, Initial and boundary conditions (with an informal description of well-posed problems), D'Alembert's solution of the wave equation; Separation of variables method to simple problems in Cartesian coordinates.

**UNIT II**

**Laplace Transforms:**Laplace transforms of various standard functions, properties of Laplace transforms, inverse Laplace transforms, transform of derivatives and integrals, Laplace transform of unit step function, impulse function, periodic functions,applications solution of

ordinary linear differential equations with constant coefficients, andsimultaneous differential equations.

**UNIT III**

. **Sequences and series:**. Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

**UNIT IV**

**ProbabilityTheory :** Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient.

**Recommended books:-**

| S. No | Name | Author(S) | Publisher |
|---|---|---|---|
| 1 | Higher Engineering Mathematics (Third Edition) Vol-II | By Dr. K.R. Kachot | Mahajan Pub. House, Ahmedabad |
| 2 | Advanced Engineering Mathematics (Fifth Edition) | Erwin Kreyszig | John Wiley |
| 3 | Higher Engineering Mathematics | Dr. B.S. Grewal | Khanna, New Delhi. |
| 4 | Elementry Differential Equations | W.E.Boyce and R.Diprima | John Wiley |
| 5 | Fourier Series& Boundary Value Problems | R.V. Churchill & J.W. Brown | McGraw-Hill. |

| | |
|---|---|
| **Course Code** | **ME201** |
| **Course Title** | **Strength of Materials-I** |
| **Type of course** | PC |
| **L T P** | 3 1 0 |
| **Credits** | 4 |
| **Course prerequisite** | Basics of Mechanical Engineering |
| **Course Objective (CO)** | The course is designed to understand the basic concepts of stress, strain and their variations due to different type of loading. The concept of Mechanical properties, Poisson's ratio, bulk modulus, elastic modulus, modulus of rigidity, combined stress and strain, principal stress, principal plane, bending moment and shear force in beam under various loading conditions, Understanding of torsional shear stress in solid and hollow shaft principal and maximum shear stress in a circular shaft subjected to combined stresses, stresses in struts and columns subjected to axial load; bending stress, slope and deflection under different loading and supporting conditions. |
| **Course outcomes** | The Students will able to:<br>1)Apply knowledge of mathematics, science for engineering applications.<br>2)Design and conduct experiments, as well as to analyze and interpret data<br>3) Identify, formulate, and solve engineering problem |

**Syllabus**

**UNIT-I**

**Simple, Compound Stresses and Strains**: Stress and Strain and their types, Hook's law, longitudinal and lateral strain, Poisson's ratio, stress-strain diagram for ductile and brittle materials, extension of a bar due to without and with self-weight, bar of uniform strength, stress in a bar, elastic constants and their significance, relation between elastic constants, Young's modulus of elasticity, modulus of rigidity and bulk modulus. Temperature stress and strain calculation due to axial load and variation of temperature in single and compound bars. Two dimensional stress system, stress at a point on a plane, principal stresses and principal planes, Mohr's circle of stress ellipse of stress and their applications. Generalized Hook's law, principal stresses related to principal strains.

**UNIT-II**

**Bending Moment (B.M) and Shear Force (S.F) Diagrams**: S.F and B.M definitions; relation between load, shear force and bending moment; B.M and S.F diagrams for cantilevers, simply supported beams with or without overhangs, and calculation of maximum B.M and S.F and the point of contra flexure under the following loads:

a) Concentrated loads

b) Uniformity distributed loads over the whole span or part of span

c) Combination of concentrated and uniformly distributed load

d) Uniformly varying loads

e) Application of moments

**UNIT-III**

**Bending and shear stresses in Beams**: Assumptions in the simple bending theory; derivation of formula and its application to beams of rectangular, circular and channel, I and T- sections. Combined direct and bending stresses in afore-mentioned sections, composite / flitched beams, Shear stress distribution in rectangular, circular, I, T and channel section; built up beams. Shear centre and its importance.

**Torsion:** Derivation of torsion equation and its assumptions and its application to the hollow and solid circular shafts. Torsional rigidity, combined torsion and bending of circular shafts; principal stress and maximum shear stresses under combined loading of bending and torsion.

**UNIT-IV**

**Columns and struts**: Introduction, failure of columns, Euler's formula, Rankine-Gordon's formula, Johnson's empirical formula for axially loaded columns and their applications.

**Slope and deflection**: Relationship between moment, slope and deflection; method of integration, Macaulay's method, moment area method and use of these methods to calculate slope and deflection for the following:

**a)** Cantilevers

**b)** Simply supported beams with or without overhang

**c)** Under concentrated loads, uniformly distributed loads or combination of concentrated & uniformly distributed loads

**Recommended books:-**

| S. No | Name | Author(S) | Publisher |
|---|---|---|---|
| 1 | Strength of Materials | *R.K.Rajput* | S.Chand *Publications.* |
| 2 | Strength of Materials | *Dr. Sadhu Singh* | *Khanna publications.* |
| 3 | Strength of Materials | D.S. Bedi | Khanna Book Publishing Company. |
| 4 | Mechanics of Materials | E.P. Popov | Prentice Hall India |

| | |
|---|---|
| **Course Code** | **ME203** |
| **Course Title** | **Applied Thermodynamics-I** |
| **type of Course** | PC |
| **L T P** | 3 1 0 |
| **Credits** | 4 |
| **Course Prerequisites** | Basics of Mechanical Engineering, Engineering Chemistry. |
| **Course Objectives (CO)** | This course is designed for comprehensive study of combustion and thermal aspects in steam power plants and its allied components. This will enable the students to understand steam properties and about the different types of turbines used in different power plants |
| **Course outcomes** | The Student will able to :<br>1) Apply various laws of thermodynamics to various processes and real systems.<br>2)Apply the concept of Entropy, Calculate heat, work and other important thermodynamic properties for various ideal gas processes<br>3)Estimate performance of various Thermodynamic gas power cycles and gas refrigeration cycle and availability in each case |

**SYLLABUS**

**UNIT-I**

**Combustion:** Combustion Equations **(**Stoichiometric and non- Stoichiometric**).** Combustion problems in Boilers and IC engines/Calculations of air fuel ratio, Analysis of products of combustion, Conversion of volumetric analysis into gravimetric analysis and vice-versa, Actual weight of air supplied, Use of mols, for solution of combustion problems.

**Properties of Steam:** Pure substance; Steam and its formation at constant pressure: wet, dry, saturated and super-heated steam; Sensible heat(enthalpy), latent heat and total heat (enthalpy) of steam; dryness fraction and its determination; degree of superheat and degree of sub-cool; Entropy and internal energy of steam; Use of Steam Tables and Mollier Chart; Basic thermodynamic processes with steam.

**UNIT-II**

**Steam Generators - Definition:** Classification and Applications of Steam Generators; Working and constructional details of fire-tube and water-tube boilers: (Cochran, Lancashire, Babcock and Wilcox boilers); Merits and demerits of fire-tube and water-tube boilers; Modern high pressure boilers. Description of boiler mountings and accessories: Different types of Safety Valves, Water level indicator, pressure gauge, Fusible plug, Feed pump, Feed Check Valve, Blow-off Cock, Steam Stop-Valve, Economiser, Super-heater; Air pre-heater and Steam accumulators; Boiler performance: equivalent evaporation, boiler efficiency. Types of draught and Calculation of chimney height.

**Rankine Cycle:** Rankine steam power cycle, Ideal and actual; Mean temperature of heat addition; Effect

of pressure, temperature and vacuum on Rankine Efficiency; Rankine Cycle Efficiency and methods of improving Rankine efficiency: Reheat cycle, Bleeding (feed-water-heating), Regenerative Cycle, Combined reheat-regenerative cycle.

**UNIT-III**

**Steam Nozzles:** Definition, types and utility of nozzles; Flow of steam through nozzles; Condition for maximum discharge through nozzle; Critical pressure ratio, its significance and its effect on discharge; Area of throat and at exit for maximum discharge; Effect of friction; Nozzle efficiency; Convergent and convergent-divergent nozzles.

**Impulse Turbines:** Introduction; Classification; Impulse versus Reaction turbines, Velocity diagrams/triangles; Combined velocity diagram/triangle and calculations for force, axial thrust, work, power, blade efficiency, stage efficiency, maximum work and maximum efficiency, effect of blade friction on velocity diagram, Compounding of impulse turbines: purpose, types and pressure and velocity variation.

**UNIT-IV**

**Reaction Turbines:** Degree of reaction, combined velocity diagram/triangle and calculations for force, axial thrust, work, power, blade efficiency, stage efficiency, overall efficiency and relative efficiency, maximum work and maximum efficiency; Calculations of blade height, Reheating, Reheat factor and condition curve; Losses in steam turbines; Back pressure and extraction turbines; Co-generation; Economic assessment; Governing of steam turbines.

**Steam Condensers:** Types of condensers, Condenser and vacuum efficiencies; Cooling water calculations; Effect of air leakage; Method to check and prevent air infiltration; Description of air pump and calculation of its capacity; Cooling towers**:** function, types and their operation.

**Recommended Books**

| S.No. | Name | Author(s) | Publisher |
|---|---|---|---|
| 1 | Engineering Thermodynamics | G. Rogers and Y. Mayhew | Pearson |
| 2 | Applied Thermodynamics | R. Yadav, Sanjay and Rajay | Central Publishing House |
| 3 | Advanced thermodynamics for engineers | Wark | McGraw-Hill |
| 4 | Thermodynamics and Thermal Engineering | J.S. Rajadurai | New Age International (P) Ltd. Publishers |

| | |
|---|---|
| Course Code | **ME205** |
| Course Title | **Manufacturing Technology I** |
| Types of Course | PC |
| LT P | 3 0 0 |
| Credits | 3 |
| Course prerequisites | Engineering Workshop |
| Course Objectives | This course is designed to provide students with an overview of a wide variety of manufacturing processes for processing of engineering materials. The students will learn principles, operations and capabilities of various metal casting and metal joining processes. They will also learn about the defects, their causes and remedies in these processes. Upon completion of the course, the students should have the ability to understand the importance of the manufacturing processes and to select a suitable metal casting and metal joining processes to fabricate an engineering product. |
| Course outcomes | The Student will able to :<br>1) Understand and analyze foundry practices like pattern making, mold making, Core making and Inspection of defects<br>2)Understand different plastic molding processes, Extrusion of Plastic and Thermoforming.<br>3)Understand different Welding and joining processes and its defects |

**SYLLABUS**

**Unit –I**

**Introduction: C**lassification of manufacturing processes, selection criteria for manufacturing processes, general trends in manufacturing.

**Unit –II**

**Casting Processes:** Introduction to metal casting. Patterns: types, materials and allowances. Moulding materials: moulding sand compositions and properties, sand testing, types of moulds, moulding machines. Cores: function, types, core making process, core-prints, chaplets. Elements of gating system and risers and their design. Design considerations of castings. Melting furnaces, cupola furnace, charge calculations, induction furnaces. Casting processes: sand casting, shell mould casting, investment casting, permanent mould casting, full mould casting, vacuum casting, die casting, centrifugal casting, and continuous casting. Metallurgical considerations in casting, Solidification of metals and alloys, directional solidification, segregation, nucleation and grain growth, critical size of nucleus. Cleaning and finishing of castings.

**Unit –III**

**Welding Processes:** Introduction and classification of welding processes, to welding processes, weldability, welding terminology, general principles, welding positions, and filler metals. Gas welding: principle and practice, oxy-acetylene welding equipment, oxy-hydrogen welding. Flame cutting. Electric arc welding: principle, equipment, relative merits of AC & DC arc welding. Welding processes: manual metal arc welding, MIG welding, TIG welding, plasma arc welding, submerged arc welding. Welding arc and its characteristics, arc stability, and arc blow. Thermal effects on weldment: heat affected zone, grain size and its control. Electrodes: types, selection , electrode coating ingredients and their function.

Resistance welding: principle and their types i.e. spot, seam, projection, up-set and flash. Spot welding machine. Advanced welding processes: friction welding, friction stir welding, ultrasonic welding, laser beam welding, plasma arc welding, electron beam welding, atomic hydrogen welding, explosive welding, Thermit welding, and electro slag welding. Other joining processes: soldering, brazing, braze welding.

**Unit –IV**

**Inspection and Testing:** Casting defects, their causes and remedies. Welding defects, their cause sand remedies. Destructive and non destructive testing: visual inspection, x-ray radiography,

| **Recommended Books** | | | |
|---|---|---|---|
| **S.No.** | **Name** | **Author(s)** | **Publisher** |
| 1 | Manufacturing Technology, Foundry, Forming & Welding | P. N. Rao | Tata McGraw Hill. |
| 2 | Welding Engineering & Technology | R.S. Parmar | Khanna Publishers. |
| 3 | Manufacturing Processes, Vol. I&II | H.S. Shan | Pearson Publishers |
| 4 | Fundamentals of Modern manufacturing | M. P. Groover. | Wiley |

BABA BHAG SINGH UNIVERSITY KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| Course Code | **ME207** |
| Course Title | **Machine Drawing** |
| Types of Course | PC |
| LT P | 1 0 6 |
| Credits | 4 |
| Course prerequisites | Engineering Drawing |
| Course Objectives | The objective of this course is to make studentsunderstand the principles and requirements of production drawings and learning how to assemble and disassemble important parts used in major mechanical engineering applications. After going through this course, the student shall be able to understand the drawings of mechanical componentsand their assemblies along with their utility for design of components. |
| :<br>**Course outcomes** | The Student will able to<br>1)Draw the machine elements including keys, couplings, cotters, riveted, bolted and welded joints<br>2)Understand the representation of materials used in machine drawing.<br>3) Construct an assembly drawing using part drawings of machine components |

**UNIT-I**

**Introduction:** Principles of Drawing, Requirements of production drawing, Sectioning and conventional representation, Dimensioning, symbols of standard tolerances, Machining Symbols, Introduction and Familiarization of Code IS: 296

**UNIT-II**

**Fasteners:** Various types of screw threads, types of nuts and bolts, screwed fasteners, welding joints and riveted joints

**UNIT-III**

**Assembly and Disassembly:**

**a) Couplings:** Solid or Rigid Coupling, Protected Type Flange coupling, Pin type flexible coupling,

muff coupling, Oldham, universal coupling, claw coupling, cone friction clutch, free hand sketch of single plate friction clutch.

**b)** Knuckle and cotter joints

**c) Pipe and Pipe Fittings:** flanged joints, spigot an socket joint, union joint, hydraulic an

expansion joint

**UNIT-IV**

**Assembly and Disassembly:**

**d) IC Engine Parts:** Piston, connecting rod

**e) Boiler Mountings:** Steam stop valve, feed check valve, safety valve, blow off cock.

**f) Bearings:** Swivel bearing, thrust bearing, Plummer block, angular plumber block

**g) Miscellaneous:** Screw Jack, Drill Press Vice, Crane hook, Tool Post, Drilling Jigs

| S.No. | Name | Author(s) | Publisher |
|---|---|---|---|
| 1 | Machine Drawing | N.D. Bhatt | Charotar publications. |
| 2 | Machine Drawing | P.S. Gill, Machine Drawing, | BD Kataria and Sons. |
| 3 | Machine Drawing | V Lakshmi , N. Sidheshwar | Tata McGraw Hill. |
| 4 | Machine Drawing | Narayanan and Mathur | |

BABA BHAG SINGH UNIVERSITY KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME209** |
| **Course Title** | **Strength of Materials Lab** |
| **type of Course** | PC |
| **L T P** | 0 0 2 |
| **Credits** | 1 |
| **Course Prerequisites** | Basics of Mechanical Engineering |
| **Course Objectives (CO)** | The objective of the strength of materials lab is to demonstrate the basic principles in the area of strength and mechanics of materials and structural analysis to the undergraduate students through a series of experiments. In this lab the experiments are performed to measure the properties of the materials such as impact strength, tensile strength, compressive strength, hardness, ductility etc. |
| **Course outcomes** | The Student will able to<br>1) Describe the behavior of materials upon normal external loads.<br>2)Predict the behavior of the material under impact conditions.<br>3) Recognize the mechanical behavior of materials |

**SYLLABUS**

**1.** To perform tensile test in ductile and brittle materials and to draw stress-strain curve and to determine various mechanical properties.

**2.** To perform compression test on Cast Iron.

**3.** To perform any one hardness tests (Rockwell, Brinell & Vicker's test)

**4.** To perform impact test to determine impact strength.

**5.** To perform torsion test and to determine various mechanical properties.

**6.** To perform Fatigue test on circular test piece.

**7.** To perform bending test on beam and to determine the Young's modulus and modulus of rupture.

**8.** Determination of Buckling loads of long columns with different end conditions.

**9.** To evaluate the stiffness and modulus of rigidity of helical coil spring.

| | |
|---|---|
| **Course Code** | **ME211** |
| **Course Title** | **Manufacturing Process-I Lab** |
| **type of Course** | PC |
| **L T P** | 0 0 2 |
| **Credits** | 1 |
| **Course Prerequisites** | Manufacturing Practice Lab |
| **Course Objectives (CO)** | The students become aware of different manufacturing process in industry. |
| **Course outcomes** | The Student will able to<br>1) Interpret foundry practices like pattern making, mold making, Core making and Inspection of defects.<br>2) Understand the welding process, their compatibility, limitations and developments in them.<br>3) Select appropriate Manufacturing Processing to manufacture any component. |

**SYLLABUS**

UNIT-1

Casting:

1. To study ingredients of molding sand and core sand.
2. Core making, core baking process and produced hollow cylindrical jobs with the help of cores.
3. To determine clay content, moisture content, hardness of a moulding sand sample.
4. To determine shatter index of a moulding sand sample.
5. To test tensile, compressive, transverse strength of moulding sand in green condition.
6. To determine permeability and grain fineness number of a moulding sand sample.
7. To study the feature of cupola furnance.

UNIT-II

Welding:

1. To make lap joint, butt joint and T- joints with manual arc welding processes
2. To make lap joint, butt joint and T- joints with the help of oxy-acetylene gas welding
3. To study MIG/TIG welding and make weld joints by these processes.
4. To study the different types of gas welding
5. To make the joints by using spot welding.

Note: At least one industrial visit must be arranged for the students for the live demonstration of Casting, Welding, Forming and Machining processes

| | |
|---|---|
| **Course Code** | **ME213** |
| **Course Title** | **Applied Thermodynamics Lab** |
| **type of Course** | PC |
| **L T P** | 0 0 2 |
| **Credits** | 1 |
| **Course Prerequisites** | Applied Thermodynamics-I. |
| **Course Objectives (CO)** | This course is designed for providing comprehensive understanding of four stroke petrol and diesel engines and to understand the working of timing of valves in IC engines and to calculate the mechanical efficiency of engines. |
| **Course outcomes** | The student will able to<br>1)Compute the property of fuels and lubricating oils using suitable tests.<br>2)Demonstrate the performance of internal combustion engines and air compressors.<br>3) Interpret the emission characteristics of internal combustion engines |

SYLLABUS

1. Study of construction and operation of 2 stroke and 4 stroke Petrol and Diesel engines using actual engines or models.
2. To plot actual valve timing diagram of a 4 stroke petrol and diesel engines and study its impact on the performance of engine.
3. To perform a boiler trial to estimate equivalent evaporation and efficiency of a boiler.
4. Determine the brake power, indicated power, friction power and mechanical efficiency of a multi cylinder petrol engine running at constant speed (Morse Test).
5. Performance testing of a diesel engine from no load to full load (at constant speed) for a single cylinder/ multi- cylinder engine in terms of brake power, indicated power, mechanical efficiency and specific fuel consumption and to measure the smoke density. Draw/obtain power consumption and exhaust emission curves.
6. Performance testing of a petrol engine from no load to full load (at constant speed) for a single cylinder/ multi- cylinder engine in terms of brake power, indicated power, mechanical efficiency and specific fuel consumption and to measure the exhaust emissions. Also draw/obtain power consumption and exhaust emission curves.
7. Study of construction and operation of various types of steam condensers and cooling towers.

| | |
|---|---|
| **Course Code** | **ME202** |
| **Course Title** | **Strength of Materials-II** |
| **Type of Course** | PC |
| **L T P** | 3 1 0 |
| **Credits** | 4 |
| **Course Prerequisites** | Strength of Materials-I |
| **Course Objectives (CO)** | The course is designed to understand the concepts of strain energy, resilience, stress under impact loading; shear stress distribution in a beam of various cross sections; stress in curved cross sections; stresses in helical, spiral and leaf springs; stress and strain analysis of thin, thick cylinder and spheres subjected to internal pressure; and various failure theories. The outcome of the course is to enhance deep and vigorous understanding of stress analysis in various machine elements, so that a student can properly analyse and design a mechanical member from the strength point of view under various conditions. |
| **Course outcomes** | The student will able to<br>1) Determine the resistance and deformation in members subjected to axial, flexural and torsional loads.<br>2)Evaluate principal stresses, strains and apply the concept of failure theories for design<br>3) Analyze and design thin, thick cylinders and springs |

**SYLLABUS**

**UNIT I**

**Thin cylinders and spheres**: Calculation of Hoop stress, longitudinal stress in a cylinder, effects of joints, change in diameter, length and internal volume. Principal stresses in sphere, change in diameter and internal volume.

**Thick cylinders**: Derivation of Lame's equations, calculation of radial, longitudinal and hoop stresses and strains due to internal pressure in thick cylinders, compound cylinders, hub shrunk on solid shafts, shrinkage allowance and shrinkage stress.

**UNIT II**

**Strain energy:** Introduction to strain energy, energy of dilation and distortion. Resilience, stress due to suddenly applied loads. Castigliano's and Maxwell's theorem of reciprocal deflection.

**UNIT III**

**Theories of failure**: Maximum principal stress theory, maximum shear stress theory, maximum principal

strain theory, total strain energy theory, shear strain energy theory. Graphical representation and derivation of equation for these theories and their application to problems related to two dimensional stress systems.

**UNIT IV**

**Springs:** Open and closed coiled helical springs under the action of axial load and/or couple. Flat spiral springs- derivation of formula for strain energy, maximum stress and rotation. Leaf spring- deflection and bending stresses.

**Bending of curved beams**: Calculation of stresses in cranes or chain hooks, rings of circular and trapezoidal section, and chain links with straight sides.

**Rotational discs:** Stresses in rotating discs and rims of uniform thickness; disc of uniform strength.

**Recommended Books**

| S.No. | Name | Author(s) | Publisher |
|---|---|---|---|
| 1 | Strength of Materials | R.K.Rajput | S.Chand Publications. |
| 2 | Strength of materials | Dr. Sadhu Singh | Khanna publications. |
| 3 | Strength of Materials | D.S. Bedi | Khanna Book Publishing Company. |
| 4 | Mechanics of Materials | E.P. Popov | Prentice Hall India. |
| 5 | Strength of Materials | R.S Lehri and A.S. Lehri | Kataria and Sons. |
| 6 | Strength of Materials | S.S.Rattan | Tata McGraw Hill. |

SANT BABA BHAG SINGH UNIVERSITY KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME204** |
| **Course Title** | **Applied Thermodynamics-II** |
| **type of Course** | PC |
| **L T P** | 3 1 0 |
| **Credits** | 4 |
| **Course Prerequisites** | Applied thermodynamics I |
| **Course Objectives (CO)** | This course is designed for providing comprehensive understanding and thermodynamic analysis of positive displacement air compressors and thermal turbo machines used in power generation, aircraft, spacecraft, rocket propulsion and internal combustion engines. The students will be able to understand the thermodynamic working as well as performance of thermal turbo power machinery. They will also be able to select various thermal devices required for aforesaid applications |
| **Course outcomes** | The students will able:<br>1)Estimate thermodynamic properties of gas mixtures.<br>2)Identify the models to estimate the properties of real gases.<br>3)Analyse reactive and non-reactive gas mixtures using the concepts of statistical thermodynamics and kinetic theory of gases.<br>Analyse reactive and non-reactive gas mixtures using the concepts of statistical thermodynamics and kinetic theory of gases. |

**SYLLABUS**

**UNIT-I**

**IC Engines:** Theory of combustion in SI and CI Engines; Various stages of combustion; Pressure-time/crank - Angle diagrams; Various phenomenon such as turbulence, squish and swirl, dissociation, pre-ignition/auto- ignition, and after burning etc.; Theory of knocking (ie,. detonation) in SI and CI Engines; Effect of engine variables on the Delay Period in SI and CI engines; Effect of various parameters on knock in SI and CI Engines; Methods employed to reduce knock in SI and CI Engines; Octane and Cetane rating of fuels, Effect of knocking on engine performance; Effect of *compression ratio* and *air-fuel ratio* on power and efficiency of engine.

**Reciprocating Compressors:** Classification of Air Compressors; Application of compressors and use of compressed air in industry and other places, Single stage single acting reciprocating compressor (with and without clearance volume): construction, operation, work input and best value of index of compression, heat rejected to cooling medium, isothermal, overall thermal, isentropic, polytropic, mechanical efficiency, free air delivery; Multistage compressors: purpose and advantages, construction and operation, work input, heat rejected in intercoolers, minimum work input, optimum pressure ratio.

**UNIT-II**

**Rotary Compressors:** Classification of rotary compressors; Construction, operation, work input and efficiency of positive displacement type of rotary compressors like Roots blower, Stagnation and static

values of pressure, Temperature and enthalpy etc. for flow through dynamic rotary machines; Complete representation of compression process on T-S coordinates with detailed description of areas representing total work done, polytropic work done; ideal work required for compression process, areas representing energy lost in internal friction .

**UNIT-III**

**Centrifugal Compressors:** Complete representation of compression process in the centrifugal compressor starting from ambient air flow through the suction pipe, Impeller, Diffuser and finally to delivery pipe on T-S coordinates; Pre-guide vanes and pre-whirl; Slip factor; Power input factor; Various modes of energy transfer in the impeller and diffuser; Degree of Reaction and its derivation; Energy transfer in backward, forward and radial vanes; Pressure coefficient as a function of slip factor; Centrifugal compressor characteristic curves; Surging and choking in centrifugal compressors..

**Axial Flow Compressors:** Different components of axial flow compressor and their arrangement; Discussion on flow passages and simple theory of aerofoil blading; Angle of attack; coefficients of lift and drag; Turbine versus compressor blades; Velocity vector; Vector diagrams; Thermodynamic analysis; Work done on the compressor and power calculations; Modes of energy transfer in rotor and stator blade flow passages; Detailed discussion on work done factor, degree of reaction, blade efficiency and their derivations, Surging, Choking and Stalling in axial flow compressors; Characteristic curves for axial flow compressor; flow parameters of axial flow compressor like Pressure Coefficient, Flow Coefficient, Work Coefficient, Temperature-rise Coefficient and Specific Speed; Comparison of axial flow compressor with centrifugal compressor and reaction turbine; Field of application of axial flow compressors.

**UNIT-IV**

**Gas Turbines:** Comparison of gas turbine with a steam turbine and IC engine; Fields of application of gas turbines; Position of gas turbine in power industry; Thermodynamics of constant pressure gas turbine cycle (Brayton cycle); Calculation of net output, work ratio and thermal efficiency of ideal and actual cycles, Thermal refinements like regeneration, inter-cooling and re-heating and their different combinations in the gas turbine cycle and their effects on gas turbine cycle i.e. gas turbine cycle. Multistage compression and expansion; Dual Turbine system; Series and parallel arrangements; Closed and Semi-closed gas turbine cycle; Requirements of a gas turbine combustion chamber; Blade materials and selection criteria for these materials and requirements of blade materials; Gas turbine fuels.

**Jet Propulsion** Principle of jet propulsion; Description of different types of jet propulsion systems like rockets and thermal jet engines, like (i) Athodyds(ramjet and pulsejet), (ii) Turbojet engine, and (iii) Turboprop engine. Thermodynamics of turbojet engine components; Development of thrust and methods for its boosting/augmentation; Thrust work and thrust power; Propulsion energy, Propulsion and thermal (internal) efficiencies; Overall thermal efficiency; Specific fuel c onsumption**;** Rocket propulsion, its thrust and thrust power; Propulsion and overall thermal efficiency; Types of rocket motors (e.g. solid propellant and liquid propellant systems).

KHIALA, DISTT. JALANDHAR (PUNJAB)

| Recommended Books | | | |
|---|---|---|---|
| **S.No.** | **Name** | **Author(s)** | **Publisher** |
| 1 | Gas Turbine Theory | H. Cohen, G.F.C. Rogers and M. Sarvan | Longmans |
| 2 | Applied Thermodynamics | R. Yadav, Sanjay and Rajay | Central Publishing House |
| 3 | Advanced thermodynamics for engineers | Wark | McGraw-Hill |
| 4 | Thermodynamics and Thermal Engineering | J.S. Rajadurai | New Age International (P) Ltd. Publishers. |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME206** |
| **Course Title** | **Mechanics of Machines-I** |
| **type of Course** | PC |
| **L T P** | 3 1 0 |
| **Credits** | 4 |
| **Course Prerequisites** | Engineering Physics , Engineering Mathematics |
| **Course Objectives (CO)** | The course under Mechanics of Machines-I has been designed to cover the basic concepts of kinematic aspects of mechanical machines and major parts used in running of the machines. The students will understand the basic concepts of machines and able to understand constructional and working features of important machine elements. The students should be able to understand various parts involved in kinematics of machines for different applications. The students shall also be able to understand requirements of basic machine parts which would help them to understand the design aspects of the machine parts. |
| **Course outcomes** | The students will able:<br>1)Identify mechanisms in real life applications.<br>2) Perform kinematic analysis of simple mechanisms.<br>3) Determine moment of inertia of rigid bodies experimentally |

**SYLLABUS**

**Unit –I**

**Basic Concept of machines:** Introduction- General concepts, Introduction of Simple mechanism, Different types of Link, Mechanism, Kinematic Pair and Kinematic Chain, Principles of Inversion, Inversion of a Four Bar Chain, Slider-Crank-Chain and Double Slider-Crank-Chain. Graphical and Analytical methods for finding: Displacement, Velocity, and Acceleration of mechanisms.

**Unit –II**

**Belts, Ropes and Chains:** Material & Types of belt, Flat and V-belts, Rope & Chain Drives, Idle Pulley, Intermediate or Counter Shaft Pulley, Angle and Right Angle Drive, Quarter Turn Drive, Velocity Ratio, Crowning of Pulley, Loose and fast pulley, stepped or cone pulleys, ratio of tension on tight and slack side of belts, Length of belt, Power transmitted by belts including consideration of Creep and Slip, Centrifugal Tensions and its effect on power transmission.

**Unit –III**

**Cams:** Types of cams and follower, definitions of terms connected with cams. Displacement,

Velocity and acceleration diagrams for cam followers. Analytical and Graphical design of cam profiles with various motions (SHM, uniform velocity, uniform acceleration and retardation, cycloidal Motion).

**Friction Devices**: Concepts of friction and wear related to bearing and clutches. Types of brakes function of brakes. Braking of front and rear tyres of a vehicle. Determination of braking capacity, Types of dynamometers,

(absorption, and transmission).

**Unit –IV**

**Flywheels:** Turning moment and crank effort diagrams for reciprocating machines' Fluctuations of speed, coefficient of fluctuation of speed and energy, Determination of mass and dimensions of flywheel used for engines and punching machines.

**Governors:** Function, types and characteristics of governors. Watt, Porter and Proell governors. Hartnell and Willson-Hartnell spring loaded governors. Numerical problems related to these governors. Sensitivity, stability, isochronisms and hunting of governors. Governor effort and power, controlling force curve, effect of sleeve friction.

**Recommended Books**

| S.No. | Name | Author(s) | Publisher |
|---|---|---|---|
| 1 | Theory of Machines | S. S. Rattan | Tata McGraw Hill |
| 2 | Theory of Machines | V.P. Singh | Dhanpat Rai |
| 3 | Theory of Mechanisms & Machines | Jagdish Lal | Metropolitan Book Co. |
| 4 | Theory of Machines | W. G. Green | Blackie & Sons, London. |
| 5 | Theory of Machines | R.S.Khurmi | S Chand & Co Ltd. |

SANT BABA BHAG SINGH UNIVERSITY KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME208** |
| **Course Title** | **Manufacturing Technology II** |
| **Types of Course** | PC |
| **LT P** | 3 0 2 |
| **Credits** | 3 |
| **Course prerequisites** | Engineering Workshop |
| **Course Objectives** | This course is designed to provide students with an overview of a wide variety of manufacturing processes for processing of engineering materials. The students will learn principles, operations and capabilities of various metal casting and metal joining processes. They will also learn about the defects, their causes and remedies in these processes. Upon completion of the course, the students should have the ability to understand the importance of the manufacturing processes and to select a suitable metal casting and metal joining processes to fabricate an engineering product. |
| **Course outcomes** | The students will able:<br>1) Understand the basic concepts and properties of Material.<br>2) Detect the defects in crystal and its effect on crystal properties.<br>3) Select proper metal, alloys, nonmetal and powder metallurgical component for specific<br>requirement |

**SLLYBUS**

**UNIT-I**

**Metal Cutting:** Introduction to machining processes, classification. Terminology related to metal cutting. Mechanics of chip formation, shear angle, chip contraction and cutting forces in metal cutting, Merchant theory, tool wear, tool life, machinability. Fundamentals of measurement of cutting forces and chip tool interface temperature.

Cutting tools: Types, geometry of single point cutting tool, twist drill and milling cutter, tool signature. Cutting tool materials: High carbon steels, alloy carbon steels, high speed steel, cast alloys, cemented carbides, ceramics and diamonds, and CBN. Selection of machining parameters. Coolants and lubricants: classification, purpose, function and properties.

**Machine Tools** Lathe: classification, description and operations and lathe attachments. Shaping and planning machine: classification, description and operations, drive mechanisms. Milling machine: classification, description and operations, indexing devices, up milling and down milling. Drilling machine: classification, description and operations. Boring machine: classification, description and operations. Grinding machines: classification, description and operations, wheel selection, grinding wheel composition and nomenclature of grinding wheels, dressing and truing of grinding wheels. Broaching machine: classification, description and operations. Speed, feed and machining time calculations of all the above machines

## UNIT-II

### Metal Forming

Introduction and classification. Rolling process: introduction, classification, rolling mills, products of rolling, rolling defects and remedies. Forging: open and closed die forging, various forging operations, forging defects, their causes and remedies. Extrusion: classification, equipment, defects and remedies. Drawing: drawing of rods, wires and tubes, draw benches, drawing defects and remedies. Sheet metal forming operations: piercing, blanking, embossing, squeezing, coining, bending, drawing and deep drawing, and spinning. Punch and die set up. Press working: press types, operations, press tools, progressive and combination dies. High velocity forming of metals: introduction to modern forming process: electro-hydraulic forming, mechanical high velocity forming, magnetic pulse forming and explosive forming

| **Recommended Books** | | | |
|---|---|---|---|
| **S.No.** | **Name** | **Author(s)** | **Publisher** |
| 1 | Manufacturing Technology, Metal cutting Volume-II | P. N. Rao | Tata McGraw Hill. |
| 3 | Manufacturing Processes, Vol. I&II | H.S. Shan | Pearson Publishers |
| 4 | Fundamentals of Modern manufacturing | M. P. Groover. | Wiley |

BABA BHAG SINGH UNIVERSITY KHIALA, DISTT. JALANDHAR (PUNJAB)

| Course Code | EVS101 |
|---|---|
| Course Title | Environmental Science |
| Type of course | HS |
| L T P | 3 0 0 |
| Credits | 3 |
| Course prerequisite | Nil |
| Course Objective (CO) | To make students aware about environment and need of maintaining it with best possible knowledge. |
| Course Outcomes | 1)Measure environmental variables and interpret results.<br>2)Evaluate local, regional and global environmental topics related to resource use and management.<br>3)Propose solutions to environmental problems related to resource use and management. |

**SYLLABUS**

**UNIT-I**

**Introduction to Environment and Ecosystem:** Definition and scope and importance of multidisciplinary nature of environment. Need for public awareness, Concept of Ecosystem, Structure, interrelationship, producers, Consumers and decomposers, ecological pyramids-biodiversity and importance. Hot spots of biodiversity.

**UNIT-II**

**Environmental Pollution & Natural Resources:** Definition, Causes, effects and control measures of air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measure of urban and industrial wastes.Role of an individual in prevention of pollution. Pollution case studies.Disaster Management: Floods, earthquake, cyclone and landslides, Natural Resources and associated problems, use and over exploitation, case studies of forest mresources and water resources.

**UNIT-III**

**Social Issues and the Environment** :From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case studies. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation.Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of pollution) Act. Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation

**UNIT-IV**

**Human Population and the Environment & Field Work:** Population growth, variation among nations. Population explosion –Family Welfare Programme. Environment and human health, Human Rights, Value Education, HIV/AIDS. Women and child Welfare. Role of Information Technology in Environment and human health. Case studies

Visit to a local area to document environemntal assetsriver/forest/grassland/hill/mountain;Visit to a local polluted site-Urban/Rural/Industrial/Agricultural;Study of common plants, insects, birds;Study of simple ecosystems-pond, river, hill slopes, etc.

**RECOMMENDED BOOKS:**

| S. No | Name | Author(S) | Publisher |
|---|---|---|---|
| 1 | A Textbook for Environmental Studies | Erach Bharucha | Orient BlackSwan |
| 2 | Environmental Biology, | Agarwal, K.C. 2001 | Nidi Publ. Ltd. Bikaner. |
| 3 | Environmental Science, | Miller T.G. Jr. | Wadsworth |

| | |
|---|---|
| **Course Code** | **ME210** |
| **Course Title** | **Material Science and Metallurgy** |
| **Type of Course** | ES |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Physics, Manufacturing Processes, Strength of Materials-I&II |
| **Course Objectives (CO)** | This course is designed to develop fundamental concepts of mechanical properties, phase transformation and heat treatment processes. The students will learn the microstructure, Imperfections, diffusion mechanisms and theories of plastic deformation. They will also understand equilibrium diagrams, time-temperature transformation curves and heat treatment processes which are useful for design and control of heat treating processes. |
| **Course outcomes** | The students will able to:<br>1)Understand the basic concepts and properties of Material<br>2) Understand about material fundamental and processing.<br>3) Detect the defects in crystal and its effect on crystal properties. |

**SYLLABUS**

**UNIT I**

**Mechanical properties of materials:** Technological significance, Terminology for mechanical properties: Strength, hardness, creep, fatigue, Toughness, Resilience, Hysteresis., ductile-brittle transition , Tensile test, Hardness test for soft and hard materials: Brinell, Rockwell and Vicker test, Nano-indentation, Impact test.

**Defects in Solids:** Point defects, line defects and dislocations, interfacial defects, bulk or volume defects. Fundamentals of plastic deformation of metals, Schmid's Law, crystallographic notation of atomic planes (Miller Indices), deformation by slip and twinning, Preferred orientation in polycrystalline materials.

**UNIT II**

**Diffusion:** Diffusion mechanisms, steady-state and non-steady- state diffusion, factors affecting diffusion. Theories of plastic deformation, nucleation, recovery, re-crystallization and grain growth

**Binary phase diagrams:** Solid solutions, factors affecting solid solubility, Isomorphous, Eutectic, Peritectic, Eutectoid and Peritectoid systems, effect of non equilibrium cooling, coring and homogenization.

**UNIT III**

**Iron-Cementite diagram:** polymorphism and allotropy, Construction and interpretation Fe-$Fe_3C$ diagrams. Transformation of Austenite to Pearlite, Bainite and Martensite. Classification of steels, their properties and applications. Types of cast iron, their microstructures and typical uses.

**Heat Treatment:** Basic principles of steel, TTT diagrams, common heat treatments like annealing, normalizing, quenching (hardening) and tempering, Martempering and austempering, Age or precipitation hardening; **Case hardening:** carburizing, nitriding and cyaniding. **Surface hardening:** Flame hardening,

Induction hardening etc. Concept of hardenability, factors affecting it, Jominy hardenability test.

**UNIT IV**

**Advanced engineering materials and alloys:** Classifications, properties and applications of alloy steels, tool steels, stainless steels, Effect of non ferrous elements (Al, Cu, Mg and Ti, Si, Mn, Cr, Mo, W, Ti) on properties of steel, copper base alloys, Aluminum base alloys, Nickel base alloys, Types of engineering composites, ceramics, polymers their properties and applications.

**Recommended Books**

| S.No. | Name | Author(s) | Publisher |
|---|---|---|---|
| 1 | The Science and Engineering of Materials | D.K. Bhattacharya | Cengage Learning. |
| 2 | Engineering Physical Metallurgy | Y. Lakhin | Mir Publishers. |
| 3 | The Science and Engineering of Materials | D.K. Bhattacharya | Cengage Learning. |
| 4 | Heat Treatment of Metals, | B. Zakharov | University Press |
| 5 | Physical Metallurgy | Vijendra Singh | Tata Mcgraw Hill |

SANT BABA BHAG SINGH UNIVERSITY
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME212** |
| **Course Title** | **Mechanics of Machines I Lab** |
| **type of Course** | PC |
| **L T P** | 0 0 2 |
| **Credits** | 1 |
| **Course Prerequisites** | Physics |
| **Course Objectives (CO)** | To understand the various links and mechanisms by performing experiments |
| **Course outcomes** | The Students will able :<br>1)To determine the follower displacement and also able to draw cam profile.<br>2 To determine the balancing of rotating Masses<br>3) Student will able to know about gear trains. |

**SYLLABUS**

1. Study of various links and mechanisms.
2. Study and draw various inversions of 4- bar chain and single slider crank chain.
3. Draw velocity and diagram of engine mechanism using graphical methods including Klien's construction.
4. Conduct experiments on various types of governors and draw graphs between height and equilibrium speed of a governor.
5. Determination of gyroscopic couple (graphical method).
6. Balancing of rotating masses (graphical method)
7. Cam profile analysis (graphical method).
8. Determination of gear- train value of compound gear trains and Epicyclic gear trains.
9. Study pressure distribution in a full journal bearing.

| | |
|---|---|
| **Course Code** | ME214 |
| **Course Title** | Manufacturing Process-II Lab |
| **type of Course** | PC |
| **L T P** | 0 0 2 |
| **Credits** | 1 |
| **Course Prerequisites** | Manufacturing Process-I, Workshop Technology Lab. |
| **Course Objectives (CO)** | The students become aware of different manufacturing process in industry. |
| **Course outcomes** | The students will able to<br>1)Illustrate the various sheet metal forming processes for a specific application.<br>2)Explain the process of making patterns, preparation of sand mould, various special casting processes and casting defects.<br>3)Describe various fusion, friction and special welding processes, soldering and brazing processes. |

**SYLLABUS**

Machining and Forming

1. To study constructional features of following machines through drawings/ sketches:
   a. Grinding machines (Surface, Cylindrical)
   b. Hydraulic Press
   c. Draw Bench
   d. Drawing and Extrusion Dies
   e. Rolling Mills
2. To grind single point and multipoint cutting tools
3. To prepare job on Lathe involving specified tolerances; cutting of V- threads and square threads.
4. To prepare job on shaper involving plane surface,
5. Use of milling machines for generation of plane surfaces, spur gears and helical gears; use of end mill cutters.
6. To determine cutting forces with dynamometer for turning, drilling and milling operations.
7. to study the features and geometry of radial drill machine.

Note: At least one industrial visit must be arranged for the students for the live demonstration of Casting, Welding, Forming and Machining processe

| | |
|---|---|
| **CourseCode** | **ME216** |
| **Course Title** | **Material Science and Metallurgy Lab** |
| **type of Course** | ES |
| **L T P** | 0 0 2 |
| **Credits** | 1 |
| **Course Prerequisites** | Strength of Materials, Manufacturing Process |
| **Course Objectives (CO)** | This Lab gives insight to study crystal structure and their mechanical behaviour. Various kinds of heat treatment processes along with the their mechanical effects are also done. |
| **Course outcomes** | The students will able to<br>1) Understand the crystal structure for SC, BCC, FCC and HCP.<br>2)Understand the microstructure for pure metals and alloy<br>3)Understand the micro structure of heat treated steels |

**SYLLABUS**

**1.** Preparation of models/charts related to atomic/crystal structure of metals.

**2.** Annealing the steel specimen and study the effect of annealing time and temperature on hardness of steel.

**3.** Hardening the steel specimen and study the effect of quenching medium on hardness of steel.

**4.** Practice of specimen preparation (cutting, mounting, polishing ,etching) of mild steel, aluminium and hardened steel specimens.

**5.** Study of the microstructure of prepared specimens of mild steel, Aluminium and hardened steel

**6.** Identification of ferrite and pearlite constituents in given specimen of mild steel.

**7.** Determination of hardenabilty of steel by Jominy End Quench Test.

| | |
|---|---|
| **Course Code** | **ME301** |
| **Course Title** | **Fluid Mechanics** |
| **Type of Course** | PC |
| **L T P** | 3 1 0 |
| **Credits** | 4 |
| **Course Prerequisites** | |
| **Course Objectives (CO)** | This course is designed for the undergraduate mechanical engineering students to develop an understanding of the behavior of fluids at rest or in motion and the subsequent effects of the fluids on the boundaries as the mechanical engineers has to deal with fluids in various applications. This course will also develop analytical abilities related to fluid flow. |
| **Course outcomes** | The students will able to<br>**1)** Use of various properties in solving the problems in fluids<br>**2)**Use of Bernoulli's equation for solutions in fluids<br>3) Determine forces drag and lift on immersed bodies |

**SYLLABUS**

**UNIT I**

**Fundamentals of Fluid Mechanics**: Introduction; Applications; Concept of fluid; Difference between solids, liquids and gases; Concept of continuum; Ideal and real fluids; Fluid properties: density, specific volume, specific weight, specific gravity, viscosity (dynamic and kinematic), vapour pressure, compressibility, bulk modulus, Mach number, surface tension and capillarity; Newtonian and non-Newtonian fluids.

**UNIT II**

**Fluid Statistics:** Pascal's law and its engineering applications; Hydrostatic paradox; Action of fluid pressure on a plane submerged surface (horizontal, vertical and inclined): resultant force and centre of pressure; Force on a curved surface due to hydrostatic pressure; Buoyancy and flotation; Stability of floating and submerged bodies; Metacentric height and its determination.

**Fluid Kinematics:** Classification of fluid flows; Lagrangian and Euler flow descriptions; Velocity and acceleration of fluid particle; Local and convective acceleration; Path line, streak line, streamline and timelines; Flow rate and discharge mean velocity; One dimensional continuity equation; Continuity equation in Cartesian (x,y,z); Rotational flows: rotation, vorticity and circulation; Stream function and velocity potential function, and relationship between them; Flow net.

**UNIT III**

**Fluid Dynamics:** Derivation of Euler's equation of motion in Cartesian coordinates, and along a streamline; Derivation of Bernoulli's equation (using principle of conservation of energy and equation of motion) and its applications to steady state ideal and real fluid flows; Representation of energy changes in fluid system (hydraulic and energy gradient lines); Impulse momentum equation; Free and forced vortex motions.

**Dimensional Analysis and Similitude:** Need of dimensional analysis; Rayleigh's and Buckingham's $\pi$ – method for dimensional analysis; Dimensionless numbers (Reynolds, Froudes, Euler, Mach, and Weber) and their significance; Need of similitude; Geometric, kinematic and dynamic similarity; Model and prototype studies; Similarity model laws.

**UNIT IV**

**Internal Flows**: Laminar and Turbulent Flows: Reynolds number, critical velocity, critical Reynolds number, hydraulic diameter, flow regimes; Hagen – Poiseuille equation; Darcy equation; Head losses in pipes and pipe fittings; Flow through pipes in series and parallel; Concept of equivalent pipe; Roughness in pipes.

**Pressure and Flow Measurement**: Manometers; Pitot tubes; Various hydraulic coefficients; Orifice meters; Venturi meters; Borda mouthpieces; Notches (rectangular, V and Trapezoidal) and weirs; Rotameters.

**Recommended Books**

| S. No. | Name | Author(s) | Publisher |
|---|---|---|---|
| 1 | Fluid Mechanics and Fluid Power Engineering | D.S KUMAR | S.K Kataria Publications. |
| 2 | Introduction To Fluid Mechanics and Fluid Machines | SK SOM & G.BISWAS | Tata Mc Graw Hill |
| 3 | Fluid Mechanics | Y.A Cengel | Tata Mc Graw Hill |
| 4 | Fluid Mechanics and Machinery | C.S.P Ojha | Oxford University Press |

| | |
|---|---|
| **Course Code** | **ME303** |
| **Course Title** | **Machine Design-I** |
| **type of Course** | PC |
| **L T P** | 3 1 0 |
| **Credits** | 4 |
| **Course Prerequisites** | Strength of Material , Theory of machine, Machine drawing |
| **Course Objectives (CO)** | The aim of this course is to make them understand the concepts in designing of permanent and temporary fasteners. |
| **Course Outcomes** | The students will able to:<br>1) Understand the customers' need, formulate the problem and draw the design specifications<br>2) Understand component behavior subjected to loads and identify the failure criteria<br>3) Design keys, cotters, couplings and joints including riveted, bolted and welded joints. |

**SYLLABUS**

**UNIT-I**

**Introduction:** Scope and meaning of machine design. Sources of design data. Design considerations from

economics, manufacturing, aesthetics and ergonomics aspects. Design Process, Selection of

Materials.

**UNIT-II**

**Screwed Joints: -** Design of Bolted joints, Bolted Joints under eccentric Loading. Welded Joints: -

Design of Fillet Welded Joints, Butt Joints, Un-symmetric Welded sections, Eccentrically loaded welded joints.

**Riveted Joints: -** Design of Lap Joints, Butt Joints, Diamond Riveting, Eccentrically loaded riveted joints.

**UNIT-III**

**Design of Cotter and Knuckle Joints**

**Shafts: -** Design of shafts under different types of loading conditions.

**Keys & Couplings: -** Design of rectangular and square keys, muff coupling, split muff coupling,

flange coupling, bushed-pin flexible coupling.

**UNIT-IV**

**Levers: -** Design of straight levers, Bell -Crank levers, foot levers, hand levers.

**Brakes and Clutches: -** Design of friction plate and cone clutches, and simple type brakes.

Introduction to Design for Manufacturing and Assembly.

**Recommended Books**

| S.No. | Name | Author(s) | Publication |
|---|---|---|---|
| **1** | Machine Design | by Shigley | Tata McGraw hill |
| **2** | Machine Design | Juvinal, John | Wiley Publishers |
| **3** | Machine Design | Spots, | Prentice hall |
| **4** | Machine Design | Norton, | Prentice Hall |
| **5** | Machine Design | Khurmi | S. Chand |

KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME305** |
| **Course Title** | **Mechanics of Machines-II** |
| **type of Course** | PC |
| **L T P** | 3 1 0 |
| **Credits** | 4 |
| **Course Prerequisites** | Mechanics of Machines-I |
| **Course Objectives (CO)** | The students will understand the basic concepts of inertia forces & couples applied to reciprocating parts of a machine. Students should be able to understand balancing of masses and design of gears & gear trains. They will also gain knowledge of kinematic synthesis and different applications of gyroscopic effect. |
| **Course Outcomes** | The students will able to<br>1) Evaluate gear tooth geometry and select appropriate gears for the required application<br>2) Understand the gyroscopic effects in ships, aero planes and road vehicles.<br>3) Analyze balancing problems in rotating and reciprocating machinery |

**SYLLABUS**

**UNIT-I**

**Static force analysis**:, Concept of force and couple, free body diagram, condition of equilibrium, static equilibrium of mechanism, methods of static force analysis of simple mechanisms. Power transmission elements, considerations of frictional forces

**UNIT-II**

**Dynamic force analysis** Determination of forces and couples for a crank, inertia of reciprocating parts, dynamically equivalent system, analytical and graphical method, inertia force analysis of basic engine mechanism, torque required to overcome inertia and gravitational force of a four bar linkage.

**UNIT-III**

**Gears:** Toothed gears, types of toothed gears and its terminology. Path of contact, arc of contact, conditions for correct gearing, forms of teeth, involutes and its variants, interference and methods of its removal. Calculation of minimum number of teeth on pinion/wheel for involute rack, helical, spiral, bevel and worm gears. Center distance for spiral gears and efficiency of spiral gears

**Gear Trains**: Types of gear trains, simple, compound and epicyclic gear trains, problemsinvolving their applications, estimation of velocity ratio of worm and worm wheel.

**UNIT-IV**

**Gyroscopic motion and couples**: Effect on supporting and holding structures of machines.stabilization of ships and planes, Gyroscopic effect on two and four wheeled vehicles

**Balancing:** Necessity of balancing, static and dynamic balancing, balancing of single and multiple rotating masses, partial unbalanced primary force in an engine, balancing of reciprocating masses, and

condition of balance in multi cylinder in line V-engines , concept of direct and reverse crank, balancing of machines, rotors, reversible rotors.

**Recommended Books**

| S.No. | Name | Author(s) | Publisher |
|---|---|---|---|
| 1 | Theory of Machines | S. S. Rattan | Tata McGraw Hill |
| 2 | Theory of Machines | V.P. Singh | Dhanpat Rai |
| 3 | Theory of Machines | Shigley | McGraw Hill. |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | SSC303-18 |
| **Course Title** | Human values& Professional Ethics/Human Resources |
| **Type of Course** | HSMC |
| **L T P** | 3:0:0 |
| **Credits** | 3 |
| **Course Prerequisites** | None |
| **Course Objectives (CO)** | To help the students to discriminate between valuable and superficial in the life. To help students develop sensitivity and awareness; leading to commitment and courage to act on their own belief. This Course will encourage the students to discover what they consider valuable. Accordingly, they should be able to discriminate between valuable and the superficial in real situations in their life. This course is an effort to 93ulfil our responsibility to provide our students significant input about understanding |
| **Course outcomes** | The students will able to:<br>1)Learn the moral issues and problems in engineering; find the solution to those problems.<br>2)Learn the need for professional ethics, codes of ethics and roles, concept of safety,risk assessment.<br>3) Gain exposure to Environment Ethics & computer ethics; know their responsibilities and rights |

**SYLLABUS**

**UNIT-I:Course Introduction-Need, Basic Guidelines, Content and Process for Value Education** : Understanding the need, basic guidelines, content and process for Value Education, Understanding Happiness and Prosperity correctly.

**Understanding Harmony in the Human Being** : Understanding the harmony with self and the Body: Sanyam and Swasthya.

**UNIT II:Harmony in Human Relationship**: Understanding harmony in the Family- the basic unit of human interaction, visualizing a universal harmonious order in society **Understanding Harmony in the Nature and Existence:** Understanding the harmony in the Nature, Holistic perception of harmony at all levels of existence

**UNIT III: Understanding of Harmony on Professional Ethics:** Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems

**UNIT IV:Strategy for transition from the present state to Universal Human Order**: At the level of individual, at the level of society. **Case studies**: typical holistic technologies, management models and production systems

**Recommended Books**

| NAME | AUTHOR | PUBLISHER |
|---|---|---|
| A Foundation Course in Value Education | R R Gaur, R Sangal | Excel Books Publishers |
| Energy & Equity | Ivan Illich | The Trinity Press, Worcester, and HarperCollins, USA |
| Human Values and Professional Ethics | RishabhAnand | Satya Prakashan, New Delhi |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | PLS303-18 |
| **Course Title** | Constitution of India |
| **Type of Course** | MC |
| **L T P** | 3 0 0 |
| **Credits** | NC |
| **Course Prerequisites** | Nil |
| **Course Objectives (CO)** | To enable the students to study and understand the basics of Indian Constitutions, aware the learners about the duties of Citizens. Also to aware about roots of Indian constitution and its relevance in present scenario. |
| **Course Outcomes** | The students will able to:<br>1) Understand the emergence and evolution of Indian Constitution<br>2) Understand the structure and composition of Indian Constitution<br>3) Understand and analyse federalism in the Indian context |

**SYLLABUS**

**UNIT I:**Course Introduction- Need, Basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education, Understanding Happiness and Prosperity correctly.
Understanding Harmony in the Human Being: Understanding the harmony with self and the Body: Sanyam and Swasthya.

**UNIT II:**Harmony in Human Relationship: Understanding harmony in the Family- the basic unit of human interaction, visualizing a universal harmonious order in society
Understanding Harmony in the Nature and Existence: Understanding the harmony in the Nature, Holistic perception of harmony at all levels of existence

**UNIT III:**Understanding of Harmony on Professional Ethics: Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems.

**UNIT IV:**Strategy for transition from the present state to Universal Human Order: At the level of individual, at the level of society.
Case studies: typical holistic technologies, management models and production systems

**RECOMMENDED BOOKS**

| S. No | Name | Author(S) | Publisher |
|---|---|---|---|
| 1 | A Foundation Course in Value Education | R R Gaur, R Sangal, G P Bagaria | Excel Books Publishers |
| 2 | Energy & Equity | Ivan Illich | The Trinity Press, Worcester, and HarperCollins, USA |
| 3 | Human Values and Professional Ethics | RishabhAnand | Satya Prakashan, New Delhi |
| 4 | Jeevan VidyaekParichay | A Nagraj | Divya Path Sansthan,Amarkantak. |

| | |
|---|---|
| **Course Code** | **ME309** |
| **Course Title** | **Fluid Mechanics Lab** |
| **type of Course** | PC |
| **L T P** | 0 0 2 |
| **Credits** | 1 |
| **Course Prerequisites** | Fluid Mechanics |
| **Course Objectives (CO)** | To understand the flow of fluid under various circumstances and determine various parameters by expreimentation |
| **Course Outcomes** | The students will able to:<br>1) Estimate the friction and measure the frictional losses in fluid flow.<br>2)Experiment with flow measurement devices like venturimeter and orifice meter.<br>3) Predict the coefficient of discharge for flow through pipes |

**SYLLAB3US**

**1.** To determine the metacentric height of a floating vessel under loaded and unloaded conditions.

**2.** To study the flow through a variable area duct and verify Bernoulli's energy equation.

**3.** To determine the coefficient of discharge for an obstruction flow meter (venturi meter/ orifice meter).

**4.** To determine the discharge coefficient for a V- notch or rectangular notch.

**5.** To study the transition from laminar to turbulent flow and to ascertain the lower critical Reynolds number.

**6.** To determine the hydraulic coefficients for flow through an orifice.

**7.** To determine the friction coefficients for pipes of different diameters.

**8.** To determine the head loss in a pipe line due to sudden expansion/ sudden contraction/ bend.

**9.** To determine the velocity distribution for pipeline flow with a pitot static probe.

**10.** Experimental evaluation of free and forced vortex flow.

| | |
|---|---|
| **Course Code** | **ME 311** |
| **Course Title** | **Automobile Engineering** |
| **Type of Course** | PE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Applied Thermodynamics and Mechanics of Machines |
| **Course Objectives (CO)** | Graduates will gain a strong foundation in core Automobile Engineering, both theoretical and applied concepts. The scope of this program is to impart knowledge to graduating students on the basics of automobiles |
| **Courseoutcomes** | The students will able to:<br>1) Understand the basic lay-out of an automobile.<br>2) Understand the operation of engine cooling, lubrication, ignition, electrical and air conditioning systems.<br>3) Understand the principles of transmission, suspension, steering and braking systems |

**SYLLABUS**

**UNIT-I**

**Introduction:** Basic structure, general layout and type of automotive vehicles, Frameless and unitary construction; position of power unit. IC Engine. Introduction of Internal and external combustion engine and their comparison, four stroke cycle S.I. and C.I. engine, Two stroke engine, Comparison of four stroke and two stroke engines, Comparison of S.I. and C.I. engine, Classification of I.C. engine.

**Fuel Supply System:** Air cleaner and fuel pumps; Air fuel requirements and constructional details of carburettors.Diesel fuel system - cleaning, injection pump, injector and nozzles. Volatility of liquid fuels, Effect of volatility on engine performance for starting, Vapour lock, Acceleration, Percolation, Carburetor icing, and Crank case dilution.

**UNIT-II**

**Combustion:** Determination of stoichometric air fuel ratio, Fuel-air and exhaust gas analysis for a given combustion process. Combustion in S.I. and C.I. engines, Detonation, Pre-ignition, Knocking, Antiknock rating of fuels Octane number, Critical compression ratio.

**Ignition System:** Battery and magneto ignition system and their comparative study, Spark plug heat range,Electronic ignition system, Firing order, Ignition timing, Centrifugal and vacuum ignition advance.

**Cooling System:** Cooling requirement, Air cooling, liquid cooling, T ype of liquid cooling system, Advantage and disadvantage of air cooling and water cooling system, Antifreeze mixture.

**Lubrication System**: Function of lubricating system, Properties of lubricating oil, Wet sump, Dry sump and mist lubrication system. Governing of I C Engine: Necessity of governing,

Various methods of governing.

**UNIT-III**

**Suspension system in automobile: C**onventional and independent suspension systems; shock absorbs and stablizers; wheels and tyres.

**Transmission system:** Basic requirements and standard transmission systems; constructional features of automobile clutch, gear box, differential, front and rear axles; overdrives, propeller shaft, universal joint and torque tube drive; Rear wheel vs front wheel drive, principle of automatic transmission.

**Steering System:** Requirement and steering geometry; castor action, camber and king pin angle, toe-in of front wheels, steering linkages and steering gears; wheel alignment; power steering**.**

**UNIT-IV**

**Braking System:** General braking requirements; Mechanical, hydraulic, vacuum power and servo brakes; Weight transfer during braking and stopping distances.

**Testing and Performance:** Performance parameters, Measurements of brake power, Indicated power, Friction power, Fuel and air consumption, Exhaust gas calorimeter, Calculation of various performance parameter, Heat balance sheet. Performance current for S.I. and C.I. engine with load and speed. Emission and Pollution: SI Engine and CI Engine emissions and its control and comparison. Effect of pollution on Human health and bio sphere**.**

**Recommended Books**

| S.No. | Name | Author(s) | Publisher |
|---|---|---|---|
| 1. | Automotive mechanics | Crouse WH | McGraw Hill |
| 2. | Automotive Mechanics | Heitner J | East West Press |
| 3. | Internal Combustion Engines | R.K.Rajput | Laxmi Publications |
| 4. | Automobile Engg. | R.S.Khurmi | S.Chand |
| 5. | Automobile Engg. | V.P.Singh | Dhanpat rai and Co. |

| | |
|---|---|
| **Course Code** | **ME 313** |
| **Course Title** | **Environmental Pollution and Abatement** |
| **Type of Course** | PE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | None |
| **Course Objectives (CO)** | To understand the various nature of pollutants, sources and effects on human body and nature. |
| **Course Outcomes** | The students will able to:<br>1)Quantify and analyze the pollution load.<br>2) Analyze/design of suitable treatment for wastewater<br>3)Model the atmospheric dispersion of air pollutants |

**SYLLABUS**

**UNIT-I**

Historical perspective. Human respiratory system; effects of pollutants on human health. Classification and sources of pollutants. CO, CO2, O2, N2 cycles, sources and sinks.

**UNIT-II**

Reactions of pollutants in the atmosphere, and their effects; smokes, smog, fog, acid rain and ozone layer. Global warming and its effects. Regulatory laws and standards. Atmospheric lapse rate, inversions and heat balance. Atmospheric diffusion of pollutants, transport, transformation and deposition.

**UNIT-III**

Air sampling and pollutant measurement methods, principles and instruments. Ambient air quality and emission standards. Control principles: removal of gaseous pollutants by absorption, adsorption, chemical reaction and other methods.

**UNIT-IV**

Selective catalytic reduction of NOX, Particulate emission control; settling chambers, cyclone separation, wet collectors, fabric filters and electrostatic precipitators. Clean coal technology and shifted emphasis on non-carbon sources of energy.

**Recommended Books**

| S.No. | Name | Author(s) | Publisher |
|---|---|---|---|
| **1.** | Principles of Pollution Abatement | Sven Erik Jørgensen | Elsevier |
| **2.** | Environmental Pollution and Control | P. R. Trivedi | PH Publishing Corporation |
| **3.** | Advanced Air and Noise Pollution Control | Lawrence K. Wang PhD | Humana Press |

| | |
|---|---|
| **Course Code** | **ME 315** |
| **Course Title** | **Mechanical Handling Systems and Equipment** |
| **Type of Course** | PE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Mechanics of Machines |
| **Course Objectives (CO)** | Graduate engineer should become aware about various Industrial Equipment |
| **Course outcomes** | The students will able to:<br>1)To discuss the material handling equipments & their applications.<br>2)To discuss the different components of material handling systems.<br>3) To study the mechanism used in material handling equipment |

**SYLLABUS**

**UNIT-I**

Types of intraplant transporting facility, principal groups of material handling equipments, choice of material handling equipment, hoisting equipment, screw type, hydraulic and pneumatic conveyors, general characteristics of hoisting machines, surface and overhead equipments, general characteristics of surface and overhead equipments and their applications.

**UNIT-II**

Flexible hoisting appliances like ropes and chains, welded load chains, roller chains, selection of chains hemp rope and steel wire rope, selection of ropes, fastening of chains and ropes, different types of load suspension appliances, fixed and movable pulleys, different types of pulley systems, multiple pulley systems. Chain and rope sheaves and sprockets.

**UNIT-III**

Load handling attachments, standard forged hook, hook weights, hook bearings, cross piece and casing of hook, crane grab for unit and piece loads, carrier beams and clamps, load platforms and side dump buckets, electric lifting magnets, grabbing attachments for loose materials, crane attachments for handling liquid materials.

Arresting gear, ratchet type arresting gear, roller ratchet, shoe brakes and its different types like electromagnetic, double shoe type, thruster operated, controller brakes, shoe brakes, thermal calculations of shoe brakes and life of linings, safety handles, load operated constant force and variable force brakes general theory of band brakes, its types and construction.

**UNIT-IV**

Different drives of hosting gears like individual and common motor drive for several mechanisms, traveling gear, traveling mechanisms for moving trolleys and cranes on runway rails, mechanisms for trackless, rubber-tyred and crawler cranes motor propelled trolley hoists and trolleys, rails and traveling wheels, slewing, jib and luffing gears.

| Recommended Books | | | |
|---|---|---|---|
| **S.No.** | **Name** | **Author(s)** | **Publisher** |
| **1** | Materials Handling Equipment | N. Rudenko | Envee Publishers, New Delhi |
| **2** | Materials Handling Equipment | M.P. Alexandrov | Mie publications, Maskow |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME 302** |
| **Course Title** | **Heat Transfer** |
| **type of Course** | PC |
| **L T P** | 3 1 0 |
| **Credits** | 4 |
| **Course Prerequisites** | Basics of Mechanical Engineering, Applied Thermodynamics, Fluid Mechanics |
| **Course Objectives (CO)** | Graduates will gain a strong foundation in Heat transfer concepts with regards to structure design and applications and also will have an ability to apply the mathematical concepts with regards to thermal engineering.Students will demonstrate the ability to design and conduct experiments,interpret and analyze data, and report results. |
| **Course Outcomes** | The students will able to :<br>1) Understand the basic modes of heat transfer<br>2)Compute temperature distribution in steady-state and unsteady-state heat conduction.<br>3)Understand and analyse heat transfer through extended surfaces |

**SYLLABUS**

**UNIT-I**

**Introduction:** Units ,definition, Basic modes of Heat Transfer, Thermal conductivity of different types of materials, convection heat transfer coefficient, Stefan Boltzman's law of Thermal Radiation

**Conduction:** Fourier's law, conductivity, diffusivity. Heat conduction equation: 1D Heat conduction, General heat conduction equation, Boundary and initial conditions, heat conduction in plane wall, cylinder, sphere, heat transfer from fins. Transient heat conduction: Lumped system analysis, transient heat conduction in large plane walls. Heat diffusion equation in Cartesian co-ordinates, boundary and initial conditions. One dimensional, steady state heat conduction without and with heat generation through plane slabs, cylinders and spheres, Concept of thermal resistance, Electrical analogy. Heat transfer through composite slabs, cylinders and spheres, contact resistance. Critical thickness of insulation for cylinder and sphere. Steady, fin effectiveness and fin efficiency.

**UNIT-II**

**Multi-dimensional Steady State Heat Conduction:** Two-dimensional steady state conduction, analytical solution, conduction shape factor, Unsteady State Heat Conduction, Transient conduction in solids with negligible internal temperature gradients (lumped parameter), Biot number and Fourier number. One-dimensional transient conduction in slab and radial systems: exact solutions, types of fin, heat flow through rectangular fin, infinitely long fin, fin insulated at the tip and fin losing heat at the tip, Estimation of error in temperature measurement in a thermometer well.

**Convection:** Flow over a body, velocity and thermal boundary layers, drag-co-efficient and heat transfer coefficient. Flow inside a duct; hydrodynamics and thermal entry lengths; fully developed and developing flow. Use of various correlations in forced convection heat transfer, flow over a flat plate,

and flow across a single cylinder and tube bundles. Free convection heat transfer from Vertical surface and vertical cylinder, horizontal surface and horizontal cylinders. theory of Free and forced convection.

**UNIT-III**

**Heat Exchangers:** Heat exchanger types, flow arrangements, overall heat transfer coefficient, fouling factor, LMTD for parallel flow and counter flow heat exchangers. Effectiveness-NTU method, expression for effectiveness of a parallel flows and counter flow heat exchangers. Multi-pass and cross flow heat exchangers.

**Boiling and Condensation:** Different regimes of boiling Pool boiling, forced convection boiling, heat transfer during pool boiling of a liquid. Nucleation and different theories of nucleation, different theories accounting for the increased values of h.t.c. during nucleate phase of boiling of liquids; different phases of flow boiling (theory only)

**UNIT-IV**

**Radiation:** Definitions, concept of black body, Kirchhoff's law, Lambert Cosine law, Stefan Boltzmann's law, Planck's distribution law, Wien's displacement law, configuration factor, Radiation heat exchange between two parallel plates, radiation shielding, radiation heat exchange in an enclosure .

**Mass Transfer:** Fick's law of definition, mass transfer coefficient, Evaporation of water in air, Schmidt number, Sherwood number

**Recommended Books**

| S.No. | Name | Author(s) | Publisher |
|---|---|---|---|
| 1. | Fundamentals of Heat and Mass transfer | DS Kumar | SK Kataria and Sons, Delh |
| 2. | A Course in Heat and Mass Transfer | S Domkundwar | Dhanpat rai & Sons,Delhi |
| 3. | Heat transfer | J P Holmans | Mcgraw hill London |
| 4. | Heat Transfer | AJ Chapman | Macmillan Publishing Company, New York |

| | |
|---|---|
| **Course Code** | **ME304** |
| **Course Title** | **Machine Design - II** |
| **type of Course** | PC |
| **L T P** | 4 1 0 |
| **Credits** | 5 |
| **Course Prerequisites** | Strength of Materials , Theory of machine, Machine drawing . Machine Design I |
| **Course Objectives (CO)** | Understand the selection/ Design of each of the transmission components |
| **Course Outcomes** | The students will able to :<br>1) Understand the concepts of principal stresses, theories of failure, stress concentration and fatigue loading.<br>2) Design shafts, couplings and gears.<br>3) Analyze the pressure distribution and design journal bearings. |

**SYLLABUS**

**UNIT-I**

Transmission Drives: Belt and rope drives: Basics, Characteristics of belt drives, selection of flat belt, Design of Flat belt, V-belt and rope (steel wire), Design of the pulley for the same

Chain Drives: Basics, Roller chains, polygonal effect, power rating, selection of chain Gear drives: Standard system of gear tooth and gear module, gear tooth failure, strength of gear tooth, terminology of spur, helical, bevel, worm and worm wheel, Design of spur, helical, straight bevel gears, worm and worm wheel

**UNIT-II**

Bearings: Slider: Principle of hydrodynamic lubrication, modes of lubrication, Reynolds equation, bearing performance parameters, slider bearing design Roller: Types, selection guidelines, static and dynamic load carrying capacity, Stribeck's equation, equivalent bearing load, load life relationship, selection of bearing, comparison of roller and slider bearing.

**UNIT-III**

Design of Flywheel: Introduction, Energy stored in a flywheel, stresses in a rim, design considerations Clutches: Design of contact clutches i.e. plate, multi-disc, cone and centrifugal clutches.

**UNIT-IV**

Springs: Types; end styles of helical compression spring; stress and deflection equation; surge in spring; nipping of leaf spring; Design of close-coil helical spring and multi leaf spring

**Recommended Books**

| S.No. | Name | Author(s) | Publication |
|---|---|---|---|
| **1** | Machine Design | by Shigley | Tata McGraw hill |
| **2** | Machine Design | Juvinal, John | Wiley Publishers |
| **3** | Machine Design | Spots, | Prentice hall |
| **4** | Machine Design | Norton, | Prentice Hall |
| **5** | Machine Design | Khurmi | S. Chand |

UNIVERSITY
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME318** |
| **Course Title** | **Computer Aided Design and Manufacturing** |
| **Type of Course** | PC |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisit** | Computer graphics, Design process, 2D & 3D Modelling, computer aided processes |
| **Course Objectives (CO)** | To study advanced features of computer aided design and manufacturing so as to be capable of accepting professional responsibilities and to understand the associativity between design and manufacturing |
| **Course Outcomes** | The students will able top:<br>1)Analyze factors influencing network design<br>2) Develop mathematical models to represent curves and surfaces.<br>3)Model engineering components using solid modelling techniques. |

**SYLLABUS**

**UNIT-I**

**Fundamentals of CAD:** Design process with and without computer; CAD/CAM system and its evaluation criteria, brief treatment of input and output devices, Display devices; Functions of a graphics package and Graphics standard GKS, IGES and STEP; Modeling and viewing; Application areas of CAD.

**Geometric Transformations:** Mathematics preliminaries, matrix representation of 2 and 3 dimensional transformation: Concatenation of transformation matrices. Application of geometric transformations.

**UNIT-II**

**Geometric Modeling:** Wireframe model: solid modeling: Boundary Representation (B-rep), Constructive Solid Geometry (CSG), Parametric Modeling Technique ; Mass, volumetric properties calculations; surface modeling, concepts of hidden-line removal and shading: Mechanical Assembly Kinematics analysis and simulation.

**Representation of curves and surfaces:** Non-parametric and parametric representation of curves. Parametric representation of Hermite Cubic, Beizer and B-spline curves; Surface and its analysis. Representation of Analytical and synthetic surfaces.

**UNIT-III**

**Overview of FEM**: Advantages and applications, recent advance in FEM, FEA software Basic

principles and general procedure of FEM.

**Group Technology (GT):** Part families; part classification and coding system: Group technology machine cells: Advantages of GT.

**Computer Aided Process Planning**: Introduction and benefits of CAPP. Types of CAPP systems, machinability, data selection systems in CAPP.

**UNIT-IV**

**Computer Integrated Manufacturing Systems:** Basic Concepts of CIM: CIM Definition, The meaning of Manufacturing, Types of Manufacturing systems; Need, Elements, Evolution of CIM; Benefits of CIM; Flexible Manufacturing Systems: Physical Components of an FMS. Types of Flexibility, Layout Considerations; FMS benefits.

**NC/CNC Machine Tools:** NC machine tools- basic components, coordinate systems; features of NC machine tools. Computerized Numerical Control (CNC): Tooling for NC machines - tool presetting equipment, flexible tooling, tool length compensation, tool path graphics; NC motion control system; Manual part programming, fixed/floating zero. Block format and codes: Computer assisted part programming. DNC and Adaptive Control: Direct numerical control: Adaptive control in machining system; Combined DNC/CNC system.

| **Recommended Books** | | | |
|---|---|---|---|
| **S.No.** | **Name** | **Author(s)** | **Publisher** |
| **1.** | CAD/CAM | Mikell P. Groover, Emory W. Zimmers | PHI |
| **2.** | Computer Integrated Design and Manufacturing | D.D. Bedworth, M.R Henderson & P.M. Wolfe | Tata McGraw Hill |
| **3.** | CAD/CAM THEORY AND CONCEPTS | KULDEEP SAREEN & CHANDANDEEP GREWAL | S.CHAND |
| **4.** | CAD/CAM | P. N Rao | Tata McGraw Hill |
| **5.** | Computer aided manufacturing (CAM) | C. Elanchezhian, G. Shanmuga Sundar | Firewall Media |

| | |
|---|---|
| **Course Code** | **ME 306** |
| **Course Title** | **Industrial Metrology** |
| **type of Course** | PC |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Basics of electronics and electrical engineeing |
| **Course Objectives (CO)** | Main objective of the metrology is to introduce the students about the measuring instruments and the methods for measurement. |
| **Course Outcomes** | The students will able to :<br><br>1)Identify techniques to minimize the errors in measurement.<br>2)Identify methods and devices for measurement of length, angle, gear & thread parameters, surface roughness and geometric features of parts.<br>3)Comprehend speed and feed mechanisms of machine tools. |

**SYLLABUS**

**UNIT-I**

**Basic Concepts of Measurements & Metrology:** Introduction, Meaning, Necessity and Objectives of measurements & metrology; Generalized Measurement system; Performance Characteristics –static & dynamic characteristics of instruments, types of measurement system, Standards of Measurement, Selection and Care of instruments; Standardizing organizations; Limits, fits & tolerances; Instrumental errors, sources & its statistical analysis.

**Linear and Angular Measurements:** Introduction & classification of Linear Measuring Instruments; Least count; Vernier Calliper, Vernier Height Gauge, Vernier Depth Gauge, Micrometers: principle, types, construction, Sources of errors and precautions to be taken, Dial indicators: construction & working; comparators; calibration of various linear measuring instruments; Introduction, Working principle & construction of Angular Measuring instruments like Protractors, Sine bars, Sine centre, Angle gauges, Spirit level, Clinometers; Applications, Advantages & limitations of commonly used linear & angular measuring instruments.

**UNIT-II**

**Screw Thread and Gear Measurements:** Introduction & classification of Threads; Elements, Specification & forms of Screw Threads; Various Methods for measuring elements of External & Internal Screw Thread; Screw Thread Gauges; Errors in Threads; Introduction & Classification of gears; Forms of gear teeth; Gear tooth terminology; Measurement and testing of spur gear: Various methods of measuring tooth thickness, tooth profile & pitch; Gear Errors.

**Measurement of Surface Finish, Straightness, Flatness:** Introduction; Surface Texture; Methods of Measuring Surface finish- Comparison Methods & Direct Instrument Measurement, Talysurf method; Measurement of Straightness, Flatness by Interferometry, Tool makers microscope.

**UNIT-III**

**Functional Elements:** Introduction of electromechanical sensors & transducers; Resistance strain gauge; Gauge Factor; Bonded & Unbounded strain gauges; Temperature Compensation.

**Temperature Measurement:** Thermal expansion methods- Bimetallic thermometers, Liquid in glass and filled-in-system thermometers; Metal resistance thermometers and Thermistors; Pyrometers; Calibration of temperature measuring instruments.

**UNIT-IV**

**Pressure and Flow Measurement:** Bourdon tube, Mcleod gauge, Thermal conductivity gauge, Ionisation gauge; Dead weight gauge tester; Ultrasonic flow meter, Hot wire anemometer, Flow visualization techniques

**Miscellaneous (Speed, Force, Torque and Shaft Power) Measurement :** Mechanical tachometers, Vibration reed tachometer and Stroboscope; Proving ring, Hydraulic and Pneumatic load cells, Torque on rotating shafts; Absorption, Transmission and driving dynamometers.

**Recommended Books**

| S.No. | Name | Author(s) | Publisher |
|---|---|---|---|
| **1.** | Measurement System: Application and Design | E.O Doebelin | Tata McGraw Hill Publishing Company Limited, New Delhi |
| **2.** | Experimental Methods for Engineers | J.P Holman | McGraw Hill |
| **3.** | Mechanical Measurement and Control, | D.S Kumar | Metropolitan Book Co |
| **4.** | Engineering Metrology | R.K Jain | Khanna Publishers |
| **5.** | Mechanical Measurements and Instrumentation | Er. R.K. Rajput | S. K. Kataria & Sons |

SBBSU UNIVERSITY KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME308** |
| **Course Title** | **Heat Transfer Lab** |
| **Type of Course** | PC |
| **L T P** | 0 0 2 |
| **Credits** | 1 |
| **Course Prerequisites** | Applied Thermodynamics and Fluid Mechanics. |
| **Course Objectives (CO)** | This Lab gives insight to study of conduction, convection and radiation processes and their applications along with insight on the coefficient of heat transfer associated with it and knowledge of flow of heat in fins. |
| **Course Outcomes** | The students will able to:<br>1)Estimate heat transfer coefficient in forced convection.<br>2)Estimate the effective thermal resistance in composite slabs and efficiency in pin<br>3)Measure heat transfer coefficient in free convection and correlate with theoretical values |

**SYLLABUS**

1. Determination of thermal conductivity of insulating powder material by concentric spheres method.

2. Determination of thermal conductivity of a metal rod.

3. Determination of coefficient of heat transfer for free/forced convection from the surface of a cylinder / plate when kept:
a) along the direction of flow

4. To plot the pool boiling curves for water and to determine its critical point

5. Determination of heat transfer coefficient for
i) film condensation ii) drop-wise condensation

6. Determination of shape factor of a complex body.

7. To plot the temperature profile and to determine fin effectiveness and fin efficiency for pin fin open to atmosphere.

| | |
|---|---|
| **Course Code** | **ME310** |
| **Course Title** | **Industrial Metrology Lab** |
| **type of Course** | PC |
| **L T P** | 0 0 2 |
| **Credits** | 1 |
| **Course Prerequisites** | Manufacturing Technology |
| **Course Objectives (CO)** | This Lab gives insight to the use of different instruments to measure roughness, effective diameter, calibration of pressure guage and use of stroboscope for the measurement of speed of shaft. |

**SYLLABUS**

1. Measurement of an angle with the help of sine bar
2. Measurement of surface roughness of a machined Plate, Rod and Pipe
3. Measurement of gear elements using profile projector
4. Measurement of effective diameter of external threads using Three wire method
5. Measurement of thread element by Tool makers microscope
6. Calibration of a pressure guage with the help of a dead weight guage tester
7. Use of stroboscope for measurement of speed of shaft

SANT BABA BHAG SINGH UNIVERSITY
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME312** |
| **Course Title** | **Design Software Lab** |
| **Type of Course** | PC |
| **L T P** | 0 0 2 |
| **Credits** | 1 |
| **Course Prerequisites** | Computer graphics, Machine Drawing. |
| **Course Objectives (CO)** | • Gaining a working knowledge of CAD solid modeling (SolidWorks).<br>• Theoretical concepts of engineering graphics, including orthographic projection, auxiliary views and sectioning, and geometric dimensioning and tolerance. . |
| **Course outcomes** | The students will able to:<br>1) Recognize the errors associated with measuring instruments<br>2)Calibrate gauges and measuring instruments.<br>3)Demonstrate the methods of measurement for various instruments and gauges. |

**SYLLABUS**

**The students will be required to carry out the following exercises using software packages (e.g. 3D modeling package/ solid works etc)**

I. Introduction to modeling (using any CAD software):

1. 2D drawing using sketcher – 2 Drawings

2. 3D modeling using 3D features (Modeling of Crane Hook, Bench Vice, Screw Jack components)

3. Assembling and drafting (any 2 above mentioned assemblies) with proper mating conditions and interference checking.

4. Surface modeling – (Computer mouse, Plastic bottles with spraying Nozzle)

II. Computer Aided Manufacturing:

1. Manual part programming on CNC Lathe and CNC Milling – (4 programs, 2 for each)

2. List of all CNC codes to be used while making a CNC programme.

| | |
|---|---|
| **Course Code** | **ME401** |
| **Course Title** | **Fluid Machinery** |
| **type of Course** | PC |
| **L T P** | 3 1 0 |
| **Credits** | 4 |
| **Course Prerequisites** | Fluid Mechanics |
| **Course Objectives (CO)** | To get knowledge about the working of hydraulic machinery, At the end of course the student will have Knowledge regarding basics of the hydro-machinery and the components, function and use of different types of turbines and pumps. Student will be able to design various components of pumps and turbines, study their characteristics plan hydraulic similitude studies. |
| **Course Outcomes** | The Students will able to<br>1)Analyze and design free surface and pipe flows<br>2)Formulate and solve one dimensional compressible fluid flow problems.<br>3)Design the working proportions of hydraulic machines. |

**SYLLABUS**

**UNIT-I**

**General Concepts**: Impulse momentum principle; jet impingement on stationary and moving flat plates, and on stationary or moving vanes with jet striking at the centre and tangentially at one end of the vane; calculations for force exerted, work done and efficiency of jet. Basic components of a turbo machine and its classification on the basis of purpose, fluid dynamic action, operating principle, geometrical features, path followed by the fluid and the type of fluid etc. Euler's equation for energy transfer in a turbo machine and specifying the energy transfer in terms of fluid and rotor kinetic energy changes.

**UNIT-II**

**Pelton Turbine**: Component parts and operation; velocity triangles for different runners, work output; Effective head, available power and efficiency; design aspects such as mean diameter of wheel, jet ratio, number of jets, number of buckets with working proportions

**Francis and Kaplan Turbines**: Component parts and operation velocity triangles and work output; working proportions and design parameters for the runner; Degree of reaction; Draft tubes - its function and types. Function and brief description of commonly used surge tanks, Electro- Mechanical governing of turbines

**UNIT-III**

**Centrifugal Pumps:** Layout and installation; Main elements and their functions; Various types and classification; Pressure changes in a pump - suction, delivery and manometric heads; vane

shape and its effect on head-capacity relationships; Departure from Euler's theory and losses; pump output and efficiency; Minimum starting speed and impeller diameters at the inner and outer periphery; Priming and priming devices, Multistage pumps - series and parallel arrangement; submersible pumps. Construction and operation; Axial and mixed flow pumps; Trouble shooting - field problems, causes and remedies.

**Similarity Relations and Performance Characteristics**: Unit quantities, specific speed and model relationships, scale effect; cavitation and Thoma's cavitation number; Concept of Net Positive Suction Head (NPSH) and its application in determining turbine / pump setting

**Reciprocating Pumps**: Components parts and working; pressure variations due to piston acceleration; acceleration effects in suction and delivery pipes; work done against friction; maximum permissible vacuum during suction stroke; Air vessels.

**UNIT-IV**

**Hydraulic Devices and Systems**: Const., operation and utility of simple and differential accumulator, intensifier, fluid coupling and torque converter, Air lift and jet pumps; gear, vane and piston pumps, Hydraulic Rams

**Recommended Books**

| S.No. | Name | Author(s) | Publisher |
|---|---|---|---|
| 1 | Hydraulic Turbines | R.L. Daughaty | McGraw Hill |
| 2 | A Textbook of Fluid Mechanics and Hydraulic machines | R.K. Bansal | Laxmi Publications |
| 3 | Hydraulic Machines | Jagdish Lal | Metropolitan Book Co |
| 4 | D.S. Kumar | Fluid Mechanics and Fluid Power Engineering | SK Kataria and Sons |
| 5 | Hydraulic Machines | K. Subramaniam | Tata Mc Graw Hill |
| 6 | Hydraulic Machines | R.K. Purohit | Scientific Publishers |

KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME405** |
| **Course Title** | **Fluid Machinery Lab** |
| **type of Course** | PC |
| **L T P** | 0 0 2 |
| **Credits** | 1 |
| **Course Prerequisites** | Fluid Mechanics |
| **Course Objectives (CO)** | To understand the working of machines that utilizes the flow of fluid so as to convert fluid energy to mechanical energy |

**SYLLABUS**

1. Determination of various efficiencies of Hydraulic Ram
2. To draw characteristics of Francis turbine/Kaplan Turbine
3. To study the constructional features of reciprocating pump and to perform test on it for determination of pump performance
4. To draw the characteristics of Pelton Turbine
5. To draw the various characteristics of Centrifugal pump
6. Determine the effect of vane shape and vane angle on the performance of centrifugal fan/Blower.

SANT BABA BHAG SINGH UNIVERSITY SBBSU KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME413** |
| **Course Title** | **Industrial Automation & Robotics** |
| **Type of Course** | PE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Fluid Mechanics |
| **Course Objectives (CO)** | The course aims at providing the knowledge of fluid power and methods to control the fluid power in a hydraulic or pneumatic circuit, application of fluid power to logic gate circuits, basic knowledge of robotics. |
| **Course Outcomes** | The students Will abe to:<br>1)Enumerate principles, strategies and advantages of industrial automation<br>2)Differentiate types of robots and robot grippers.<br>3)Understand the basic components of robots. |

**SYLLABUS**

**UNIT-I**

**Introduction:** Concept and scope of automation, Socio economic impacts of automation, Types of Automation, Low Cost Automation.

**Fluid Power:** Fluid power control elements, Standard graphical symbols, Fluid power generators; Hydraulic and pneumatic Cylinders - construction, design and mounting; Hydraulic and pneumatic Valves for pressure, flow and direction control.

**UNIT-II**

**Basic hydraulic and pneumatic circuits:** Direct and Indirect Control of Single/Double Acting Cylinders; Designing of logic circuits for a given time displacement diagram & sequence of operations, Hydraulic & Pneumatic Circuits using Time Delay Valve & Quick Exhaust Valve; Memory Circuit & Speed Control of a Cylinder, Troubleshooting and "Causes & Effects of Malfunctions", Basics of Control Chain, Circuit Layouts, Designation of specific Elements in a Circuit.

**UNIT-III**

**Fluidics:** Boolean algebra, Truth Tables, Logic Gates, Conda effect.

**Electrical and Electronic Controls:** Basics of Programmable logic controllers (PLC), Architecture & Components of PLC, Ladder Logic Diagrams.

**UNIT-IV**

**Transfer Devices and feeders:** Classification, Constructional details and Applications of Transfer devices, Vibratory bowl feeders, Reciprocating tube, Centrifugal hopper feeders.

**Robotics:** Introduction, Classification based on geometry, control and path movement, Robot

Specifications, Robot Performance Parameters, Robot Programming, Machine Vision, Teach pendants, Industrial Applications of Robots.

| **Recommended Books** | | | |
|---|---|---|---|
| **S.No.** | **Name** | **Author(s)** | **Publisher** |
| **1** | Fluid Power with applications | Anthony Esposito | Pearson |
| **2** | Robotic Technology and Flexible Automation | S. R Deb | Tata Mc Hill |
| **3** | Pneumatic Control | S. R Majumdar | McGraw Hill |
| **4** | Introduction to Robotics | Saeed B. Niku | Wiley India |
| **5** | Robotics | Ashitava Ghosal | Oxford |

SANT BABA BHAG SINGH UNIVERSITY
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME415** |
| **Course Title** | **Management of Supply Chain** |
| **Type of Course** | PE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Industrial Engineering |
| **Course Objectives (CO)** | Graduate engineer should become aware of supply chain concepts, relation between supplier and organisations. |
| **Course Outcomes** | The students Will able to:<br>1)Understand the decision phases and apply competitive & supply chain strategies.<br>2)Understand drivers of supply chain performance.<br>3)Analyze factors influencing network design. |

**SYLLABUS**

**UNIT-I**

**Introduction:** Objectives of supply chain Management, key components of supply chain i.e. sourcing, distribution strategy, customer service strategy; supply chain Management as Integrated logistics, generic activities, architecture of supply chain, future potential of supply chain Management.

**UNIT-II**

**Corporate Profitability:** Link to supply chain, evaluation of SCM strategies, customer focus in SCM, inventory and logistic Management, vendor Management, justin- time (JIT).

**UNIT-III**

**Quality Management:** Inherent link to SCM: Suppliers development, distribution channel, re-engineering of supply chain, IT – enabled supply chain: Electronic data interchange, enterprise resource planning, implementation of IT, Scope of emerging distributed cooperative tele-manufacturing over internet.

**UNIT-IV**

**Organizational Issues:** Application of knowledge Management for effectiveness SCM, social interactions and linking of functional units in a supply chain, Combined core competency of SC: Global sourcing, technology and tools – essential enablers, framework for managing knowledge intensive supply chian. Recent Trends in SCM: Tierisation of supplies, Reverse

logistics, JIT II.

| Recommended Books | | | |
|---|---|---|---|
| **S.No.** | **Name** | **Author(s)** | **Publisher** |
| 1 | Supply Chain Management | Chopra | Pearson Education Asia, New Delhi |
| 2 | Logistics and Supply Chain Management | Christopher | Pearson Education Asia, New Delhi |
| 3 | Manufacturing Operations and Supply Chain Management | Taylor & Brunt | Business Press Thomson Learning N.Youk. |
| 4 | Purchasing and Supply Chain Management | Arjan J. Van Weele | Engineering, Business Press, Thomson Learning N.Youk. |

SANT BABA BHAG SINGH UNIVERSITY
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME417** |
| **Course Title** | **Introduction to Mechatronics** |
| **Type of Course** | PE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Basics of Electronics Engineering, Industrial automation and robotics |
| **Course Objectives (CO)** | The primary objective of mechatronics is to integrate the mechanical systems with electrical, electronics and computer systems and to provide multidisciplinary approach to product development and manufacturing system design. As a discipline mechatronics encompasses electronics enhancing mechanics and electronics replacing mechanics. |
| **Course Outcomes** | The students will able to :<br>1) |

**SYLLABUS**

**UNIT-I**

**Introduction:** What is Mechatronics, Systems, Measurement Systems, Control Systems, Microprocessor- based controllers, The Mechatronics Approach.

**Sensors & Transducers:** Sensors and Transducers, Performance Terminology, (Displacement, Position & Proximity Sensors),(Velocity & Motion, Force, Fluid Pressure, Liquid Flow, Liquid Level, Temperature & Light Sensors), Selection of Sensors.

**UNIT-II**

**Electronic Fundamentals:** Signal Conditioning Process, Operational Amplifier, Digital Logic, Logic Gates, Boolean Algebra, Data Acquisition Systems, Measurement Systems, Testing and Calibration.

**Actuators:** Mechanical Actuation Systems, Hydraulic & Pneumatic Actuation Systems, Electrical Actuation Systems, A.C. Motor, D.C. Motor, Stepper Motor.

**UNIT-III**

**System Modelling & Control:** Mathematical Models, Engineering Systems, Electromechanical & Hydraulic- Mechanical Systems, Modelling Dynamic Systems, Transfer Functions, Introduction to MATLAB & SIMULINK, Control Modes, PID Controller.

**UNIT-IV**

**Microprocessor & Computer:** Computer and Interfacing, Microcomputer Structure, Microcontrollers, Application of Microcontrollers, PLC.

**Design & Mechatronics:** Designing, Possible Design Solutions, Case Studies of Mechatronic Systems.

**Recommended Books**

| S.No. | Name | Author(s) | Publisher |
|---|---|---|---|
| **1.** | Analytical Robotics and mechatronics. | Wolfram Stadler | McGraw Hill |
| **2.** | Mechatronics | Dan Necsulescu, | Pearson Education Asia |
| **3.** | Introduction to Digital Computer Electronics | A.P. Mahind | McGraw Hill |
| **4.** | Measurement Systems | E.O. Doeblin | McGraw Hill |

| | |
|---|---|
| **Course Code** | ME419 |
| **Course Title** | Finite Element Method |
| **Type of Course** | PE |
| **L T P** | 3 1 0 |
| **Credits** | 4 |
| **Course Prerequisites** | The pre-requisites for FEM are Strength of Materials and Engineering Mathematics |
| **Course Objectives (CO)** | The aims of this module are: To provide an understanding of fundamental knowledge and technique of FEM |
| **Course Outcomes** | The students will able to:<br>1)Apply finite element method to solve problems in solid mechanics, fluid mechanics and heat transfer<br>2) Formulate and solve problems in one dimensional structures including trusses, beams and frames.<br>3)Formulate FE characteristic equations for two dimensional elements and analyze plain stress, plain strain, axi-symmetric and plate bending problems |

**SYLLABUS**

**UNIT-I**

**Introduction**- Field Conditions, Boundary conditions, Approximate solutions.

**Basic Principles of structural Mechanics**- Equilibrium conditions, Strain displacement relations, Linear constitutive relations, Principle of virtual work, Energy principles, Application to finite element method.

**UNIT-II**

**Element Properties**- displacement models, Relation between the nodal degrees of freedom and generalized coordinates, convergence requirements, Natural coordinate systems, Shape functions (interpolation functions), element strains and stresses, Element stiffness matrix, Static condensation

**Isoparametric Elements**- Two- dimensional Isoparametric elements, computation of stiffness matrix for isoparametric elements, convergence criteria for isoparametric element

**UNIT-III**

**Direct Stiffness Method of Analysis** and Solution Technique- Assemblage of elements-direct stiffness method, Gauss elimination and matrix decomposition.

**Analysis of Framed Structures**- Two dimensional truss element, Three dimensional truss-element, Tree dimensional beam element

**UNIT-IV**

**Plane Stress and Plane Strain analysis**- Triangular elements, Rectangular elements,

Isoparametric elements, Incompatible displacement models. Application of FEM to Heat conduction problems

| **Recommended Books** | | | |
|---|---|---|---|
| **S.No.** | **Name** | **Author(s)** | **Publisher** |
| **1** | Finite Element Analysis | C S Krishnamoorthy | Tata McGraw-Hill Education |
| **2** | Finite Element Method | Desai and Abel | CRC Press |
| **3** | Finite element Method | Zienkiewics | |
| **4** | Concepts and Applications of Finite Element analysis | Cook | |
| **5** | Basic Programs in Finite Element Method | David K Brown | |

SANT BABA BHAG SINGH UNIVERSITY
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME421** |
| **Course Title** | **Mechanical Vibrations** |
| **type of Course** | PE |
| **L T P** | 3 1 0 |
| **Credits** | 4 |
| **Course Prerequisites** | Theory of Machines, Strength of Materials |
| **Course Objectives (CO)** | 1. Explain the concepts and dynamic modelling methods of multi-rigid body systems and flexible body systems through theoretical derivation, explanation, demonstrations and the setting of tasks that exemplify what has been taught<br>Demonstrate proficiency in obtaining analytical and numerical solutions<br>3. Apply skills in instrumentation, measurement and signal processing - through vibration testing for several physical, mechanical and structural systems<br>4. Apply the learned vibration theory to solve engineering problems. |
| **Course outcomes** | The students will able to:<br>1)Understand the causes and effects of vibration in mechanical systems.<br>2)Develop schematic models for physical systems and formulate governing equations of motion.<br>3)Understand the role of damping, stiffness and inertia in mechanical systems |

**SYLLABUS**

**UNIT-I**

**Introduction:**Basic concepts, Types of vibration, Periodic & Harmonic vibrations, Methods of vibration analysis, Beats

**UNIT-II**

**Vibration of Single Degree of Freedom System:**

Undamped free vibrations, damped free vibrations and damped force vibration system, Equilibrium and energy methods for determining natural Frequency; Rayleigh's method, free vibrations of system with viscous damping, over damped, critically and under damped systems, Equivalent stiffness of spring combination, Estimation of damping by decay plots, logarithmic decrement

**Forced vibration**

Sources of Excitation, Response of an undamped, damped, unbalance rotating-reciprocating systems, base and support excitation under Harmonic force, vibration isolators, transmissibility, whirling of shaft, Vibration exciters and pickups.

**UNIT-III**

**Two degrees of Freedom systems:** a) Principal modes of vibrations, natural frequencies, amplitude ratio, undamped free, damped free, forced harmonic vibration, semi-definite systems, combined rectilinear & angular modes; Lagrange's equation.

b) Application to un-damped and damped absorbers: Vibration absorber – principle; centrifugal pendulum vibration absorber, torsional vibration damper, Torsionally equivalent shaft and Langrange's Equations to form equation of motion of vibrating body.

**Multi-degree of freedom systems:**

Undamped free vibrations, stiffness and flexibility influence coefficients, Generalised coordinates, orthogonality

principal, matrix iteration method, Rayleigh and Dunkerley, Eigen values and eigen vectors

**UNIT-IV**

**Continuous systems:**

Lateral vibrations of a string, longitudinal vibrations of bars, transverse vibrations of beams,Euler's equation of motion for beam vibration, natural frequencies for various end conditions,torsional vibration of circular shafts

**Recommended Books**

| S.No. | Name | Author(s) | Publisher |
|---|---|---|---|
| 1 | The Science and Engineering of Materials | D.K. Bhattacharya, | Cengage Learning |
| 2 | Physical Metallurgy | Vijendra Singh | Y. Lakhin , Engineering Physical Metallurgy, Mir Publishers. |
| 3 | Heat Treatment of Metals | B. Zakharov | University Press. |
| 4 | Physical Metallurgy: Principles and Practice | V. Raghavan | PHI Learning. |
| 5 | Engineering Physical Metallurgy | Y. Lakhin | Mir Publishers. |

SANT BABA BHAG SINGH UNIVERSITY SBBSU KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME423** |
| **Course Title** | **Computational Fluid dynamics** |
| **Type of Course** | PE |
| **L T P** | 3 1 0 |
| **Credits** | 4 |
| **Course Prerequisites** | Fluid dynamics, Fluid dynamics, heat transfer, Engineering Mathematics. |
| **Course Objectives (CO)** | To impart the knowledge of two dimensional heat flow concepts, FDM, viscous flow and application of CFD in the fields of industrial, civil, automobile and environmental to students. |
| **Course outcomes** | The students will able to :<br>1)Develop mathematical models for flow phenomena.<br>2)Analyze mathematical and computational methods for fluid flow and heat transfer simulations.<br>3)Solve computational problems related to fluid flows and heat transfer |

**SYLLABUS**

**UNIT-I**

Governing Differential Equations and Finite Difference Method- Classification of PDEs - Initial and Boundary conditions - Initial and Boundary value problems - Finite difference method - Central, Forward, Backward difference for a uniform grid – Central difference expressions for a non-uniform grid - Numerical error - Accuracy of solution – Grid independence test.

**UNIT-II**

Conduction Heat Transfer- Applications of Heat conduction - Steady and Unsteady conductions - One dimensional steady state problems - Two dimensional steady state problems - Three dimensional steady state problems - Transient one dimensional problems.

Convection Heat Transfer- Introduction - Steady one dimensional Convection Diffusion - Unsteady one. Dimensional Convection – Diffusion – Unsteady two dimensional Convection - Diffusion.

**UNIT-III**

Incompressible Fluid Flow- Introduction - Governing equations - Difficulties in solving Navier- Stokes equation - Stream function - Vorticity method - In viscid flow (steady) - Determination of pressure for viscous flow.

**UNIT-IV**

Applications of Computational Fluid Dynamics- Computer graphics in CFD - Future of CFD - Enhancing the design process - understanding - Applications - Automobile, Engine, Industrial, Civil, Environmental.

**Recommended Books**

| S.No. | Name | Author(s) | Publisher |
|---|---|---|---|
| 1. | Computational Fluid flow and Heat Transfer | Muralidhar, K., and Sundararajan, T | Narosa Publishing House. |
| 2. | Computer simulation of flow and heat transfer | Ghoshdasdidar, P.S | Tata McGraw – Hill, New Delhi |
| 3. | Computational fluid mechanics and Heat Transfer | Anderson, D. A., Tannehill, J. L | Hemisphere Publishing Corporation |

| | |
|---|---|
| **Course Code** | **ME403** |
| **Course Title** | **Refrigeration & Air Conditioning** |
| **Type of Course** | PC |
| **L T P** | 3 1 0 |
| **Credits** | 4 |
| **Course Prerequisites** | Applied Thermodynamics & Heat Transfer |
| **Course Objectives (CO)** | Provide broad study of refrigeration process in different systems. Its applications in Aircraft system and study of human comfort and Load Estimation. |
| **Course Outcomes** | The students will able to :<br>1)Understand the principles and applications of refrigeration systems.<br>2)Understand vapour compression refrigeration system and identify methods for performance improvement.<br>3)Analyze air-conditioning processes using the principles of psychometric. |

**SYLLABUS**

**UNIT I**

**Introduction And Basic Cycles Of Refrigeration:** Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect & C.O.P. Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Aircraft refrigeration system, Classification of aircraft refrigeration system. Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature (DART).

**UNIT II**

**Vapour Compression Refrigeration System:** Single stage system, Analysis of vapour compression cycle, Use of TS and PH charts, Effect of change in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P of the cycle, Actual vapour compression refrigeration cycle, Multistage vapour compression system requirement, Removal of flash gas, Intercooling, Different configuration of multistage system, Cascade system.

**UNIT III**

**Vapour Absorption Refrigeration System:** Working Principle of vapour absorption refrigeration system, Comparison between absorption & compression systems, Elementary idea of refrigerant absorbent mixtures, Temperature – concentration diagram & Enthalpy – concentration diagram, Adiabatic mixing of two streams, Ammonia – Water vapour absorption system, Lithium-Bromide water vapour absorption system, Comparison. Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants, SecondaryRefrigerants and CFC free refrigerants

**UNIT IV**

**Air Conditioning and Load Estimation:** Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes, Thermal analysis of human body, Effective temperature and comfort chart, Cooling and heating load calculations, Selection of inside & outside design conditions, Heat transfer through walls & roofs, Infiltration & ventilation, Internal heat gain, Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), Apparatus dew point (ADP). Elementary knowledge of refrigeration & air conditioning equipments compressors, condensers, evaporators & expansion devices, Air washers, Cooling, towers & humidifying efficiency, Food preservation, Cold storage, Refrigerates Freezers, Ice plant, Water coolers, Elementary knowledge of transmission and distribution of air through ducts and fans, Basic difference between comfort and industrial air conditioning.

**Recommended Books**

| S.No. | Name | Author(s) | Publisher |
|---|---|---|---|
| 1 | Refrigeration and Air-Conditioning | CP Arora | Tata McGraw Hill |
| 2 | Refrigeration and Air-Conditioning | S C Arora & S Domkundwar | Dhanpat Rai Publication |
| 3 | Refrigeration and Air-Conditioning | R.K. Rajput | Katson Books. |
| 4 | Refrigeration and Air-Conditioning | Jordan and Priester | Prentice Hall of India |
| 5 | Refrigeration and Air-Conditioning | W.F.Stocker and J.W.Jones | McGraw-Hill |
| 6 | Refrigeration and Air-Conditioning | Ramesh Arora | Prentice Hall of India |

| | |
|---|---|
| **Course Code** | **ME407** |
| **Course Title** | **Refrigeration & Air Conditioning Lab** |
| **Type of Course** | PC |
| **L T P** | 0 0 2 |
| **Credits** | 1 |
| **Course Prerequisites** | Applied Thermodynamics & Heat Transfer |
| **Course Objectives (CO)** | Provide broad study of refrigeration process in different systems. Its applications in Aircraft system and study of human comfort and Load Estimation. |

**SYLLABUS**

1. Study of various elements of a vapour compression refrigeration system through cut sections models / actual apparatus.
2. Study and performance testing of domestic refrigerator.
3. Study the performance testing of Electrolux refrigerator.
4. Study and performance testing of an Ice plant.
5. Calculation/ Estimation of cooling load for a large building.
6. Visit to a central Air conditioning plant for study of processes for winter and summer air-conditioning
7. Visit to a cold storage for study of its working.
8. Study and performance testing of window type room air conditioner.
9. Study and performance testing of water cooler.

KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME314** |
| **Course Title** | **Advanced Manufacturing Processes** |
| **type of Course** | PE |
| **L T P** | 4 0 0 |
| **Credits** | 4 |
| **Course Prerequisites** | Basic knowledge of casting, welding, forming and other manufacturing process. |
| **Course Objectives (CO)** | To become aware about advanced manufacturing process in industry. |
| **Course Outcomes** | The students will able to<br>1) Understand abrasive and electrical discharge machining processes<br>2)Understand forming process for thin sections<br>3) Understand the principles and applications of friction stir welding processes |

**SYLLABUS**

**UNIT-I**

Introduction: Overview of general trends in Manufacturing, concept and significance of important properties related to manufacturing processes; Machinability index, Formability, weldabilty, Fluidity, dimensional accuracy, surface integrity, residual stresses, limitations of conventional manufacturing processes need and evolution of advanced manufacturing, selection and economics of manufacturing processes.

**UNIT-II**

Advanced Machining Processes: Classification, Review of conventional machining processes, Principles, process parameters, capabilities and mechanism of material removal of Electro discharge machining, Electrochemical Machining, Laser Beam Machining, and Abrasive Flow machining, concept and need of Hybrid machining Processes.

**UNIT-III**

Advanced Welding Processes: Classification, Review of conventional welding processes, Principles, process parameters, capabilities and theoretical considerations for Ultrasonic Welding, friction Welding, Explosion Welding, Underwater Welding, Adhesive Bonding Advanced Forming Processes: Classification, Review of conventional Forming processes, concept of High Energy Rate Forming, Principles, process parameters, capabilities and theoretical considerations for Explosive Forming, Electro hydraulic Forming, Electromagnetic Forming, Super plastic forming

**UNIT-IV**

Advanced Casting processes: Classification, Review of conventional casting processes, brief review regarding Casting of Ferrous and Non-ferrous metals, Principles, process parameters, capabilities and

theoretical considerations for Shell Mould Casting, Vacuum Casting, Lost Foam Casting, Investment Casting, Centrifugal Casting, and concept of rapid solidification

.

**Recommended Books**

| S No. | Name | Author(s) | Publisher |
|---|---|---|---|
| 1 | Modern Machining Processes | Shan and Pandey | Tata Mc Hill N. Delhi |
| 2 | G.F Benedict | Non Traditional manufacturing, | Marcel Dekker |
| 3 | P.K Mishra | Non-Conventional Machining | Narosa Publishing House N. Delhi |
| 4 | ASTME | High Velocity Forming | pf Metals PHI N. Delhi |

| | |
|---|---|
| **Course Code** | ME316 |
| **Course Title** | Non-Destructive Evaluation & Testing |
| **Type of Course** | PE |
| **L T P** | 4 0 0 |
| **Credits** | 4 |
| **Course Prerequisites** | Material science & Metallurgy |
| **Course Objectives (CO)** | Overview of methods employed for non-destructive evaluation of structures and materials taught in the context of damage tolerant structural analysis. |
| **Course Outcomes** | The students will able to:<br>1) List and define different defects that occur in welding shown through Non-Destructive Examination/Destructive Testing<br>2 identify the types of equipment used for each Non-Destructive and Destructive Examination.<br>3) go to specific Code, Standard, or Specification related to each testing method. |

**SYLLABUS**

**UNIT-I**

**Overview:** Motivation, Background, Capabilities, Limitations of NDT Methods, Variables in Inspection and Statistical Issues.

**UNIT-II**

**Surface Methods** Visual Inspection - Physical Principles, Methodology, Limitations, Applications. Liquid Penetrant Testing - Physical Principles, Methodology, Limitations, Applications. Magnetic Particle Inspection – Physical Principles, Methodology, Limitations, Applications.

**UNIT-III**

**Volumetric Methods:** Electro-Magnetic Methods – Maxell's Equations, Magnetic Flux Leakage, Eddy Current, Low Frequency Eddy Current, Remote Field Eddy Current, Pulsed Eddy Current. Acoustical Methods - Ultrasonic NDT principles, Different types of wave modes, Physics of wave generation, reception, interactions and propagation. Calibration, data collection, quantification, and interpretation, New methods using guided waves, Resonance and other Low Frequency Methods. Radiographic Methods - Principles of X-ray NDT, Equipment, Calibration, Image Collection, Quantification, and Interpretation. High power sources and high quality films. Digital Radiography, Introduction to Tomography and Laminography. Thermal Methods - Principles of thermography and approaches in NDT, Sources and detectors, capabilities and limitations, measurement of diffusivity and wall thickness. Optical Methods - Principles of Shearography and holography, applications in NDT.

**UNIT-IV**

**Applications:** Nuclear Industry, Aerospace Industry, Transportation Industry, Process Industry.

| Recommended Books | | | |
|---|---|---|---|
| **S.No.** | **Name** | **Author(s)** | **Publisher** |
| **1.** | Non destructive Evaluation - Theory, Techniques, and Applications. | P.J. Shull, Marcell Decker Inc. | NY |
| **2.** | The testing of Engg materials | H.E. Davies, G.E Troxell and GFW Hauck, | Mc Graw Hill |
| **3.** | Non-destructive Evaluation - A tool in Design, Manufacturing and Service. | D.E. Bray and R. K. Stanley. | CRC Press |

SANT BABA BHAG SINGH UNIVERSITY
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME412** |
| **Course Title** | **Technology of Surface Coating** |
| **Type of Course** | PE |
| **L T P** | 4 0 0 |
| **Credits** | 4 |
| **Course Prerequisites** | Material science and Metallurgy |
| **Course Objectives (CO)** | Scope of surface engineering in metals, ceramics, polymers and composites |
| **Course** | |

**UNIT-I**

**Introduction to surface engineering**

Introduction to surface engineering, Scope of surface engineering in metals, ceramics, polymers and composites, Surface Preparation methods such as Chemical, Electrochemical, Mechanical-Sand Blasting, Shot peening, Shot blasting, Hydroblasting, Vapor Phase Degreasing etc.,Properties of Various Coating, Coating Methods.

**UNIT-II**

**Chemical Conversion Coating:**

Chromating, Phosphating, Anodizing, Thermochemical processes, industrial practice, economy and energy considerations.

**Metallic coating:** Surface pretreatments, Hot Dipping, galvanizing, Electrolytic and Electroless plating of important metals and alloys, testing/evaluation of surface properties.

Coating from Vapour Phase: PVD, CVD, Various Methods used, mechanisms, important reactions involved and applications.

**UNIT-III**

**Plasma Coating:** Sputtering, Plasma Spray & Ion Implantation Methods, mechanisms & applications. Surface modification by directed energy beams like ion, electron and laser beams, novelty of composition and micro structures.

**UNIT-IV**

**Diffusion Coating:** Various Techniques For Single And Multiple Element Coating, High Temperature Coating- Carburising, Carbonitriding ,Silicanizing,Chromizing,, Aluminizing, Boronizing, Boronitriding

| S. No | Name | Author(S) | Publisher |
|---|---|---|---|
| 1 | Surface Engineering for Corrosion and Wear Resistance. | J. R. Davis | Tata McGraw-Hil |
| **2** | Surface Finishing Systems. metal annd non-metal finishing handbook-guide, | George J. Rudzki | Metals Park ASM,1983 |
| **3** | Surface Preparation and Finishes for Metal | James A Murphey James A. Murphy- - McGraw-Hill, New York 1971 | Tata McGraw-Hil $5^{th}$ edition |

# *Open Electives*

| | |
|---|---|
| **Course Code** | **CSE371** |
| **Course Title** | **Basics Of Database Design** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Elementary knowledge about computers including some experience using Windows. Basic knowledge about programming in some common programming language. |
| **Course Objectives (CO)** | This subject assesses new developments in database technology. It Interpret and explain the impact of emerging database standards and Evaluate the contribution of database theory to practical implementations of database management systems |

## SYLLABUS

**UNIT-I**

**Introduction to Databases and Transactions:** Basic concepts **of** database, Need of database system, File based system, view of data, database architecture,

**Data Models:** The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction.

**Database Design ER-Diagram:** Database design and ER Model: overview, ER-Model, Constraints, ER-Diagrams, ERD Issues, weak entity sets, Codd's rules, Relational Schemas.

**UNIT-II**

**Relational database Model:** Logical view of data, keys, integrity rules. Relational Database design: features of good relational database design, atomic domain and Normalization.

**Relational Algebra and Calculus:** Relational algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, relational comparison. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vs algebra, computational capabilities.

**UNIT-III**

**Constraints, Views and SQL:** Database Languages, Constraints and its types, Integrity constraints, Views: Introduction to views, updates on views, comparison between tables and views SQL: data definition, aggregate function, Null Values.

**UNIT-IV**

**Transaction management and Concurrency control:** Transaction management: ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks),Time stamping methods, optimistic methods, database recovery management

**Database Security and Authorization:** Introduction to Database Security Issues, Discretionary Access Control Based on Granting/Revoking of Privileges.

| RECOMMENDED BOOKS | | | |
|---|---|---|---|
| **Sr. no.** | **Name** | **Author(S)** | **Publisher** |
| 1 | Fundamentals of Database Systems, Third Edition | Elmasri/Navathe | Addison Wesley |
| 2 | Database Concepts | Korth and Silberschatz Abraham, | McGraw Hall |
| 3 | An introduction to Database Systems | C.J.Date. | Addison Wesley |
| 4 | An introduction to Database Systems | Bipin C. Desai. | West Publishing |
| 5 | SQL,PL/SQL ,The programming language of oracle | Ivan Bayross | BPB Publication |

| | |
|---|---|
| **Course Code** | **CSE373** |
| **Course Title** | **Fuzzy logic** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Basic knowledge about programming in some common programming language. |
| **Course Objectives (CO)** | To use Fuzzy logic in Design and Manufacture. |

## SYLLABUS

**UNIT-I**

**Introduction, Classical Sets and Fuzzy Sets**

Background, Uncertainty and Imprecision, Statistics and Random Processes, Uncertainty in Information, Fuzzy Sets and Membership, Chance versus Ambiguity. Classical Sets - Operations on Classical Sets, Properties of Classical (Crisp) Sets, Mapping of Classical Sets to Functions Fuzzy Sets - Fuzzy Set operations, Properties of Fuzzy Sets. Sets as Points in Hypercubes

**UNIT-II**

**Classical Relations and Fuzzy Relations**

Cartesian Product, Crisp Relations- Cardinality of Crisp Relations, Operations on Crisp Relations, Properties of Crisp Relations, Composition. Fuzzy Relations - Cardinality of Fuzzy Relations, Operations on Fuzzy Relations, Properties of Fuzzy Relations, Fuzzy Cartesian Product and Composition.

**UNIT-III**

**Membership Functions**

Features of the Membership Function, Standard Forms and Boundaries, Fuzzification, Membership Value Assignments – Intuition, Inference, Rank Ordering, Angular Fuzzy Sets, Neural Networks, Genetic Algorithms, Inductive Reasoning.

**UNIT-IV**

Fuzzy-to-Crisp Conversions, Fuzzy Arithmetic, Defuzzification Methods Extension Principle - Crisp Functions, Mapping and Relations, Functions of fuzzy Sets.

**Fuzzy Rule- Based Systems**

Rule-Based Systems - Canonical Rule Forms, Decomposition of Compound Rules, Likelihood and Truth Qualification, Aggregation of Fuzzy Rules, Graphical Techniques of Inference

**Fuzzy Classification**

Classification by Equivalence Relations - Crisp Relations, Fuzzy Relations. Cluster Analysis, Cluster Validity, c-Means Clustering - Hard c-Means (HCM), Fuzzy c-Means (FCM). Classification Metric, Hardening the Fuzzy c-Partition.

| **RECOMMENDED BOOKS** | | | |
|---|---|---|---|
| **S.No.** | **Name** | **Author(s)** | **Publisher** |
| **1** | Fuzzy Sets And Fuzzy Logic | Klir.G, Yuan B.B | Prentice Hall Of India Private Limited, 1997 |
| **2** | Fundamentals Of Neural Networks | Laurance Fausett | Prentice Hall |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | ME371 |
| **Course Title** | Total Quality Management |
| **type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Nil |
| **Course Objectives (CO)** | This subject provides students with the knowledge to understand the philosophy and core values of Total Quality Management (TQM), determining the voice of the customer and the impact of quality on economic performance and long-term business success of an organization; apply and evaluate best practices for the attainment of total quality. |
| **Course Outcomes** | The students will able to<br>1)Develop an understanding on quality management philosophies and frameworks.<br>2)Adopt TQM methodologies for continuous improvement of quality.<br>3)Determine the set of indicators to evaluate performance excellence of an organization |

## SYLLABUS

**UNIT-I**

**Quality and Total Quality Management:** Excellence in manufacturing/service, factors of excellence, relevance of TQM.
**Concept and definition of quality:** Total quality control (TQC) and Total Quality Management (TQM), salient features of TQC and TQM. Total Quality Management Models, benefits of TQM.
**Just-in-time (JIT):** Definition: Elements, benefits, equipment layout for JIT system, Kanban system MRP (Material Requirement planning) vs JIT system, Waste elimination, workers involvement through JIT: JIT cause and effect chain, JIT implementation.

**UNIT-II**

**Customer:** Satisfaction, data collection and complaint, redressal mechanism.
**Planning Process:** Policy development and implementation; plan formulation and implementation.
**Process Management:** Factors affecting process management, Quality function development (QFD), and quality assurance system.

**UNIT-III**

**Total Employees Involvement (TEI):** Empowering employees: team building; quality circles; reward and Recognition; education and training, Suggestion schemes.
**Problems solving:** Defining problem, Problem identification and solving process, QC tools.
Benchmarking: Definition, concept, process and types of benchmarking.

**UNIT-IV**

**Quality Systems:** Concept of quality system standards: relevance and origin of ISO 9000; Benefits; Elements of ISO 9001, ISO 9002, ISO 9003.
**Advanced techniques of TQM:** Design of experiments: failure mode effect analysis: Taguchi methods.

| **RECOMMENDED BOOKS** | | | |
|---|---|---|---|
| **S.No.** | **Name** | **Author(s)** | **Publisher** |
| **1** | Total Quality Management | Sunder Raju | Tata McGraw Hill. |
| **2** | TQM for engineers | M.Zairi | Aditya Books. |
| **3** | Total Quality Management Handbook | J.L. Hradeskym | McGraw Hill. |
| **4** | Total Quality Key terms and concepts | William L.Duncan | Amacom |
| **5** | Total Quality Management and Operational Excellence Text with Cases | John S. Oakland | Routledge |

BABA FARID UNIVERSITY KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME373** |
| **Course Title** | **Production Planning & Control** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course pre-requisite** | NA |
| **Course Objectives** | The objective of this course is to Assist the students to acquire proficiency concept of planning and control of production. |
| **Corse Outcomes** | The students will able to:<br>1)Understand the role Production Planning and control activities in Manufacturing and Services.<br>2)Understand and perform various Inventory Management techniques and apply in real manufacturing scenario.<br>3)Demonstrate various Scheduling procedures |

**Syllabus**

**UNIT-I**

Production Planning & Control: Importance, Objectives, and Functions Types of Production Systems. Production Procedure: Production Cycle, Planning & Control in the Production Procedure. Production Organization: Organization Structure, Sections of Planning & Control Department. Product Selection, Process Selection, Plant Location, Plant Layout, Operations Capacity Planning.

**UNIT-II**

Production Order: Process Charts, Production Master Programmes, Operation & Route Sheets, Breakdown of the Production Order & preparation of various Cards. Production Planning: Operations Planning and Scheduling Systems, Aggregate Planning Process, Strategies for Aggregate Planning, Disaggregation of Aggregate Plans, Master Production Schedule (MPS), Material Requirement Planning (MRP), Rough Cut Capacity Planning.

**UNIT-III**

Production Control: Machine Loading; Infinite and Finite Loading, Gantt Load Chart, Visual Load Profiles; Detailed Scheduling: Gantt Scheduling Chart, Forward and Backward Scheduling, Forms Schedules, Inputs of Schedule, Drawing a Job Schedule, Factors influencing Scheduling,

Procedure Scheduling, Reducing Scheduling Problems; Dispatching; Expediting; recording Progress; Input / Output Control.

**UNIT-IV**

Production Control for Mass Production: Design of Production Line, Assembly Line Balancing. Production Control for Batch production: Inventory Control for Single and Multiple Products, Line of Balance. Production control for Job Shop Production: Jumbled Flow in a Job Shop, Job Sequencing for Machine Limited Scheduling Systems, Job Sequencing for Men and Machine Limited Scheduling Systems.

| **RECOMMENDED BOOKS** | | | |
|---|---|---|---|
| **Sr No** | **Author(s)** | **Title** | **Publisher** |
| 1. | Bhupender Kour | Effectual Communication Skills | S.K. Kataria and Sons |
| 2. | R. Datta Roy and K.K. Dheer | Communications Skills | Vishal Publishing Company |
| 3 | The Essence of Effective Communication | Ludlow and Panthon | Prentice Hall of India |
| 4 | Essentials of Business Comunication | Pal and Rorualling | S. Chand and Sons. New Delhi |

BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **EE371** |
| **Course Title** | **Electrical Energy Conservation and Auditing** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Basic electrical. |
| **Course Objectives (CO)** | To understand the current energy scenario and importance of energy conservation, the concepts of energy management, the methods of improving energy efficiency in different electrical systems and the concepts of different energy efficient devices. |

**SYLLABUS**

**UNIT- I**

**Energy Scenario** Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, restructuring of the energy supply sector, energy strategy for the future, air pollution, climate change. Energy Conservation Act-2001 and its features.

**UNIT- II**

**Basics of Energy and its various forms.** Electricity tariff, load management and maximum demand control, power factor improvement, selection & location of capacitors, Thermal Basics-fuels, thermal energy contents of fuel, temperature & pressure, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity & heat transfer, units and conversion.

**UNIT- III**

**Energy Management & Audit** Definition, energy audit, need, types of energy audit. Energy management (audit) approach-understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments. Material and Energy balance: Facility as an energy system, methods for preparing process flow, material and energy balance diagrams.

**UNIT- IV**

**Energy Efficiency in Electrical Systems -**Electrical system: Electricity billing, electrical load

management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors, distribution and transformer losses. Electric motors: Types, losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors.

| **RECOMMENDED BOOKS** | | | |
|---|---|---|---|
| **Sr. no.** | **Name** | **AUTHOR(S)** | **PUBLISHER** |
| 1 | Guide books for National Certification Examination for Energy | Manager Energy Auditors Book-1 | General Aspects |
| 2 | Utilization of Electrical Energy and Conservation | S. C. Tripathy, | McGraw Hill, 1991. |
| 3 | Success stories of Energy Conservation | BEE | BEE New Delhi |

BABA BHAG SINGH UNIVERSITY KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **EE373** |
| **Course Title** | **Elements of Power System** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Basic electrical. |
| **Course Objectives (CO)** | To familiarize with concept of power system transmission and distribution. |

## SYLLABUS

**UNIT-I**

**Power System Components:** Single line Diagram of Power system, Brief description of power system Elements: Synchronous machine, transformer, transmission line, bus bar, circuit breaker and isolator Supply System Different kinds of supply system and their comparison, choice of transmission voltage

**Transmission Lines:** Configurations, types of conductors, resistance of line, skin effect, Kelvin's law. Proximity effect.

**UNIT-II**

**Over Head Transmission Lines:-**Calculation of inductance and capacitance of single phase, three phase, single circuit and double circuit transmission lines, Representation and performance of short, medium and long transmission lines, Ferranti effect. Surge impedance loading **Overhead line Insulators:** Type of insulators and their applications, potential distribution over a string of insulators, methods of equalizing the potential, string efficiency

**UNIT-III**

**Mechanical Design of transmission line:** Catenary curve, calculation of sag & tension, effects of wind and ice loading, sag template, vibration dampers Insulated cables: Type of cables and their construction, dielectric stress, grading of cables, insulation resistance, capacitance of single phase and three phase cables, dielectric loss, heating of cables

**UNIT-IV**

**EHV AC and HVDC Transmission:** Introduction to EHV AC and HVDC transmission and their comparison, use of bundle conductors, kinds of DC links, and incorporation of HVDC into AC system.

| RECOMMENDED BOOKS | | | |
|---|---|---|---|
| **Sr. no.** | **Name** | **AUTHOR(S)** | **PUBLISHER** |
| 1 | Electrical Power Systems. | WadhwaC. L. | New age international Ltd. |
| 2 | Power System Analysis and Design. | GuptaB. R. | S. Chand & Co |
| 3 | Electric Power | Uppal S. L. | Khanna Publishers |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ECE371** |
| **Course Title** | **Signals and Systems** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | NA |
| **Course Objectives (CO)** | Projects are non-recurring activities requiring a different set of skill for planning as compared to regular and operative activities. The course is aimed at developing the understanding of project activities and relevant skills. |

**SYLLABUS**

**UNIT- I**

Introduction to Signals and Systems : Basic definitions, Classification of signals and systems. Signal operations and properties. Basic continuous time signals, signal sampling and quantization, discretization of continuous time signals, discrete time signals. Basic system properties, Representation of digital signals.

**UNIT- II**

Impulse response of CT and DT LTI Systems: characterization and convolution integral for CT-LTI system, signal responses to CT-LTI system, properties of convolution, LTI system response properties from impulse response. Impulse response characterization and convolution sum, Impulse response of DT-LTI system. System analysis from difference equation model .

**UNIT- III**

Representation of periodic functions: Fourier series, Frequency spectrum of aperiodic signals, Fourier Transform, Relation between Laplace Transform and Fourier Transform and its properties.

**UNIT- IV**

Z-Transform & its Properties: The z-Transform, Convergence of z-Transform, Basic z-Transform, Properties of z-Transform, Inverse z-Transform and Solving difference equation using z-Transform .

| RECOMMENDED BOOKS | | | |
|---|---|---|---|
| **S. No** | **Name** | **AUTHOR(S)** | **PUBLISHER** |
| 1 | Signals and Systems | A.V. Oppenheim, A.S. Willsky and I.T. Young, | Prentice Hall |
| 2 | Introduction to Signals and Systems | Douglas K. Lindner | McGraw Hill International |
| 3 | Signals and Systems - Continuous and Discrete | R.F. Ziemer, W.H. Tranter and D.R. Fannin | Prentice Hall |
| 4 | Circuits and Systems: A Modern Approach | Papoulis | HRW |
| 5 | Signal Processing and Linear Systems | B.P. Lathi | Oxford University Press |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ECE373** |
| **Course Title** | **Microcontroller and Applications** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Microprocessor |
| **Course Objectives (CO)** | The course has been planned to know the architecture, instruction sets and various techniques for the interfacing of 8051 with different real world I/O devices to accomplish certain tasks. |

**SYLLABUS**

**UNIT- I**

Introduction to 8051 Microcontrollers: Basic differences and similarities between Microprocessor and Microcontroller, Overview of 8051 family. : Intel 8051 history, Pin diagram of 8051, 8051-Architecture, Additional features in 8052.

**UNIT-II**

8051 Assembly Language Programming: Introduction to 8051 Assembly programming, Assembling and running an 8051 program, Data Types and directives, 8051 flag bits and PSW register. Register banks and stack.

**UNIT-III**

Instruction Set of 8051: Addressing modes and accessing memory using various addressing modes, Jump, Loop and Call instructions, Arithmetic instructions and programs, Logic instructions and programs, Single bit instructions and programming, Timer/counter programming in the 8051, Interrupt programming.

**UNIT-IV**

Serial Communication: 8051 connection to RS 232, 8051 serial communication programming. Hardware interfacing: I/O Port programming, Bit manipulation. Interfacing to a LED, LCD, Keyboard, ADC, DAC , Stepper Motors and sensors. Introduction to latest microcontroller: PIC microcontroller- Architecture, PIN Diagram.

**RECOMMENDED BOOKS**

| S. No | Name | Author(S) | Publisher |
|---|---|---|---|
| 1 | The 8051 Microcontroller and embedded Systems | Ali Mazidi | Pearson Education |
| 2 | The PIC Microcontroller and Embedded Systems | Ali Mazidi | Ali Mazidi |
| 3 | An Embedded Software Primer | David e Simon | Pearson Education |

| | |
|---|---|
| **Course Code** | **CE371** |
| **Course Title** | **Renewable Energy Resources** |
| **Type of Course** | **OE** |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | NA |
| **Course Objectives (CO)** | The class will explore society's present needs and future energy demands, examine conventional energy sources and systems, including fossil fuels and nuclearenergy, and then focus on alternate, renewable energy sources such as solar, biomass (conversions), wind power, geothermal, and hydro. |

**SYLLABUS**

**UNIT-I**

**Principles of solar radiation:** Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

**UNIT-II**

**Solar energy collection:** Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.
**Solar energy storage and applications:** Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

**UNIT-III**

**Wind energy:** Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria
**Bio-mass:** Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

**UNIT-IV**

**Geothermal energy**: Resources, types of wells, methods of harnessing the energy, potential in India.
**Ocean energy:** OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.
**Direct energy conversion:** Need for DEC, Carnot cycle, limitations, principles of DEC

| Recommended Books | | | |
|---|---|---|---|
| **S.No.** | **Name** | **Author(s)** | **Publisher** |
| **1** | Non-Conventional Energy Sources | G.D. Rai | Khanna Publishers |
| **2** | Renewable Energy Resources | Twidell&Wier | CRC Press( Taylor & Francis) |
| **3** | Renewable energy resources | Tiwari and Ghosal | Narosa. |
| **4** | Renewable Energy Technologies | K Mittal | Wheeler |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **CE373** |
| **Course Title** | **Architecture & Town Planning** |
| **Type of Course** | OE |
| **L T P** | 30 0 |
| **Credits** | 3 |
| **Course Prerequisites** | |
| **Course Objectives (CO)** | To enable the students to relate the architectural projects in context of planning in rural, urban and regional context. |

## SYLLABUS

**UNIT-I**

**Elements of Design**:
Line direction. Shape, size, texture, value and colour, balance, scale and proportion.
**Principles of Design**:
Repetition, gradation, harmony, contrast and unity, creation of 2 D and 3 D compositions.

**UNIT-II**

**The Industrial Revolution**:
The age of revivals, the emergence of engineer, new materials and techniques and the evolution of balloon frame and steel frame.
**Origin of Modern Architecture**:
Definition and concept of modern architecture, various pioneers of modern architecture.

**UNIT-III**

**Town Planning**:
Definition and meaning, age of planning, scope and motives of planning, brief history of town planning – its origin and growth, historically development of town planning in ancient valley civilizations. Indus Nile Tigris and Euphrates, Greek Roman, Medieval and Renaissance town planning
**New Concepts**:
Garden city movement, Linear city and concentric city concepts, Neighbourhood and Radburm, La-cite industrial, Radiant city to present day planning.

**UNIT-IV**

**Planning Principles**:

Types of town and their functions, types of town planning – Grid Iron, Radial, Spider webs, Irregular and Mixed, their advantages and disadvantages.
**Planning Practice and Techniques**:
Zoning – its definition, procedure and districts, height and bulk zoning, F. A. R., Master Plan – Meaning, preparation and realization, the scope of city planning – city rehabilitation and slum

clearance.

| RECOMMENDED BOOKS | | | |
|---|---|---|---|
| **Sr. no.** | **Name** | **Author(s)** | **Publisher** |
| 1 | Urban Planning Problems | Cherry, Gordon | Board Hill, London |
| 2 | Urban and Regional Planning in India | Sundaram,K V | Vikas Publishing house(P) Ltd.,New Delhi |
| 3 | The Urban Pattern | Gallion A B,Eisner S, | Van Nostrandreinhold,New York |

.

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **CSE372** |
| **Course Title** | **Computer Networks** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Basic knowledge of Computer, Digital Circuits and Network Arrangement. |
| **Course Objectives (CO)** | To be familiar with various computer network architectures and to identify the infrastructure components, design infrastructure including devices, topologies and protocols. |

## SYLLABUS

**UNIT-I**

**Introduction to Computer Networks:** Computer network and its goals, Types of computer networks: LAN, MAN, WAN, Wireless and wired networks, broadcast and point to point networks, Network topologies, Network software: concept of layers, protocols, interfaces and services, ISO-OSI reference model, TCP/IP reference model.

**UNIT-II**

**Physical Layer:** Concept of Analog & Digital Signal, Bandwidth, Transmission Impairments: Attenuation, Distortion, Noise, Data rate limits : Nyquist formula, Shannon Formula, Multiplexing : Frequency Division, Time Division, Wavelength Division, Introduction to Transmission Media : Twisted pair, Coaxial cable, Fiber optics, Wireless transmission (radio, microwave, infrared), Switching: Circuit Switching, Message Switching ,Packet Switching & their comparisons.

**Data Link Layer:** Design issues, Framing, Error detection and correction codes: checksum, CRC, hamming code, Data link protocols for noisy and noiseless channels, Sliding Window Protocols: Stop & Wait ARQ, Go-back-N ARQ, Selective repeat ARQ, Data link protocols: HDLC and PPP.
**Medium Access Sub-Layer:** Static and dynamic channel allocation, Random Access: ALOHA, CSMA protocols, Controlled Access: Polling, Token Passing, IEEE802.3 frame format, Ethernet cabling, Manchester encoding, collision detection in 802.3, Binary exponential back off algorithm.

**UNIT-III**

**Network Layer**: Design issues, IPv4 classful and classless addressing, subnetting, Routing algorithms: distance vector and link state routing, Congestion control: Principles of Congestion Control, Congestion prevention policies, Leaky bucket and token bucket algorithms.

**Transport Layer**: Elements of transport protocols: addressing, connection establishment and release, flow control and buffering, multiplexing and de-multiplexing, crash recovery, introduction to TCP/UDP protocols and their comparison.

**UNIT-IV**

**Application Layer**: World Wide Web (WWW), Domain Name System (DNS), E-mail, File Transfer Protocol (FTP), Network security.
**Session & Presentation Layer**

| **RECOMMENDED BOOKS** | | | |
|---|---|---|---|
| **Sr. no.** | **Name** | **Author(S)** | **Publisher** |
| 1 | Communication Networks: Fundamentals and Concepts and Key Architectures | Leon Garrcia and IndraWidjaja | TMH |
| 2 | Computer Networks. | A.S. Tanenbaum | PHI |
| 3 | Introduction to Data Communication and Networks | Forouzan, Coombs and Fagan | TMH |
| 4 | Data and Communication | William Stallings | PHI |

SANT BABA BHAG SINGH UNIVERSITY
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **CSE374** |
| **Course Title** | **Computer Organization** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Basic knowledge of computer and its components. |
| **Course Objectives (CO)** | This subject gives the basic knowledge to analyse architectures and computational designs and synthesize new and better architectures. |

**SYLLABUS**

**UNIT-I**

**Introduction:** Introduction to Number System and Representation of information.
**Register Transfer and Micro operations:** Register transfer language & operations, arithmetic micro operations, logic micro operations, shift micro operations, arithmetic logic shift unit. Design of a complete basic computer and it's working.

**UNIT-II**

**Basic Computer Organisation and Design:** Instruction codes, Computer registers, Computer Instructions, Timing and control, Instruction Cycle, Memory reference instructions, Input/ Output and Interrupt, Design of basic Computer, Design of Accumulator Logic.
**Design of Control Unit:** Control memory, Hardwired control CPU design, Micro-programmed control CPU design and their comparative study.

**UNIT-III**

**Central Processing Unit:** General Register Organisation, Stack Organisation, Instruction formats, Addressing Modes, Data transfer and manipulations, Program control, RISC and CISC architecture.
**Input-Output Organisation:** Peripheral devices, I/O Interface, asynchronous data transfer, modes of transfer, priority interrupt, DMA, I/O processor, serial communication.
**Memory Organisation:** Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory, memory management hardware.

**UNIT-IV**

**Pipelining**: Introduction to pipelining and pipeline hazards, design issues of pipeline architecture.
**Introduction to Parallel Processing**: Inter-process or communication & synchronization.

| RECOMMENDED BOOKS | | | |
|---|---|---|---|
| **Sr. no.** | **Name** | **Author(S)** | **Publisher** |
| **1** | Advanced Computer Architecture | Kai Hawang | Tata McGraw Hill |
| **2** | Computer Organization and Design | P.Pal Choudhary | PHI |
| **3** | Computer System Architecture | M.Moris Mano | Pearson |
| **4** | Computer Organization and Architecture | William Stallings | Pearson |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME372** |
| **Course Title** | **Industrial Engineering Management** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course pre-requisite** | None |
| **Course Objectives** | To familiarize the students with management of industrial resources and production operations |
| **Course outcomes** | 1)Student shall be able to describe basic concepts and theories within the area of industrial management<br>2)Student shall be able to present organization alanalysis,<br>3)Student shallalso be able to use simple project planning technique |

**Syllabus**

**UNIT-1**

**Introduction**: Definition and scope of industrial engineering Role of an industrial engineering Role of an industrial engineer in industry, Functions of industrial engineering department and its organization, Qualities of an industrial engineer. Plant Layout and Material Handling: Different types of layouts viz. Product, process and combination layouts, Introduction to layouts based on the GT, JIT and cellular manufacturing systems, Development of plant layout. Types of material handling equipment, relationship of material handling with plant layouts.

**UNIT -2**

Work-study: Areas of application of work study in industry; Method study and work measurements and their inter-relationship. Reaction of management and labour to work study; Role of work study in improving plant productivity and safety. Method Study: Objectives and procedure for methods analysis: Select, Record, Examine, Develop, Define, Install and Maintain. Recording techniques, Micromotion and macro-motion study: Principles of motion economy, Normal work areas and work place design.

**UNIT-3**

Work Measurement: Objectives, Work measurement techniques - time study, work sampling, pre-determined motion time standards (PMTS) Determination of time standards. Observed time, basic time, normal time, rating factors, allowances, standard time. Value Engineering: Types of values, concept of value engineering, phases of value engineering studies, application of value engineering.

**UNIT-4**

Work Design: Concepts of job enlargement, job enrichment and job rotation. Effective job design considering technological and behavior factors. Ergonomics: Introduction to ergonomic considerations in designing man-machine systems with special reference to design of displays and controls.

| S. No | Author | Title | Publisher |
|---|---|---|---|
| 1 | Gayler Shotbolt | Introduction to Work study | Tata McGraw Hill |
| 2 | H.S. Shan | Work Study and Ergonomics | Dhanpat Rai and Co. Ltd |
| 3 | R. Bernes | Motion and time study by | John-Wiley |
| 4 | D.J. Oborne | Ergonomics at work | John Wiley |
| 5 | D. Miles | Techniques of Value Analysis and Engineering | McGraw Hill |

| | |
|---|---|
| **Course Code** | **ME374** |
| **Course Title** | **MANAGEMENT INFORMATION SYSTEM** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course pre-requisite** | NA |
| **Course Objectives** | 1)Recognize contemporary MIS theory and how information systems support business strategy, business processes, and practical applications in an organization. |
| **Course Outcomes** | The students will be able to<br>1)Relate the basic concepts and technologies used in the field of management information systems.<br>2)Compare the processes of developing and implementing information systems.<br>3)Outline the role of the ethical, social, and security issues of information systems. |

**Syllabus**

**UNIT- I**

Information and Decision Making: Concept of information; data versus information, characteristics of information, classification of information, cost and value of information, Use of information in the decision making process, information requirements for decision making, types of decisions, decision making process, decision making models role of information system, decision support systems, expert systems.

**UNIT- II**

Management Information Systems (MIS): Concept, Characteristics and importance of management information systems, types of information systems role of computers in management information systems, hierarchy of data processing systems, operating elements of MIS, information needs of MIS, storage and retrieval of data processing, functions of information systems, management reports. Analysis and design cycle for MIS. Various approaches to system analysis and design. Strategic and project Planning for MIS, analysis and design, matching mission, objectives and plans of MIS with business plans, project planning

for MIS, Conceptual system design, Detailed system design, Implementation, Evaluation and Maintenance of MIS

.

**UNIT- III**

Computer Networks and Data Communication Computer network: Local Area networks; characteristics topologies network structures, switching networks, OSI standards for multi vendor network. I.A.N standards, application of networks, Data Communication concepts, types and modes of transmission, hardware requirements, communication controllers, Data Communication software, data communication protocol.

**UNIT- IV**

Data Base Management Systems: Introduction, data base designing, relational data base management system. Introduction to computerized data base management system.

**RECOMMENDED BOOKS**

| Sr. no. | Name | AUTHOR(S) | PUBLISHER |
|---|---|---|---|
| 1. | Information System for Modern Management. | G. Mudrick, Joel E. Ross and James R. Clagget | Prentice Hall.. |
| 2. | Management Information systems | G. Davis and M. Olson | McGraw Hill |
| 3 | Information systems for management | Henry C. Lucas | McGraw Hill |

| | |
|---|---|
| **Course Code** | **EE372** |
| **Course Title** | **Industrial Electrical System** |
| **Type of Course** | **OE** |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Basic electrical. |
| **Course Objectives (CO)** | Understand the electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings, SLD. Understand various components of industrial electrical systems. Analyze and select the proper size of various electrical system components. |

**SYLLABUS**

**UNIT-I**

LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices.

**UNIT-II**

Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.

**UNIT-III**

Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premise, flood lighting.

**UNIT-IV**

DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks. Study of basic PLC, Role of in automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation.

| RECOMMENDED BOOKS | | | |
|---|---|---|---|
| **Sr. no.** | **Name** | **AUTHOR(S)** | **PUBLISHER** |
| 1 | Electrical Power Systems. | WadhwaC. L. | New age international Ltd. |
| 2 | Power System Analysis and Design. | GuptaB. R. | S. Chand & Co |
| 3 | Electric Power | Uppal S. L. | Khanna Publishers |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **EE374** |
| **Course Title** | **Fundamentals of Electrical Machines** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Basic electrical. |
| **Course Objectives (CO)** | To became familiar with single phase and three phase transformer, DC and AC machines, parallel operation of machines& to calculate the efficiency of machines. |

## SYLLABUS

### UNIT-I

**Introduction**
Basic Principle, Types and constructional features of electrical machines, torque, and torque angle, basic electromagnetic laws, Induced EMF.

### UNIT-II

**Transformers**
Basic principle, turns ratio, types and parts of a transformer, ideal transformer, transformer on no-load and on-load, phasor diagram, transformer reactance and equivalent circuit, losses, efficiency, all day efficiency, regulation, basic concept of three-phase transformer and auto transformer (excluding analysis).

### UNIT-III

**Direct Current (DC) Machines**
Principle, Constructional features, Types of direct current (DC) machines, Electromotive force (EMF) and torque equations, circuit model, armature reaction, commutation, Types of armature winding(no detailed diagram), characteristics of dc motors, characteristics of dc generators, starting (three point and four point starters), speed control methods, efficiency and applications.

### UNIT-IV

**A.C MOTORS**
**Three-phase Induction Machines:** Concept of rotating magnetic field in three phase, Construction and principle of operation. slip frequency, rotor currents, rotor Magneto motive force (MMF) and torque production, equivalent circuit; torque slip characteristics, power output, starting;

**Single-phase Induction Motors:** Principle of single phase induction motors, double field revolving theory, types of single phase induction motors.
**Synchronous Machines:** Construction and types, Electromotive force (EMF) equation, synchronous reactance.

**Principle of Special Motors:** Alternating current (AC) series motor, universal motor, reluctance motor, hysteresis motor, stepper motor, Brushless Motors, Switched reluctance motor and their Applications.

| RECOMMENDED BOOKS | | | |
|---|---|---|---|
| **Sr. no.** | **Name** | **Author(s)** | **Publisher** |
| 1 | Electrical Machines, VOL II | Thareja B.L | S.Chand |
| 2 | Bimbhra P.S. | Electrical Machinery, | Khanna Publishers |
| 3 | Electrical Machines | Nagrath I.J. and Kothari D.P | Tata McGraw Hill |

| | |
|---|---|
| **Course Code** | **ECE372** |
| **Course Title** | **Analog and Digital Communication** |
| **Type of Course** | OE |
| **L T P** | 3-0-0 |
| **Credits** | 3 |
| **Course Prerequisites** | Electronics Devices |
| **Course Objectives (CO)** | To study the fundamentals, mathematical analysis, generation, reception and considerations for various types of modulation techniques and impart practical knowledge of different communication systems. |

**SYLLABUS**

**UNIT- I**

Review of Fundamental Concepts and Mathematical preliminaries: Elements of an electrical communication system; Characteristics of communication channel and their mathematical modeling; Signal models: deterministic and random; signal classification; Convolution Integral and response of LTI system; Fourier series representation, Parseval's theorem; Fourier transform; Hilbert transform.

**UNIT- II**

Analog communication systems: Concept of modulation and demodulation, Continuous wave (CW) modulation: amplitude modulation (AM) - double sideband (DSB); double sideband suppressed carrier (DSBSC); single sideband suppressed carrier (SSBSC) and vestigial sideband (VSB) modulation, angle modulation - phase modulation (PM) & frequency modulation (FM); narrow and wideband FM. Representation of narrowband noise; receiver model, signal to noise ratio (SNR), noise figure, noise temperature, noise in DSB-SC, SSB, AM & FM receivers, pre-emphasis and de-emphasis.

**UNIT- III**

Pulse Modulation: Sampling process, sampling theorem for band limited signals; pulse amplitude modulation (PAM); pulse width modulation (PWM); pulse position modulation (PPM) ; pulse code modulation (PCM); line coding; differential pulse code modulation; delta modulation and adaptive delta modulation, Basics of time division multiplexing, noise consideration in PAM and PCM systems..

**UNIT- IV**

Basic digital modulation schemes: Overview of geometric representation of signals, Gram-Schmidt Orthogonalization procedure; Basic digital modulations schemes: Phase shift keying (PSK), amplitude shift keying (ASK), frequency shift keying (FSK) and Quadrature amplitude modulation (QAM); coherent demodulation and detection; probability of error.

| RECOMMENDED BOOKS | | | |
|---|---|---|---|
| **S. No** | **Name** | **Author(S)** | **Publisher** |
| 1 | Communication Systems | Simon Haykin | Wiley India |
| 2 | Modern Digital and Analog Communication Systems | B P Lathi, Zhi Ding | Oxford University Press |
| 3 | Principles of Communication Systems | H. Taub, D. L. Schilling, G. Saha | Tata McGraw-Hill |
| 4 | Digital Communications | Bernard Sklar | Prentice Hall of India |
| 5 | Principles of Communication Systems | Taub and Schilling | Tata McGraw-Hill |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ECE374** |
| **Course Title** | **Analog Circuits** |
| **Type of Course** | **OE** |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Circuit models of CMOS, and BJT, Electronic circuit analysis |
| **Course Objectives (CO)** | The course has been planned to Introduce the principles of analog circuits and apply the techniques for the design of analog integrated circuit (Analog IC's). |

**SYLLABUS**

**UNIT- I**

Low Frequency Transistor Amplifier : Equivalent circuit of BJT using h-parameter for CB, CE and CC & configuration, calculation of transistor parameter for CB, CE & CC using h-parameters, comparison of transistor amplifier configuration.

**UNIT- II**

Multistage and Large Signal Amplifiers: General cascaded system, RC coupled amplifier and its frequency response, merits and demerits, cascade amplifier, Darlington compound configuration, multistage frequency effect. Large Signal Amplifier Analysis and design of class A, B, AB, C amplifiers, push pull amplifiers, transformer less output stages, distortion calculations.

**UNIT-III**

Feedback Amplifier Feedback concept, characteristics of negative and positive feedback. Effect of negative and positive feedback on input impedance, output impedance, gain, and noise and frequency response..

**UNIT-IV**

Oscillators Classification of Oscillators, frequency and frequency stability of oscillatory circuits, Tuned based Oscillators, Hartley Oscillator, Colpitts Oscillators Clapp Oscillator, Crystal Oscillator, Phase Shift Oscillator, Wein Bridge Oscillator

**RECOMMENDED BOOKS**

| S. No | Name | Author(S) | Publisher |
|---|---|---|---|
| 1 | Analysis and Design of Analog Integrated Circuits | P.R. Gray and R.G. Meyer | John Wiley and Sons |
| 2 | Integrated Electronics | Millman & Halkias | Tata McGraw Hill. |
| 3 | Electronic Circuit: Discrete & Integrated | Schilling & Belone | Tata McGraw Hill. |

| | |
|---|---|
| **Course Code** | **CE372** |
| **Course Title** | **Construction of Metro System** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Transport & Railway Engineering |
| **Course Objectives (CO)** | Study of metro systems |

**SYLLABUS**

**UNIT- I**

Overview of Metro System, Need for metro.

**UNIT- II**

Routing Studies, Basic Planning and Financials, Intial Surveys and investigations, Basics Of construction planning and management

**UNIT-III**

Construction Methods for elevated and underground stations, via duct spans & bridges , underground tunnels , Depots commercial and service buildings

**UNIT-IV**

Construction quality and safety systems , traffic integration , multi modal transfers and pedestrians facilities , environment and social safeguards

Track system – permanent way, facilities management

---

| **RECOMMENDED BOOKS** | | | |
|---|---|---|---|
| **Sr. no.** | **Name** | **AUTHOR(S)** | **PUBLISHER** |
| 1 | Metro rail projects in INDIA | M.Ramachandran | Oxford University Press |
| 2 | Underground Infrastructures | RK Goel, Bhawani Singh and Jian Zhao | Imprint: Butterworth-Heinemann, Elsevier Inc. |
| 3 | Construction Safety activity book(METRO) | Crenshaw and LAX Transit | Metro |

| | |
|---|---|
| **Course Code** | **CE374** |
| **Course Title** | **Traffic Engineering** |
| **Type of Course** | 0E |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Transportation Engineering-I,II |
| **Course Objectives (CO)** | The objective of the course is to give knowledge about the design of flexible and rigid pavements and basic knowledge of docks, harbor & tunnels. |

**SYLLABUS**

**UNIT-I**

**Introduction:**
Types of pavement structure. Importance and functions of various components of pavement structures, design factors, Factors affecting pavement design, Design wheel load, equivalent single wheel load, repetition of loads climate variation.

**UNIT-II**

**Design of Flexible Pavements:**
Flexible pavement design methods: CBR method, group index method , IRC method of design of flexible pavement.

**Design of Rigid Pavements:**
General design considerations, Wheel load stresses, Westergard's stress equation for wheel load, evaluation of wheel load stress, temperature stresses, design of joints, design of dowel and tie bars, IRC method of design of rigid pavements, CRCP( Continuously Reinforced concrete pavements) FRC ( Fibre reinforced concrete pavements), pre stressed concrete pavements

**UNIT-III**

**Design of Bituminous Mixes:**
Requirements of bituminous mixes, Marshall Method of Bituminous Mix Design

**Harbor and Docks**
Harbours and ports, water transportation, natural phenomenon: tides, wind & waves, classification, facilities at major port, protection facilities: wall type & special break waters**,** planning & layout of ports, classification of docks, docking facilities, repairing facilities-fixed form & movable form , approach facilities, loading and unloading facilities, guiding facilities-light house & signal, storing facilities.

**UNIT-IV**

**Tunnels**
General, basic definition, merits & demerits of tunnels & open cuts, selection of alignment of tunnel, classification of tunnels, tunnel approaches.

**Problems in Tunneling**

Introduction to various stages in tunnel construction, methods of tunneling in soft soil & rock, tunnel lining necessity & material used, drainage in tunnels, health protection in tunnels.

| **RECOMMENDED BOOKS** | | | |
|---|---|---|---|
| **Sr. no.** | **Name** | **AUTHOR(S)** | **PUBLISHER** |
| 1 | Docks and harbor engineering | Bindra S.P | Dhanpat rai |
| 2 | Principles, practices and design highway engineering | Sharma S.K | S chand & company ltd 1995 |
| 3 | Highway engineering | Khanna S.K & Justo CEG | Nem chand and brother roorkee |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **CSE471** |
| **Course Title** | **Concepts of Operating Systems** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Overview of Computer Architecture |
| **Course Objectives (CO)** | This course provides the knowledge about the role of an operating system, issues in the management of resources like processor, memory and input-output, design of an operating system. |

## SYLLABUS

**UNIT-I**

**Introduction:** Operating Systems functions, Types of operating systems, Multiprogramming systems, Batch systems, Time-sharing systems, Operating system operations, Special purpose operating systems, distributed systems, Different computing environments.

**UNIT-II**

**Operating System Organization:** Processor and user modes, user operating system interface, Kernels, System calls and its types, System programs, Operating system structures, Virtual machines.
**Process Management:** Process states, Process Scheduling, Process hierarchy, Threads, Threading issues, Multi-threading models, Non-pre-emptive and pre-emptive scheduling algorithms, Concurrent processes, Critical section, Semaphores, methods for inter-process communication, Deadlocks.

**UNIT-III**

**Memory Management:** Physical and virtual address space, Memory allocation strategies, Paging, Segmentation, Virtual memory and Demand paging, Page replacement algorithms.
**File and I/O Management:** Directory structure, File operations, Files system mounting, File allocation methods, Device management, Disk scheduling algorithms.

**UNIT-IV**

**OS and Security:** Security breaches, types of attacks, attack prevention methods, security policy and access control, OS design considerations for security, access control lists and OS support, internet and general network security, Policy mechanism, Program, network and system threats, Authentication.

| RECOMMENDED BOOKS | | | |
|---|---|---|---|
| **Sr. no.** | **Name** | **Author(S)** | **Publisher** |
| 1 | Operating Systems Concepts | A Silberschatz, P.B. Galvin, G. Gagne | John Wiley Publications |
| 2 | Operating Systems: A Modern Perspective | G. Nutt | Pearson Education |
| 3 | Modern Operating Systems | A.S. Tanenbaum | Pearson Education |
| 4 | Operating Systems, Internals & Design Principles | W. Stallings | Prentice Hall of India |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Code** | **CSE473** |
| **Course Title** | **Data Warehousing And Data Mining** |
| **Type of Course** | **OE** |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Database Systems |
| **Course Objectives (CO)** | Students will be enabled to understand and implement classical models and algorithms in data warehousing and data mining. |

# SYLLABUS

**UNIT-I**

Data Warehouse Fundamentals: Introduction to Data Warehouse, OLTP Systems; Differences between OLTP Systems and Data Warehouse: Characteristics of Data Warehouse; Functionality of Data Warehouse: Advantages and Applications of Data Warehouse;

**Data Warehouse Architecture**: Introductions, Components of Data warehouse Architecture: Technical Architectures; Data warehouse architectures 1: Data warehouse architecture 2: Data warehouse architecture 3: Tool selection: Federated Data Warehouse Architecture:

**UNIT-II**

Data Warehouse & OLAP: Introduction: What is OLAP?; Characteristics of OLAP, Steps in the OLAP Creation Process, Advantageous of OLAP: What is Multidimensional Data: OLAP Architectures; MOLAP, ROLAP, HOLAP: Data Warehouse and OLAP: Hypercube & Multicubes

**Meta data Management in Data Warehouse**: Introductions to Metadata: Categorizing Meta data: Meta data management in practice; Meta data requirements gathering, Meta data classification, Meta data collection strategies: Meta Data Management in Oracle and SAS: Tools for Meta data management

**UNIT-III**

Introduction to Data Mining: Introduction: Scope of Data Mining: What is Data Mining; How does Data Mining Works, Predictive Modeling: Data Mining and Data Warehousing: Architecture for Data Mining: Profitable Applications: Data Mining Tools: Data Preprocessing: Introduction, Data Preprocessing Overview, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

**Data Mining Techniques**- An Overview: Introduction, Data Mining, Data Mining Versus Database Management System, Data Mining Techniques- Association rules, Classification, Regression, Clustering, Neural networks.

**Clustering:** Introduction, Clustering, Cluster Analysis, Clustering Methods- K means, Hierarchical clustering, Agglomerative clustering, Divisive clustering, clustering and segmentation software, evaluating clusters.

**UNIT-IV**

Web Mining: Introduction, Terminologies, Categories of Web Mining – Web Content Mining, Web Structure Mining, Web Usage Mining, Applications of Web Mining, and Agent based and Data base approaches, Web mining Software.

**Applications of Data mining**: Introduction, Business Applications Using Data Mining- Risk management and targeted marketing, Customer profiles and feature construction, Medical applications (diabetic screening), Scientific Applications using Data Mining, Other Applications.

| **RECOMMENDED BOOKS** | | | |
|---|---|---|---|
| **Sr. no.** | **Name** | **AUTHOR(S)** | **PUBLISHER** |
| 1 | Data Warehousing And Data Mining | Varsha V. Bhosale | Wiley India |
| 2 | Data Warehousing: OLAP and Data Mining | Amos Gilat | Wiley India |
| 3 | Introduction to Data Mining | Pang-Ning Tan, Michael Steinbach, Vipin Kumar | **Pearson Education India** |
| 4 | Data Mining | Pieter Adrians, Dolf zantinge | **Pearson Education India** |
| 5 | Database Management Systems | R. Ramakrishnan, J. Gehrke, | McGraw Hill |

KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ME471** |
| **Course Title** | **Material Management** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course pre-requisite** | NA |
| **Course Objectives** | To introduce to the students the various concepts of materials management |
| **Course Outcomes** | The students will able to<br>1)Develop an ability to perform the role of a materials manager in an organization.<br>2)manage the activities of materials manager like purchasing, inventory analysis, storage etc.in a scientific manner.<br>3. S.hall be able to improve due date performance through use of MRP techniques with in capacity constraints |

**Syllabus**

**UNIT I**

Introduction to materials management – Objectives – Functions – Operating Cycle – Value analysis – Make or buy decisions.

**UNIT II**

Management of purchase: Purchasing policies and procedures – Selection of sources of supply – Vendor development – Vendor evaluation and rating – Methods of purchasing – Imports – Buyer – Seller relationship – Negotiations.

**UNIT III**

Management of stores and logistics 12 Stores function – Location – Layout – Stock taking – Materials handling – Transportation – Insurance – Codification – Inventory pricing – stores management – safety – warehousing – Distribution linear programming – Traveling Salesman problems – Network analysis – Logistics Management.

**UNIT IV**

Materials plan for forecasting – Materials requirements planning – Quantity – Periodic – Deterministic models – Finite production. Inventory management 10 ABC analysis – Aggregate planning – Lot size under constraints – Just in Time (JIT) system.

| **RECOMMENDED BOOKS** | | | |
|---|---|---|---|
| **Sr No** | **Name** | **AUTHOR(S)** | **PUBLISHER** |
| 1. | Engineering Management | Dr. R. Kesavan, C.Elanchezian and T.SundarSelwyn. | Eswar Press |
| 2. | Purchasing and Material Management, | Lamer Lee and Donald W. Dobler | Tata McGraw Hill, 200 |
| 3 | Handbook of Materials Management | Gopalakrishnan.P | Prentice Hall of India. |

| | |
|---|---|
| **Course Code** | **ME473** |
| **Course Title** | **MAINTENANCE AND RELIABILITY ENGINEERING** |
| **Type of Course** | OE |
| **L T P** | **3 0 0** |
| **Credits** | 3 |
| **Course pre-requisite** | NA |
| **Course Objectives** | 1)To provide the students with the fundamental concepts, the necessary knowledge and the basic skills related to systems reliability and systems maintenance function<br>2) To expose them to the necessary engineering techniques used for analyzing, Planning and controlling |
| **Course Outcomes** | The students will able to:<br>1)Understand the maintenance function and its objectives and know how to prepare report about the maintenance function.<br>2) Gain the necessary knowledge about the types of maintenance and know how to use them when design maintenance systems.<br>3)Gain the necessary knowledge about failure distributions and apply failure analysis techniques |

**Syllabus**

**UNIT-I**

Introduction: Objective and characteristics of maintenance function, Organization of the maintenance system, Operating practices in maintenance, Maintenance record keeping.
Cost Aspect of Maintenance: Costs of machine breakdown, estimation of life cycle costs, Application of work measurement in maintenance, Manpower planning and training, Incentive payments for maintenance.
UNIT-II

Planning of Maintenance Activities: Evaluation of alternative maintenance policies breakdown, preventive and predictive maintenance, fault diagnosis and condition monitoring techniques, simulation of alternative practices, Development of preventive maintenance schedule, House keeping practices, total productive maintenance.
Maintenance Engineering: Maintenance requirements of mechanical, electrical, process and service equipment, Safety aspect in maintenance, Aspect of lubrication; chemical control of corrosion, Computerized maintenance information systems.
**UNIT-III**

Reliability: Concept and definition, configuration of failure data, various terms used in failure data analysis in mathematical forms, component and system failures, uses of reliability concepts in design and maintenance of different system.
Reliability and Availability of Engineering systems: Quantitative estimation of reliability of parts, Reliability of parallel and series elements, Accuracy and confidence of reliability estimation, Statistical estimation of reliability indices, Machine failure pattern, Breakdown time distribution.

**UNIT-IV**

Reliability improvement: Reliability in design, reliability in engineering, systems, systems with spares, reliability simulation, redundant and stand by systems, confidence levels, component improvement element, unit and standby redundancy optimization and reliability-cost trade off.

Fault Tree Analysis: Introduction and importance, fault tree construction, reliability calculations from fault tree, tie set and cut set methods, event tree and numerical problems.

| **RECOMMENDED BOOKS** | | | |
|---|---|---|---|
| **Sr No** | **Name** | **Authjors** | **Publisher** |
| 1 | Maintenance Engineering Handbook, | Lindley R. Higgins | McGraw Hill |
| 2 | Maintenance Planning control | Edward Arnold | McGraw Hill |

| | |
|---|---|
| **Course Code** | **EE471** |
| **Course Title** | **Wind and Solar energy system** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | NA |
| **Course Objectives (CO)** | The class will explore society's present needs and future energy demands, examine conventional energy sources and systems, then focus on alternate, renewable energy sources such as solar and wind power. |

**SYLLABUS**

**UNIT-I**

History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power-cumulative distribution functions.

**UNIT-II**

Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent-Magnet Synchronous Generators, Power electronics converters. Generator-Converter configurations, Converter Control.

**UNIT-III**

Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.

**UNIT-IV**

Technologies-Amorphous, monocrystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems

| **RECOMMENDED BOOKS** | | | |
|---|---|---|---|
| **S.No.** | **Name** | **Author(s)** | **Publisher** |
| **1** | Non-Conventional Energy Sources | G.D. Rai | Khanna Publishers |
| **2** | Renewable Energy Resources | Twidell&Wier | CRC Press( Taylor & Francis) |
| **3** | Solar Energy: Principles of Thermal Collection and Storage. | S. P. Sukhatme | McGraw Hill, 1984. |
| **4** | Wind Power in Power Systems | T. Ackermann | John Wiley and Sons Ltd., 2005. |

| | |
|---|---|
| **Course Code** | **EE473** |
| **Course Title** | **Instrumentation Engineering** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | NA |
| **Course Objectives (CO)** | To understand the principle and working of electronic instruments and their application. 2. To understand the concept of digital instruments and their comparison. 3. To be able to inculcate the knowledge regarding different types of transducers. 4. To identify the details of instrumentation and devices intended for a particular application. |

SYLLABUS

UNIT-I

ELECTRONIC INSTRUMENTS:-Electronic Voltmeter and Current Probes, Tuned Type and Sampling type Voltmeter, Current Probes for D.C. and A.C. Measurements, Electronic Multimeter - Construction, Measurement of D.C. and A.C. Voltage and Current, Measurement of Resistance. CRO- Construction, Synchronization, Measurement of Voltage, Current, Phase and Frequency, DSO- Working and Operation

UNIT-II

Comparison of Analog and Digital Instruments, Digital Voltmeter, Multimeter and Frequency Meter.

UNIT-III

TRANSDUCERS:-Block Diagram Representation of Instrumentation System, Terminology and Definition, Classification, Transducing Principles and Elements, Ultrasonic, Optical and Infrared Sensors, Inductive, Capacitive and Resistive Transducers for Measurements of Length, Thickness, Displacement, Velocity, Torque, Level, Pressure, Temperature, Flow, Humidity, Moisture and ph.

UNIT-IV

Recorders: X-Y Recorders, Strip-Chart Recorder, Magnetic and Potentiometric Recorder, Digital Displays- LED and LCD, Introduction to Data Acquisition Systems.

Recommended Books

| S.No. | Name | Author(s) | Publisher |
|---|---|---|---|
| 1 | A course in Electrical & Electronic Instrumentation, | Sawhney A.K., | Dhanpat Rai and Sons. |
| 2 | Electronics Instrumentation and Measurements, | Bell David A | Prentice Hall, India |
| 3 | Electrical Measurements Fundamentals, Concepts, Applications, | Reissl and Martin V | Wiley Eastern Limited, New Delhi. |

| | |
|---|---|
| **Course Code** | **ECE471** |
| **Course Title** | **Bio-Medical Electronics** |
| **Type of Course** | **OE** |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Applications Of Electronics In Medical Field. |
| **Course Objectives (CO)** | To study the methods of recording various bio-potentials, how to measure various physiological information, understand the working of biotelemetry and understand the practical application of electronics in biomedical. |

**SYLLABUS**

**UNIT I**

Introduction to Biomedical Signals: The origin of Bio-potential, biological amplifiers, ECG, EMG, PCG, EOG, lead systems and recording methods, typical waveforms and signal characteristics. Electrode theory and Different types of Electrodes. Polarization, Electrode behavior, Electrode-skin interface.

**UNIT II**

Cardio Vascular Measurement: Measurement of blood pressure, balloon flow, cardiac output and cardiac rate. Assist Devices and bio-telemetry: Cardiac pacemakers, DC Defibrillator, Telemetry principles, frequency selection, Biotelemetry, radio-pill and tele-stimulation.

**UNIT III**

Neurological Signal Processing :Modeling of EEG Signals, Detection of spikes and spindles, Detection of Alpha, Beta and Gamma Waves, Auto Regressive (A.R.) modeling of seizure EEG, Sleep Stage analysis, Inverse Filtering, Least squares and polynomial modeling.

**UNIT IV**

Radiological Equipment: Ionizing radiation, Diagnostic x-ray equipment, use of Radio Isotope in diagnosis, Radiation Therapy. Recent trends in medical instrumentation: Thermograph, endoscopy unit, Laser in medicine, Diathermy units, Electrical safety in medical equipment.

**RECOMMENDED BOOKS**

| S. No | Name | Author(S) | Publisher |
|---|---|---|---|
| 1 | Biomedical Signal Processing: Principles and techniques | D.C.Reddy | Tata McGraw-Hill |
| 2 | Willis J Tompkins | Biomedical Signal Processing | Prentice Hall |
| 3 | Khandpur, R.S. | Handbook of Biomedical Instrumentation | Tata McGraw-Hill |
| 4 | Introduction to Biomedical equipment Technology | Joseph J.Carr and John M.Brown | John Wiley and Sons |
| 5 | Biomedical Signal Processing & Signal Modeling | Bruce | John Wiley and Sons |

| | |
|---|---|
| **Course Code** | **ECE473** |
| **Course Title** | **Principles of VLSI Design** |
| **Type of Course** | **OE** |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Knowledge of Microprocessor 8085 and Microcontroller 8051. |
| **Course Objectives (CO)** | To introduce Microprocessor Architectural Concepts, Instructions & communications and latest microcontrollers. |

**SYLLABUS**

**UNIT I:** Introduction: Introduction to Computer-aided design tools for digital systems. Hardware description languages, Introduction to VHDL, Data objects, Classes and data types, Operators, Overloading, Logical operators. Types of delays, Entity and Architecture

**UNIT II:** VHDL Statements: Assignment statements, sequential Statements and process, Conditional statements, Case statements, Array and loops, Resolution functions, Packages & Libraries, Concurrent statements.

**UNIT III:** Combinational Circuit and Sequential Circuit Design: VHDL models and simulation of combinational circuits such as Multiplexers, Encoders, Decoders, Code converters, Comparators, Implementation of Boolean functions etc VHDL Models and simulation of sequential circuits, Shift registers, Counters etc.

**UNIT IV:** Design of Microcomputer: Basic components of a computer, Specifications, Architecture of a simple Microcomputer system, Implementation of a simple microcomputer system using VHDL. Design with CPLDs and FPGAs: Programmable logic devices : ROM, PLAs, GAL, PEEL, CPLDs and FPGA. Design and implementation using CPLDs and FPGA

**RECOMMENDED BOOKS**

| S. No | Name | Author(S) | Publisher |
|---|---|---|---|
| 1 | A VHDL Primmer | Bhasker | Prentice Hall |
| 2 | "Digital System Design using VHDL | Charles. H. Roth | PWS |
| 3 | VDHL-Analysis & Modelling of Digital Systems | Navabi Z | McGraw Hill |
| 4 | Fundamentals of Digital Logic with VHDL Design. | Brown and Vranesic; | TMH |

| | |
|---|---|
| **Course Code** | **CE471** |
| **Course Title** | **Rural Technology & Community Development** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | NA |
| **Course Objectives (CO)** | The objective of this course is to make students aware of the various elements of rural technology and community development. |

**SYLLABUS**

**UNIT-I**

**Data analysis and measures of central tendency**

Meaning nature scope and limitations of statistics, collection of statistical data, classification, tabulation and diagrammatic representation of data, measures of central tendency : statistical averages means, media and mode.

**UNIT-II**

**Data Information and Knowledge**

Concept of information, need of information(professional education, research), qualities of information, value of information, difference between data and information, properties of the needed information, information and management, planning organizing, Coordinating and controlling

**UNIT-III**

**Concept of Marketing**

Difference between marketing selling and retailing, marketing mix, market segmentation, marketing planning, strategy and approaches; modern concept of marketing

**Community Development**

Concept, definition, meaning, need, history, principles objectives and scope. Community building: coming age, regenerating community, community model

**UNIT-IV**

**Consensus Organizing model**

What's behind building healthy communities, participatory democracy. The role of various NGOs in community development. The role of business and government in community development initiatives, how to form a non profit corporation fund raising and grant writing.

**RECOMMENDED BOOKS**

| Sr. no. | Name | Author(s) | Publisher |
|---|---|---|---|
| 1 | Encouraging community development | Biddle William wishart | Mcgraw hill |
| 2 | Sustainable rural technology | M.S Virdi | Daya publishing house |
| 3 | Rural technology | Punia RD Roy | Satyaparkashan |
| 4 | Rural education and technology | S.B Verma, S.K Jiloka | Deep and deep publication |

| | |
|---|---|
| **Course Code** | **CE473** |
| **Course Title** | **Waste Water Engineering** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Environmental Engineering |
| **Course Objectives (CO)** | It is the branch of environmental engineering in which the basic principles of science and engineering are applied to the problems of water pollution control. So, as an overview, this wastewater engineering includes wastewater treatment, sludge disposal and reuse, wastewater reclamation and reuse, effluent disposal and the role of engineer. |

**SYLLABUS**

**UNIT I**

**Introduction**:

Terms & definitions, systems of sanitation and their merits and demerits, system of sewerage, choice of sewerage system and suitability to Indian conditions.

**Design Of Sewers:**

Quantity of sanitary and storm sewage flow, forms of sewers. Conditions of flow in sewers, sewers of equivalent section, self cleansing and limiting velocity, hydraulic formulae for flow of sewerage in sewers and their design.

**UNIT II**

**Construction & Maintenance Of Sewers:**

Sewer appurtenances, materials for sewers. Laying of sewers, joints in sewers, testing of sewers pipes. Maintenance, operation and precaution before entering a sewer.

**House Drainage**:

Principles of house drainage, traps, inspection chamber Indian and European type W.C. flushing cisterns, soil-waste and anti-syphonage pipes, plumbing system.

**UNIT III**

**Characteristics & Testing Of Sewage**:

Composition of sewage, sampling, physical & chemical analysis of sewerage, biological decomposition of sewage, kinetics of organic waste stabilization.

**Treatment Of Sewage**:

Unit processes of waste water treatment, importance of environmental sanitation, treatment of water; impurities in water-processes for their removal – typical flow-sheets. Sedimentation: factors affecting efficiency, design values of various parameters, tube settlers. Coagulation and flocculation: mechanisms, common coagulants, rapid mixing and flocculating devices screens, grit chambers, detritus tank, skimming tank, grease traps, sedimentation, chemical treatment, aerobic biological treatment, trickling filter (lrtf & hrtf), activated sludge processes, anaerobic treatment, units-sludge digesters and biogas plant.

**UNIT IV**

**Low Cost Waste Water Treatment Units:**

Theory, design, advantages & disadvantages of oxidation's ponds, lagoons, ditches, septic tanks and imhoff tanks.

| RECOMMENDED BOOKS | | | |
|---|---|---|---|
| **Sr. no.** | **Name** | **AUTHOR(S)** | **PUBLISHER** |
| 1 | "Water Supply Engineering" Vol. II | Garg S K | Khanna Publishers, New Delhi, 2003 |
| 2 | Environmental Engg. - A design Approach | Arcadio P. Sincero and Gregoria P. Sincero | Prentice Hall of India, New Delhi |
| 3 | Waste Water Engineering - Treatment and Reuse | Metcalf & Eddy | McGraw Hill, New Delhi, 2003 |
| 4 | Waste Water Engg. (Environmental Engg.-II) | Punmia B C | Laxmi Publication, New Delhi, 2002 |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **CSE472** |
| **Course Title** | **Image Analysis** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Computer fundamentals |
| **Course Objectives (CO)** | To make students familiar with the various fundamentals & and processes involved in the processing of an image. |

**SYLLABUS**

**UNIT -I**

Digital Image Fundamentals & Transforms: Introduction, Background, Digital Image Representation, Fundamental Steps in Image Processing, Elements of a Digital Image Processing System. Elements of Visual Perception, Sampling and Quantization, Basic Relationships between Pixels, Imagining Geometry. Introduction to the Fourier Transform, The Discrete Fourier Transform, Some Properties of the Two-Dimensional Fourier Transform.

**UNIT-II**

Image Enhancement: Spatial Domain Methods, Frequency Domain Methods, Some Simple Intensity Transformations, Histogram Processing, Image Subtraction, Image Averaging, Smoothing Filters, Sharpening Filters, Low pass Filtering, High pass Filtering.

**UNIT-III**

Image Restoration & Compression: Degradations Model - Definitions, Degradation Model for Continuous, Restoration in the Spatial Domain, Geometric Transformation. Error free compression, Variable-Length Coding, Bit-Plane Coding, Lossless Predictive Coding. Lossy Compression – Lossy Predictive Coding, Transform Coding.

**UNIT-IV**

Image Segmentation &Representation: Edge Detection, Thresholding, Region-Based Segmentation. Image Representation, Boundary and Regional Descriptors, Relational Descriptors. Object Recognition: Pattern and pattern classes, recognition based on Decision Theoretic Methods, Structur

| RECOMMENDED BOOKS | | | |
|---|---|---|---|
| **S. No** | **Name** | **Author(S)** | **Publisher** |
| 1 | Digital Image Processing | Rafael. C. Gonzalez & Richard E.Woods | Pearson Education |
| 2 | Digital Image Processing | W.K.Pratt. | John Wiley & sons |
| 3 | Image Processing Analysis and Machine Vision | M. Sonka | Thomson Learning |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **CSE474** |
| **Course Title** | **Concepts of Cloud Computing** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Distributed System, Operating Systems and Networking |
| **Course Objectives (CO)** | This Course work provides the complete understanding of Cloud system, its implementation techniques and its various applications in the field of computer Science. |

## SYLLABUS

**UNIT-I**

Introduction: Principles and characteristics of cloud computing- IaaS, PaaS, SaaS; service oriented computing and cloud environment. Cloud Computing Technology: Client systems, Networks, server systems and security from services perspectives; Accessing the cloud with platforms and applications; cloud storage.

**UNIT-II**

Working with Cloud: Infrastructure as a Service–conceptual model and working Platform as a Service – conceptual model and functionalities. Software as a Service: conceptual model and working.

**UNIT-III**

Using Cloud Services: Cloud collaborative applications and services–case studies with calendars, schedulers and event management; cloud applications in project management. Case studies: Microsoft Azure, Google App Engine and Open source clouds- Open-Nebula and Eucalyptus.

**UNIT-IV**

Virtualization Technology, Creating VMs, Hypervisor. Storage Technology, types of Storage Devices, RAID Tech Practical Session for RAID (Hands on) File system, DAS, NAS & SAN Tech.

**RECOMMENDED BOOKS**

| Sr. no. | Name | Author(s) | Publisher |
|---|---|---|---|
| 1 | Cloud Computing – A Practical Approach | Anthony T.Velte, Toby J.Velte and Robert E | TMH |
| 2 | Cloud Computing – Web based Applications | Michael Miller | Pearson Publishing |

| | |
|---|---|
| Course Code | **ME472** |
| Course Title | **Operations Management** |
| Type of Course | OE |
| L T P | 3 0 0 |
| Credits | 3 |
| Course pre-requisite | NA |
| Course Objectives | 1) To gain an understanding and appreciation of the principles and applications relevant to the planning, design, and operations of manufacturing/service firms. |
| Course Outcomes | The students will able to:<br>1)Apply knowledge of fundamental concepts of operations management.<br>2)Apply knowledge of approaches to operational performance improvement.<br>3)Apply decision-support tools to business decision making. |

**Syllabus**

**UNIT- I**

Operations management: Concept, Functions. Product Design and development : Product design and its characteristics: Product development process (Technical): Product development techniques .Process selection- Project, job, Batch, Mass and Process types of Production Systems.

**UNIT-II**

Facility Location: importance, Factors in Location Analysis: Location Analysis Techniques. Facility Layout : Objectives: Advantages: Basic types of layouts. Capacity Planning : Concepts: Factors Affecting Capacity Planning, Capacity Planning Decisions. Production Planning & Control (PPC) :Concepts, Objectives, Functions. Work Study : Productivity: Method Study; Work Measurement.

**UNIT- III**

Introduction to modern productivity techniques : just in time, Kanban system. Total Quality Management & six sigma. Functions of Purchasing Management : Objectives, Functions:

Methods: Procedure. Value analysis : Concepts. Stock control systems. Virtual factory concept. Production worksheets.

**UNIT- IV**

Inventory Management : Concepts, Classification: Objectives: Factors Affecting Inventory Control Policy: Inventory costs: Re-order Level, Quality Management - Quality Concepts, Difference between Inspections, Quality Control, Quality Assurances, Total Quality Management: Control Charts: acceptance Sampling.

| **RECOMMENDED TEXT BOOKS** | | | |
|---|---|---|---|
| S. No | Author | Title | Publisher |
| 1 | Nair | Production & Operations Management | Tata McGraw hill |
| 2 | Adam and Eben | Production & Operations Management | Prentice Hall |

SANT BABA BHAG SINGH UNIVERSITY KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| Course Code | **ME474** |
| Course Title | **Industrial Safety** |
| Type of Course | **OE** |
| L T P | 3 0 0 |
| Credits | 3 |
| Course pre-requisite | EVS |
| Course Objectives | To aware the students with potential Risks in operations and their Management. |
| Course Outcomes | The students will able to:<br>1) Enumerate the importance of industrial safety.<br>2)Indicate unsafe acts and conditions causing accidents.<br>3) Outline accident investigation and analysis |

**SYLLABUS**

**UNIT- 1**

Introduction Growing concern for safety and health, Safety terminology. Health and safety regulations: International and National scenario : National policy: Product and system liability, Safety cost and losses: Cost of accidents and hidden costs, Growing awakening and concern for environment: Environment protection Act 1986 (amended 1991) : Global warming . Principles of total safety and environment management: Goal, synergy and differences between safety and environment, Synergy of quality with safety, health and environment, Safety . Safety and health hazards, Types of hazards, . Measuring performance of safety and health systems : Indices, and their computation . Safety hazards: Safety in construction, Machine guards & machine tools safety, Safety in material handling.

**UNIT- II**

Fire safety and industrial security, Principles of fire safety : Occupational injuries and precaution, Characteristics and nature of fire : Fire hazards . Types of fires and ways of extinguishing: Automatic sprinklers : Portable extinguisher : Extinguishing agents . Fire prevention techniques: Building codes & regulation : Building materials and internal finishes . Electrical fire safety:

Problems and facts : Electrical distribution and earthing : FRLS wiring : Portable genset and appliances : Electrical processes like welding & cutting . Fire regulations: Standards : Occupancy & egress : Escape plans & displays : Protective clothing : Protective strategies : Emergency preparedness . Fire losses and assessment: After effect & plan of action

**UNIT- III**

Health, Industrial hygiene, Loss control and productivity, Application of occupational hygiene, Health hazard agents: Chemical agents like toxic compounds and materials: Physical agents like noise, vibration & radiation : Biological hazards . Exposure risk assessment: Routes of exposure Measurement of exposure: Exposure factors . Pulmonary diseases due to environment pollution. Respiratory and personal protective equipment, Development and administering medical surveillance system, Environmental management. Sustainable development planning: National policy Environmental damage and costs : Deteriorating impact on environment . Environmental factors and safety. Environmental design of work place: Location: Work direction walkways: Area allocation and sitting/working plan . Illumination: Types of lighting (natural vs artificial) : Luminous level : Glare . Ventilation: Types (natural and mechanical): Heat calculation: Measurements. Noise: Types: Protection: Effects & productivity . Drinking water: Contamination: Causes: Precaution : Preventive maintenance Industrial pollution hazards . Air pollution: Types: Causes: Prevention and control Water pollution: Categories : Causes : Prevention and control . Soil and ground pollution: Categories: Causes: Prevention and control . Noise pollution: Causes: Prevention : Acoustic design : Monitor and controls . Industrial waste: Types: Control : Reuse . Environmental impact assessment: Objective: Environment impact in India: Other efforts in conserving nature

**UNIT-IV**

Compliance of environmental laws: Guidelines for location of industries: Compliance of water & air pollution acts, and other environmental laws, Imperative for sustainable development. Green house gases: Composition: Effect . Carbon emission: Kyoto protocol: Carbon credits: Emission trading: Carbon credit scenario in India : Corporate social responsibility . Carbon foot print: Measures to reduce : Initial investment . Ozone layer depletion. Mutual agreements: Member states: Scope: Responsibilities . Rain water harvesting: India's tradition in water harvesting : Rainfall data : Catch water practice and policy : Basic design : Making a mass movement . Wasteland reclamation and reforestation: Restoration of ecology: Restoration of water logged soil : Mine rehabilitation : Managed reforestation : Tree plantation : Climatic change mitigation EHS regulations and disaster management . Introduction to disaster management.

Recommended Books:

| S. No | Author | Title | Publisher |
|---|---|---|---|
| 1 | L M Deshmukh | Industrial Safety Management | McGraw Hill, 2010. |
| 2 | A.K. DAS | Principles of Fire Safety Engineering: Understanding Fire and Fire Protection | PHI |
| 3 | R.K. Mishra | Safety Management | AITBS Publishers India |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **EE472** |
| **Course Title** | **Electrical Materials** |
| **type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Basic electrical. |
| **Course Objectives (CO)** | To familiarize about Materials used in Electrical Engineering |

**SYLLABUS**

**UNIT-I**

**Dielectric Materials:**

Static dielectric constant, Polarization, atomic interpretation of the dielectric constant of mono-atomic and poly atomic gases, internal fields in the solids and liquids, static dielectric constants of solids, ferroelectric materials and spontaneous polarization, piezo- electricity. Frequency dependence of electronics, ionic and orientational polarization, complex dielectric constant and dielectric losses.

**UNIT-II**

**Conductivity of Metals:**

Ohm's Law and relaxation time of electrons, collision time and mean free path. Electron scattering and resistivity of metals. Heat developed in current carrying conductor, thermal conductivity of metals, superconductivity.

**UNIT-III**

**Magnetic Materials :**

Magnetization from microscopic view point, orbital magnetic dipole movement and angular momentum materials, diamagnetism, origin of permanent magnetic dipoles in material. Paramagnetic spin systems.

**UNIT-IV**

**Properties of ferromagnetic materials:**

Spontaneous magnetization and the curie-Weils Law. Ferromagnetic Domains and coercive force, anti-ferromagnetic and ferromagnetic materials, magnetic materials for electrical devices, introduction to permanent magnets.

**RECOMMENDED BOOKS**

| S. No. | NAME | AUTHOR(S) | PUBLISHER |
|---|---|---|---|
| 1 | Electrical Engineering materials | A.J. Dekker. | Englewood Cliffs, NJ: Prentice Hall |
| 2 | Electrical Engineering Materials | G.P. Chhalotra. | Khanna |
| 3 | Electrical Engineering materials | S.P. Seth and P.V. Gupta. | Dhanpat Rai |

| | |
|---|---|
| **Course Code** | **EE474** |
| **Course Title** | **Electrical & Hybrid Vehicles** |
| type of Course | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Applied mechanics & Basic Electrical. |
| **Course Objectives (CO)** | Understand the models to describe hybrid vehicles and their performance. Understand the different possible ways of energy storage. Understand the different strategies related to energy storage systems. |

## SYLLABUS

**UNIT-I**

Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics. Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

**UNIT-II**

Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis. Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

**UNIT-III**

Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis,

**UNIT-IV**

Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

| RECOMMENDED BOOKS | | | |
|---|---|---|---|
| **S.No.** | **Name** | **Author(s)** | **Publisher** |
| **1** | Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives. | C. Mi, M. A. Masrur and D. W. Gao. | John Wiley & Sons, 2011. |
| **2** | Hybrid Electric Vehicles: Energy Management Strategies. | S. Onori, L. Serrao and G. Rizzoni, “ | Springer, 2015. |
| **3** | Electric and Hybrid Vehicles. | T. Denton | Routledge, 2016. |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ECE472** |
| **Course Title** | **Embedded Systems** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Basics Knowledge of Microprocessor and Microcontroller and its Programming |
| **Course Objectives (CO)** | The goal of the course is to teach the concepts C Language and object oriented programming, ARM architecture and peripheral interfacing. To read and understand the C and C++ programming, ARM processor architecture and programming The course focuses on how to write program and peripheral interfacing of ARM processor and develop the applications. |

**SYLLABUS**

**UNIT-I**

Embedded system introduction: Introduction to embedded system, embedded system architecture, classification of embedded system, challenges and design issues in embedded system, introduction to the register bank, families of the ARM processor, interrupt and vector table & other features of ARM: JTAG, I2C bus.

**UNIT-II**

ARM Programming Instructions Introduction to the instruction set of the ARM processor, Addressing modes, load store instruction, PSR (Program Status Register) instructions, conditional instructions, and interrupt instructions.

**UNIT-III**

C Programming Integrated Development Environment (IDE) for C/C++ Programming, C/C++ Programs using Function Calls, Structures, Pointers, Integers & Floating Point Arithmetic, and Assembly Code using Instruction Scheduling, Register Allocation, and Conditional Execution Loops.

**UNIT- IV**

Interfacing Peripherals ARM processor interfacing with ADC, DAC, Sensors, Memory, LCD Display, Stepper Motor, DC Motor, SD-MMC Card, Biometric & RFID, ZIGBEE, GSM Interfaces, and Debugging Tools.

| RECOMMENDED BOOKS | | | |
|---|---|---|---|
| **S. No** | **Name** | **Author(S)** | **Publisher** |
| **1** | Radio Frequency & Microwave Electronics | Mathew. M. Radmanesh | Pearson Education Asia |
| **2** | Foundation of Microwave Engineering | RE Collin | Prentice Hall of India |
| **3** | Antenna and Radio Wave Propagation | RE Collin | Prentice Hall of India |
| **4** | Antennas: Theory and Practice | R Chatterjee | Pearson Education Asia |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ECE474** |
| **Course Title** | **Advanced Optical Communication System** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Electromagnetic Theory, Communication Engineering, Digital Communication |
| **Course Objectives (CO)** | To explain the need and significance of Optical Communication System and impart knowledge of types, basic laws, and transmission characteristics, components of optical fibres. |

**SYLLABUS**

**UNIT-I**

Overview: The Electromagnetic Spectrum, Properties of Light, Dual Nature of Light, Concept of a photon, Wave Model, Characteristics of light waves, general communication systems, evolution of Basic Fiber Optic Communication System, Benefits and disadvantages of Fiber Optics, Transmission Through Optical Fiber, The Laws of Reflection and Refraction, Light rays and light waves, Reflection of light from optical surfaces, Refraction of light from optical interfaces, The Numerical Aperture (NA), The Optical Fiber, Types of Fiber.

**UNIT-II**

Losses In Optical Fiber: Attenuation, Material absorption losses, linear and non linear scattering losses, fiber bend loss, dispersion viz. inter modal dispersion and intra modal dispersion, overall fiber dispersion and polarization, Dispersion shifted and dispersion flattened fibers, attenuation and dispersion limits in fibers, Kerr nonlinearity, self phase modulation, combined effect of dispersion and self phase modulation.

**UNIT-III**

Optical Sources And Detectors : Sources: Basic principle of surface emitter LED and edge emitter LED- material used, structure, internal quantum efficiency and characteristics, LASER Diode - material used, structure, internal quantum efficiency and characteristics, working Principle and characteristics of Distributed feedback (DFB) laser. Detectors: PIN photodiode - material used, working principle & characteristics, Avalanche Photodiode: - material used, working principle and characteristics

**UNIT-IV**

Advanced Topics: Optical TDM, SCM, WDM and Hybrid multiplexing methods, Fiber Optic Networks, Transreceivers for Fiber-Optic Networks, Semiconductor Optical Amplifiers, Erbium Doped Fiber Amplifiers (EDFAs).

| RECOMMENDED BOOKS | | | |
|---|---|---|---|
| **S. No** | **Name** | **Author(S)** | **Publisher** |
| 1 | Optical Fiber Communication Principles & Practice. | John M.Senior | PHI Publication |
| 2 | Optical Communication Systems | John Gowar | PHI Publications. |
| 3 | Optical Fiber Communication | Gerd Keiser. | Mc Graw Hill International Publications |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **CE472** |
| **Course Title** | **Tall BUILDING** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Design of concrete, steel structures, earthquake engineering |
| **Course Objectives (CO)** | The objective of the study is to identify the structural systems for various combinations of gravity and horizontal loading considering their functional use and heights. The students Should be able to analyze the behaviour and drift capacities of various high rise structural forms. |

**UNIT-I**

Definition of tall building-need for constructing tall building-Historic background-factors affecting growth. Design Criteria, Design Philosophy of High Rise structures, Materials, Loading gravity loading- Dead and live load, live load reduction techniques-sequential loading, Impact loading, Wind Loading, Wind Characteristics, Static and Dynamic wind Effects.

**UNIT-II**

Analytical and wind tunnel experimental method, Earthquake loading-equivalent lateral force method modal analysis, Introduction to Performance based seismic design. Structural form, Floor systems Rigid frame Structures- rigid frame behaviour –approximate determination of member forces by gravity loading- two cycle moment distribution, approximate determination of member forces by lateral loading- Portal method, Cantilever method, approximate analysis of drift.

**UNIT-III**

Structural design of tall concrete and masonry buildings: commentary structure a standards, plastic analysis-strength of members and correction, non-linear analysis and limit design, stability, stiffness and crack control creep shrinkage and temperature effects. Limit state design, masonry structures.

**UNIT-IV**

Frame-shear wall systems: Twist of frame. Analysis of shear wall, frame wall interaction, analysis of coupled shear wall, computation of earthquake load dynamic analysis of tall building

| **Suggested textbooks** | | | |
|---|---|---|---|
| **S. No** | **Name** | **Author(S)** | **Publisher** |
| **1** | High rise Building Structures" | Schumelles W | John Wiley and Sons, New York |
| **2** | Structural Analysis and Design of Tall Buildings | Taranath Bungale | McGraw Hall |
| **3** | Tall Building structures: Analysis and Design | Smith Bryan Stafford, Coull Alex. | New York Wiley-Inter science, , 1991. |

| | |
|---|---|
| **Course Code** | **CE474** |
| **Course Title** | **Remote Sensing And Geographical Information System** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | |
| **Course Objectives (CO)** | To introduce the principles and basic concepts of Remote Sensing ar<br>To introduce the remote sensing systems, data products and analy introduce the spatial data models, analysis and presentation techniqu study the applications of Remote Sensing and GIS in agriculture, s water resources |

## SYLLABUS

**UNIT– I**

**Introduction**

Basic principles of remote sensing; Conventional aerial photography; Non-conventional photography; Non-photographic sensors; Rocket and earth orbital imagery; Energy sources and radiation principles; Energy interaction in the atmosphere and with earth surface; Nature of electromagnetic radiation; Active and passive remote sensing systems; Earth resource satellite.

**Photographic Systems for Remote Sensing**

Fundamental consideration; Aerial photographic film, cameras and filters.

**UNIT– II**

**Imaging and Nonimaging Sensors**

Sensor fundamentals; Nonimaging sensors; Optical mechanical scanners; Radiometric calibration.

**Remote Sensing Data Systems Processing and Management**

**I**nformation system; Image data storage and retrieval; Image data input and output; Image processing principles; Image processing implementation; Pattern recognition.

**UNIT-–III**

**Ground Investigations in Support of Remote Sensing**

Test sites; Common measurements; Geologic investigations; Agriculture and Forestry investigations; Atmospheric investigation.

**Image Interpretation**

Activities of image interpretation; Elements of image interpretation; Techniques of Image interpretation; Visual requirements for image interpretation; Image interpretation equipment.

**UNIT-– IV**

**Digital Image Processing and Geographic Information System**

Image rectification and restoration; Image enhancement; Contrast manipulation; Multi image manipulation; Image classification; Post classification smoothing; Classification accuracy assessment; Basic concepts of GIS; Data imagery and GIS application for land and water resources.

| **RECOMMENDED BOOKS** | | | |
|---|---|---|---|
| **Sr. no.** | **Name** | **Author(s)** | **Publisher** |
| 1 | Introduction to Environmental Remote Sensing | Barret, E.C. and Curits, L.F. | John Wiley and Sons Inc. New York |
| 2 | Space Remote Sensing System Introduction | Chern, H.S. | Academic Press Inc. New York |
| 3 | Remote Sensing and Image Interpretation | Lillesand, T.M. and Kiefer, R.W. | John Wiley and Sons Inc. New York |
| 4 | Remote Sensing: Methods and Applications | Hard, R.M. | John Wiley and Sons Inc. New York |
| 5 | Manual of Remote Sensing | Reeves, R.G., Ansom, A. and David Landen | Kendall/Hunt Publishing Company |

| | |
|---|---|
| **Course Code** | **CSE476** |
| **Course Title** | **Big Data** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Knowledge of Database Management System. |
| **Course Objectives (CO)** | To understand big data analytics as the next wave for businesses looking for competitive advantage, To understand the financial value of big data analytics, To explore tools and practices for working with big data, To understand how big data analytics can leverage into a key component, To understand how to mine the data, To learn about stream computing, To know about the research that requires the integration of large amounts of data. |

**SYLLABUS**

**UNIT I**

**Introduction to Big Data**

Analytics, Nuances of big data, Value, Issues, Case for Big data, Big data options Team challenge, Big data sources, Acquisition, Nuts and Bolts of Big data. Features of Big Data, Security, Compliance, auditing and protection, Evolution of Big data.

**UNIT II**

**Data Analysis**

Evolution of analytic scalability, Convergence, parallel processing systems, Cloud computing, grid computing, map reduce, enterprise analytic sand box, analytic data sets, Analytic methods, analytic tools, Cognos, Microstrategy, Pentaho. Analysis approaches, Statistical significance, business approaches, Analytic innovation, Traditional approaches

**UNIT III**

**Stream Computing**

Introduction to Streams Concepts, Stream data model and architecture, Stream Computing, Sampling data in a stream, Filtering streams, Counting distinct elements in a stream, Estimating moments, Counting oneness in a window, Decaying window.

**UNIT IV**

**Predictive Analytics And Visualization**

Predictive Analytics, Supervised, Unsupervised learning, Neural networks, Kohonen models, Normal, Deviations from normal patterns, Normal behaviours, Expert options, Variable entry, Mining Frequent itemsets, Market based model, Apriori Algorithm, Handling large data sets in Main memory, Limited Pass algorithm, Counting frequent itemsets in a stream, Clustering Techniques, Hierarchical, K- Means, Clustering high dimensional data Visualizations, Visual

data analysis techniques, interaction techniques; Systems and applications:

| RECOMMENDED BOOKS | | | |
|---|---|---|---|
| **Sr. no.** | **Name** | **AUTHOR(S)** | **PUBLISHER** |
| 1 | Big Data Analytics: Turning Big Data into Big Money | Frank J Ohlhorst | Wiley and SAS Business Series |
| 2 | Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis | Colleen Mccue | Elsevier |
| 3 | Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics | Bill Franks | Wiley and SAS Business Series |
| 4 | Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data | Paul Zikopoulos, Chris Eaton, Paul Zikopoulos | McGraw Hill |
| 5 | Data Mining Concepts and Techniques | Jiawei Han, MichelineKamber | Elsevier |

SANT BABA DEEP SINGH UNIVERSITY KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **CSE478** |
| **Course Title** | **Network Security** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Computer Networks |
| **Course Objectives (CO)** | It aims to introduce students to the fundamental techniques used in implementing secure network communications, and to give them an understanding of common threats and attacks. |

## SYLLABUS

**UNIT- I**

**Introduction to Network Technology:** SLIP/PPP Dedicated lines, BOOTP, DHCP, Domain management (DNS), Transport Layer issues, TCP/IP, Gateway, Dial-up, Internet networking TCP/IP protocols, IP addressing.

**UNIT-II**

**Basics of Network security**- Fundamentals of network security, Basics of IPv6, IPsec: overview of IPsec, IP and IPv6, Authentication header (AH), Encapsulating Security Payload (ESP).

**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.

**UNIT-III**

**Model of Network security-** Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Block Cipher and the Data Encryption Standard - Modes of operation, Triple DES, AES, RC4, RSA, Attacks, Primality test, Factoring.

**Discrete Logarithms** –Digital signatures, RSA, ElGamal, DSA, Unwanted traffic: denial of service attacks.

**UNIT-IV**

**Authentication applications** – Kerberos, X.509, PKI, Electronic Mail security, PGP, S/MIME, IP security, Web Security, SSL, TLS, SET.

**System Security** – Intruders, Malicious software, viruses, Firewalls and filters, Security Standards.

**RECOMMENDED BOOKS**

| Sr. no. | Name | AUTHOR(S) | PUBLISHER |
|---|---|---|---|
| 1 | Network Security and Ethical Hacking | Rajat Khare | Luniver Press |
| 2 | Cryptography and Network Security | AtulKahate | Tata Mc-Graw Hill |
| 3 | Computer Networks | A.S Tanenbaum | Pearson |

| | |
|---|---|
| **Course Code** | **ME476** |
| **Course Title** | **IC ENGINES** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course pre-requisite** | None |
| **Course Objectives** | The students will learn to classify different types of internal combustion engines and their applications. |
| **Course outcomes** | The students will able to<br>1)Differentiate the internal combustion engines based on the classification parameters.<br>2)Explain different types of fuel injection system and combustion chambers of CI engine<br>3)Discuss various ignition methods used in I.C engine |

**Syllabus**

**UNIT-I**

Introduction to IC Engines: Definition of engine; Heat Engine, Historical Development of IC Engines, Classification & Nomenclature, Application of IC Engines, Air Standard Cycle, Carnot Cycle, Sterling Cycle, Ericson Cycle, Otto Cycle, Diesel cycle, Dual Cycle, Thermodynamics Analysis of these cycle

Actual Working of I.C. Engine: Working of 4 stroke petrol & diesel engines and their valve timing diagram, working of 2-stroke petrol & diesel engines & their valve timing diagrams, comparison of two stroke & four stroke engines, Actual working of 2 & 4 stroke gas engine and their valve diagram

**UNIT-II**

Fuel Air Cycles and their analysis: Introduction to fuel air cycles and their significance, composition of cylinder gases, variable specific heats, Dissociation, effect of no. of moles, comparison of air standards & fuel air cycles, effect of operating variable like compression ratio, fuel air ratio, actual cycles and their analysis; Difference between Actual and Fuel-Air Cycle, Actual and Fuel-Air Cycles for S.I. and C.I. Engines.

IC Engine Fuels: Introduction, types of fuels, solid, liquid and gaseous fuels, chemical structure of petroleum, petroleum refining process, important qualities of S.I. & C.I. Engine fuels and their rating. Combustion of fuels; Calorific valves of fuels, theoretical determination of CV of fuel, combustion equation for hydrocarbon fuels, determination of minimum air required for combustion, conversions of volumetric analysis of mass analysis, Determination of air supplied from volumetric analysis of Dry flue gases, Determination of excess air supplied , Determination

of % of carbon in fuel burning to CO & CO2 , Determination of minimum quantity of air supplied to gaseous

**UNIT- III**

Fuel Supply System: Fuel Supply System and fuel pumps, properties of air fuel mixture, a sample carburetor an its working, approximate analysis of simple carburetor, Actual air fuel ratio of single jet carburetor, Exact analysis of single jet carburetor, ideal requirements from a carburetor, limitations of single jet carburetor, different devices used to meet the requirements of an ideal carburetor. Different modern carburetors, introduction to petrol injection, fuel injection systems for C.I.

Engines: classification of injection systems, injection pump, injection pump governor, mechanical governor, fuel injection systems, injection pump Governor, Mechanical Governor, Fuel Injector, Nozzle, Injection of S.I. Engines, Fuel Filters.
Introduction, Stages of Combination in S.I. Engine, Flame font propagation, factor influencing the flame speed, ignition lag and factors affecting the lag, Abnormal combustion and knocking, control and measurement of knock, rating of S.I. Engine fuels and anti knock agents, combustion chambers of S.I. Engines

**UNIT-IV**

Supercharging: Introduction, purpose of supercharging, type of superchargers, analysis of superchargers, performance of superchargers, Arrangement of Supercharger and its installation, Turbo charged engines, supercharging of S.I. & C.I. Engines. Limitations of supercharging.

Measurement and Testing: Measurement of friction horse power, brake horse power, indicated horse power, measurement of speed, air consumption, fuel consumption, heat carried by cooling water, heat carried by the exhaust gases, heat balance sheet, governing of I.C. Engines, performance characteristics of I.C. Engines: Performance parameters, performance of S.I. Engines, performance of C.I. Engine, Engine performance maps

| S. No | Name | Author | Publisher |
|---|---|---|---|
| 1 | Internal Combustion Engines | V. Ganesan | Prentice Hall |
| 2 | A Course in Internal Combustion Engines. | M. Damundwar | Dhanpat Rai |
| 3 | Internal combustion engine fundamentals | John B. Heywood | McGraw-Hil |

| | |
|---|---|
| **Course Code** | **ME478** |
| **Course Title** | **Power Plant engineering** |
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course pre-requisite** | Applied thermodynamics |
| **Course Objectives** | To provide an overview of power plants and the associated energy conversion issues. |
| **Course Outcomes** | The students will able to<br>1) Summarize the layout and components in a power plant.<br>2) Enumerate and classify the types of power plants available.<br>3) Recognize the steam cycles on pressure - volume and temperature diagram |

**Syllabus**

**UNIT-I**

Coal based thermal power plants, basic Rankine cycle and its modifications, layout of modern coal power plant, super critical boilers, FBC boilers, turbines, condensers, steam and heating rates, subsystems of thermal power plants, fuel and ash handling, draught system, feed water treatment, binary cycles and cogeneration systems Gas turbine and combined cycle power plants, Brayton cycle analysis and optimization, components of gas turbine power plants, combined cycle power plants, Integrated Gasifier based Combined Cycle (IGCC) systems.

**UNIT-II**

Basics of nuclear energy conversion, Layout and subsystems of nuclear power plants, Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANDU Reactor, Pressurized Heavy Water Reactor (PHWR), Fast Breeder Reactors (FBR), gas cooled and liquid metal cooled reactors, safety measures for nuclear power plants.

**UNIT-III**

Hydroelectric power plants, classification, typical layout and components, principles of wind, tidal, solar PV and solar thermal, geothermal, biogas and fuel cell power systems.

**UNIT-IV**

Energy, economic and environmental issues, power tariffs, load distribution parameters, load curve, capital and operating cost of different power plants, pollution control technologies including waste disposal options for coal and nuclear plants.

**Recommended Text Books**

| S. No | Author | Title | Publisher |
|---|---|---|---|
| 1 | El Wakil M.M | Power Plant Technology | McGraw Hill, 2010. |
| 2 | Elliot T.C&Chen K | Power Plant Engineering | McGraw Hill, 1998. |
| 3 | Nag P.K., | Power Plant Engineering | Tata McGraw Hill, 2008 |

SANT BABA BHAG SINGH UNIVERSITY
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **EE476** |
| **Course Title** | **Electrical Measurement** |
| **Type of Course** | Open Elective |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Basic electrical |
| **Course Objectives (CO)** | To understand various electrical quantities, their measurements and to familiarize with the construction, working principle and applications of various electrical instruments. |

**SYLLABUS**

**UNIT-I**

**UNITS, DIMENSIONS AND STANDARDS:** Introduction to MKS **(Meter-Kilogram-Second)** and Rationalized MKSA **(Meter-Kilogram-Second-Ampere)** System, SI Units (International System of Units), Standards of electromotive force (EMF), Resistance, Capacitance and Inductance, Systematic errors

**GENERAL THEORY OF ANALOG MEASURING INSTRUMENTS:** Operating torque, damping and controlling torque, Torque-weight ratio, Pointers and Scales. Principles of operation of various types of electro mechanical indicating / registering instruments viz. Permanent Magnet Moving Coil (PMMC), dynamometer, induction, thermal, etc. for direct current and alternating current measurement of voltage, current, power, frequency, phase and power factor etc., energy meter: their sources of error and compensation, shunts and multipliers, multi-meter.

**UNIT-II**

**POTENTIOMETERS:** Basic direct current (DC) potentiometer circuit, Modern form of DC potentiometer, measurement of voltage, current, Resistance and calibration of voltmeter and ammeter using DC potentiometer, volt ratio box, Self-balancing potentiometer, Alternating current (AC) potentiometers and their applications.

**UNIT-III**

**MAGNETIC MEASUREMENTS:** Flux meter, B-H Curve, Hysteresis loop, Permeameters, AC Testing of Magnetic materials, Separation of iron losses, iron loss measurement by Wattmeter and Bridge methods

**UNIT-IV**

**INSTRUMENT TRANSFORMERS:** Theory and construction of current and potential transformers, ratio and phase angle errors and their minimization, Characteristics of current transformers (CT) and potential transformers (PT) and their Testing.

**RECOMMENDED BOOKS**

| Sr. no. | Name | AUTHOR(S) | PUBLISHER |
|---|---|---|---|
| 1 | A Course in Electrical and Electronics Measurement and Instrumentation. | Sawhney A. K | Dhanpat Rai and Sons. |
| 2 | Electrical Measurements and Measuring instruments | Golding Edward William and Widdis Frederick Charles | Wheelers India . |
| 3 | Modern Electronic Instrumentation. and Measurement Techniques | Helfrick A.D. and Cooper W.D. | Prentice Hall |

| | |
|---|---|
| **Course Code** | **EE478** |
| **Course Title** | **Energy Auditing & Management.** |
| **Type of Course** | Open Elective |
| **L T P** | 3 0 0 |
| **Credits** | 3 |

| | |
|---|---|
| **Course Prerequisites** | Basic electrical. |
| **Course Objectives (CO)** | To understand how energy is used within the plant and to find opportunities for improvement, energy saving, energy audits concepts to evaluate the effectiveness of an energy efficiency project or program. |

**SYLLABUS**

**UNIT-I**

**Energy Scenario:** Energy needs of growing economy, Long term energy scenario, Energy pricing, Energy sector reforms, Energy and environment: Air pollution, Climate change, Energy security, Energy conservation and its importance, Energy strategy for the future, Energy conservation Act- 2001 and its features.

**UNIT-II**

**Energy Management and Audit:** Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach-understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution, Energy audit instruments

**UNIT-III**

**Financial Management:** Investment-need, Appraisal and criteria, Financial analysis techniques- Simple payback period, Return on investment, Net present value, Internal rate of return, Cash flows, Risk and sensitivity analysis, Financing options, Energy performance contracts and role of energy savings companies (ESCOs).

**UNIT-IV**

**Electrical system:** Electricity tariff, Load management and maximum demand control, Power factor improvement, Distribution and transformer losses. Losses in induction motors, Motor efficiency, Factors affecting motor performance, Rewinding and motor replacement issues, energy efficient motors. Light source, Choice of lighting, Luminance requirements, and Energy conservation avenues

**Compressed air system:** Types of air compressors, Compressor efficiency, efficient compressor operation, Compressed air system components, Capacity assessment, Leakage test Factors affecting the performance and efficiency.

**RECOMMENDED BOOKS**

| Sr. no. | Name | AUTHOR(S) | PUBLISHER |
|---|---|---|---|
| 1 | Solar Energy and Energy Conservation. | Sawhney and Maheshwari | Prentice Hall (India) |
| 2 | Energy Technology | Rao S. and B. B. Parulkar | Khanna Publishers |
| 3 | Solar Energy | Sukhatme S. P | Tata McGraw Hill |

| | |
|---|---|
| **Course Code** | **ECE476** |
| **Course Title** | **Digital System Design** |

| | |
|---|---|
| **Type of Course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisite** | Basic Electronics, Digital Electronics, VHDL |
| **Course Objectives (CO)** | To provide the knowledge of designing various combinational and Sequential circuits using VHDL. To introduce the concept of Finite state machine and use it for minimization of specified synchronous and asynchronous sequential circuits |

**SYLLABUS**

**UNIT-I**

Review of Digital Electronic concepts: Basic gates, Adder, Subtractor, Multipliers, Multiplexers, ROM, PLA, PAL, and PLD, Minimization techniques: optimal combinational with K Map and tabular methods. Simplification and minimization.

**UNIT- II**

Synchronous Sequential Logic: The Concept Of Memory, The Binary Cell, The Cell and the Bouncing Switch, Set /Reset, Design of sequential modules – SR, D, T and J-K Flip-flops, Flip-flop applications – Clock generation, Counters, Registers, Triggering of flip-flops, State reduction and assignment, Flip-flop excitation tables, Design procedure.

**UNIT-III**

Finite State Machines: Finite state model, Memory elements and their excitation functions, Synthesis of Synchronous sequential circuits, Capabilities and limitations of FSM, Design, Modeling and Simulation of Moore and Mealy machines. Design and VHDL implementation of FSMs.

**UNIT IV**

Asynchronous Sequential Logic: Analysis Procedure, Circuits with latches, Design procedure, Reduction of state and flow tables, Race-free state assignment, Hazards, Design examples. Design issues like metastability, synchronizers, clock skew and timing Considerations. Designing with Programmable Logic Devices and Programmable Gate Arrays: Read only memories, Programmable logic arrays, Programmable array logic

**RECOMMENDED BOOKS**

| S. | Name | Author(S) | Publisher |
|---|---|---|---|

| No | | | |
|---|---|---|---|
| 1 | VHDL | Douglas Perry | TMH |
| 2 | An Engineering Approach to Digital Design | William I. Fletcher | Prentice Hall of India |
| 3 | Digital System Design using VHDL | Charles H.Roth | Thomson |
| 4 | Fundamentals of Digital Logic with VHDL design | Stephen Brown, ZvonkoVranesic | TMH |
| 5 | Digital Design | John Wakerley | Prentice Hall |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **ECE478** |
| **Course Title** | **Broadband Communication** |
| **Type of course** | OE |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course prerequisites** | Knowledge of Analog and Digital Communication. |
| **Course objectives (CO)** | Study the principles and features of various possible alternatives for realizing high speed communication systems. Analyze and identify the suitability of a specific broadband system from the available alternatives depending on the geographical location, subscriber density. |

## SYLLABUS

**UNIT I**

Mobile and Satellite Communication - Mobile Communication Principles, Architecture of GSM, Introduction to 2G to 4G Systems such as GSM, HSCSD, GPRS, EDGE etc, Principles of CDMA. Satellite technology evolution, LEO, MEO, GEO satellites and their special services, orbital equations, link budget for C- band satellite, impact of satellite in Indian scenario.

**UNIT II**

Fixed Wireless System and Wireless System-Microwave Links, Private Unlicensed links( Spread Spectrum), MMDS(Multi channel Multi- point distribution service), LMDS (Local multipoint Distribution Service), Introduction to Wi- Fi and Wi- MAX , Principles and Parameters for Wireless LAN (IEEE 802.11 Standards), Operating Principles for Wi- MAX( IEEE 802.16 standard) , Comparison of Wi- Fi and Wi- MAX.

**UNIT III**

Optical Fiber Communication**.-**Principles of optical fiber communication, significant features and advantages of optical fiber communications, Recent trend- FTTH( Fiber – to –the – Home) System.

**UNIT IV**

Quality of Service (Qos) in Broadband. Qos issues in broadband communication.

| RECOMMENDED BOOKS | | | |
|---|---|---|---|
| **S. No.** | **Name** | **Author(S)** | **Publisher** |
| 1 | Mobile Communication Design Fundamentals | William C.Y. Lee | John Wiley & Sons |
| 2 | Satellite Communications | Timothy Pratt | John Wiley & Sons |
| 3 | Wireless Communications | T.L Singhal | Tata McGraw-Hill |
| 4 | Optical Fibre Communications | Senior.John.M | Prentice Hall |

SANT BABA BHAG SINGH UNIVERSITY
SBBSU
KHIALA, DISTT. JALANDHAR (PUNJAB)

| | |
|---|---|
| **Course Code** | **CE476** |
| **Course Title** | **Infrastructure And Real Estate Management** |
| **Type of Course** | **OE** |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Engineering Economics |
| **Course Objectives (CO)** | The objective of this course is to make students aware of the various elements of infra structure and real estate management. |

**SYLLABUS**

**UNIT- I**

**Introduction:**
Impact of Infrastructure development on economic development, standard of livingand environment. Reasons for rise of public sector and government in infrastructural activities. Changed socio-economic scenario and current problems and related issues.

**Infrastructure Management:**
Importance, scope and role in different sectors of construction.

- **Highway Sector:**
  Repayment of Funds, Toll Collection Strategy, Shadow tolling, and directtolls, Maintenance strategy, Review of toll rates & structuring to suit the traffic demand
- **Irrigation Projects:**
  Large / Small Dams - Instrumentation, monitoring of water levels,catchments area, rainfall data management, prediction, land irrigation planning & policies,processes Barrages, Canals.
- **Power Projects:**
  Power scenario in India, Estimated requirement, Generation of Powerdistribution strategies, national grid, load calculation & factors, Hydropower - day to dayoperations, management structures, maintenance, Thermal Power, Nuclear Power.
- **Airports:**
  Requisites of domestic & International airports & cargo & military airports, facilitiesavailable, Terminal management, ATC.
- **Railways:** Mass Rapid Transport System MRTS, LRT, Multi-modal Transport System.

**UNIT- II**

**Real estate management**
Introduction, functions of real estate project management.

**Project management –I**
Project management processes and organizational pattern, work breakdown structure, time scheduling techniques, CPM/PERT network analysis, resource management and scheduling techniques, material management, time cost analysis, project organization, project peculiarities, good practices and managerial responsibilities, project cost control.

**Project management II**
The application of management processes such as scope management, cost management, risk management, communication management and time management during the different construction phases. Some of the major techniques to be discussed are value engineering, quality

function deployment, cost benefit analysis, risk identification and its quantification.

**UNIT- III**

**Operation management**

Introduction , nature & scope of operation/production management, relationship with other functional areas, recent trends in operation management, manufacturing & theory of constraints, types of production system, just in time(JIT) and lean system

**Product design and process selection**

Stages in product design processes, value analysis, facility location and layout: types characteristics, merits and demerits, work measurement, job design

**UNIT- IV**

**Forecasting and capacity planning**

Method of forecasting, overview of operation planning, aggregate production planning, production strategies, capacity requirement planning, MRP, scheduling supply chain management, purchase management, inventory management.

**Quality management**

Definition, dimension, cost of quality, continuous improvement(kaizen), ISO (9000&14000 series), quality awards, statistical quality control, variable and attribute, process control, control chart(X,R,P,np and C Charts) acceptance sampling operating characteristic curve(AQL, LTPD, a & b risk) total quality management(TQM)

| **RECOMMENDED BOOKS** | | | |
|---|---|---|---|
| **Sr. no.** | **Name** | **AUTHOR(S)** | **PUBLISHER** |
| 1 | Project planning analysis, selection, financing, implementation and review | Chandra, prassanna | Tata McGraw Hill.Pub |
| 2 | Infrastructure development & financing towards a public private partnership | Raghuram.G& Jain R | Macmillan India ltd |
| 3 | Production and operation management, concepts methods & strategy | Charry S.N(2005) | John willy &sons asiapvt ltd |

| | |
|---|---|
| **Course Code** | **CE478** |
| **Course Title** | **Site Investigation** |

| | |
|---|---|
| **Type of Course** | **OE** |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Prerequisites** | Soil Mechanics |
| **Course Objectives (CO)** | The course is intended for geotechnical engineers/engineering geologists to gain a practical understanding of the planning and design of site investigations, the spectrum of investigation techniques available, laboratory test scheduling, and interpretation of result |

**UNIT-I**

Introduction: Soil formation Processes – Characteristics of major soil deposits of India. Necessity and Importance of soil exploration Method of sub surface exploration Test pits , Trenches, Caissons, Tunnels and drifts, Wash boring , Percussion drilling , Rotary drilling, Factors affecting the selection of a suitable method of boring. Extent of boring, Factors controlling spacing and depth of bore holes, Spacing and depth for various Civil engineering structures.

**UNIT-II**

Indirect method of exploration, Seismic method, Electrical resistivity, Resistivity sounding and profiling, Qualitative and quantitative interpretation of test results, Comparison of resistivity and seismic surveys, Shortcomings.

Ground water Observation: Different method of ground water observation: Time lag in observation, Sampling of ground water.

**UNIT-III**

Sampling: Source of disturbance and their influence, Type of sampler, Principle of design of sampler, Representative and undisturbed sampling in various types of soils, Surface sampling, Amount of sampling, Boring and sampling record, Preservation and shipment of sample preparation of bore log. Standard penetration test

**UNIT-IV**

Investigation below sea/river bed – methods and equipment's – interpretation of offshore exploration, Instrumentation in soil engineering - strain gauges - resistance and inductance type.

**Suggested textbooks**

| S. No | Name | Author(S) | Publisher |
|---|---|---|---|
| **1** | Site investigation" | Simon and Cayton | |
| **2** | Foundation Analysis and Design | Bowles J E | McGraw Hill, New York |