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**SYLLABI OF**

**B. TECH.**

**1. MECHANICAL ENGINEERING**

**2. MECHATRONICS ENGINEERING**

**3. AUTOMOBILE ENGINEERING**

**GYAN VIHAR SCHOOL OF**

**ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**EDITION 2014**

**GYAN VIHAR SCHOOL OF ENGINEERING & TECHNOLOGY**

**B. TECH. MECHANICAL ENGINEERING – 4 YEARS PROGRAM**

**FEATURES OF B.TECH PROGRAM OF SGVU**

Bachelor of Technology in Mechanical Engineering (B. Tech) is a four year graduation degree programe in Mechanical Engineering. The course has been so designed that the students can meet all the demands of professionals in the field of Mechanical Engineering.

**NEED, OBJECTIVES & MAIN FEATURES OF B. TECH PROGRAM**

**NEED –**

* To develop a platform for higher studies in the field of Mechanical Engineering and its applications
* To develop the ability in students for understanding the basic concepts and their applications in the industries.
* To develop the capability in students for relevant research work.
* To obtain and generate an employment in computing field.

**OBJECTIVES**

* The main objective of BTECH program is to provide a basic platform for higher studies of mechanical engineering. This will only be achieved by an approach involving rigorous and comprehensive academic course work covering practical hands on experience with real world applications.

**FEATURES OF BTECH CURRICULUM**

* 1st year of the program offered by SGVU is common to all B. Tech. programs covering courses related to Basic Sciences, Humanities Communication skills etc.
* 2nd year covers the areas of thermodynamics, machine design, mechanics of solids, material science, fluid mechanics, IC Engines, Instrumentation and control apart from machine design lab, strength of material lab, machine drawing lab, and fluid mechanics lab.
* 3rd year covers the subjects – dynamics of machine, heat and mass transfer, dynamics of machine, fundamental of aerodynamics apart from dynamics of machine lab, fluid machine lab, heat and mass transfer lab, mechanical vibration lab, and industrial engineering lab.
* B.Tech course contains the job oriented and advanced practical labs which help students understand the practical applications of the areas of mechanical engineering with the theoretical knowledge as well.
* B.Tech Mechanical Engineering Curricula includes the industry visits,Summerr Training,Seminars Projects to develop the creativity an enhance the developed

Attitude towards the industrial sector.

**ROLE OF BTECH CURRICULUM IN NATIONAL DEVELOPMENT**

Mechanical engineering plays a major role in the employment as well as in the economy of the country, the curriculum plays an important role in the development of graduates who can serve world class services and take the nation forward.

**GLOBAL TRENDS REFLECTED IN B.Tech CURRICULUM**

There is always a demand of mechanical engineers globally. The department of mechanical engineering aims to produce high quality engineers in technology with a sound theoretical and practical knowledge who can under take responsibility to contribute effectively in the progress of the country and society.

**POSSIBILITY OF MOTIVATION & SELF DEVELOPMENT**

There are various possibilities of motivation and self development of the students through curriculum. The curriculum has been so designed that a student can

* understand the professional/industry environment
* understand team work and group dynamism.
* develop a sense of effective problem solving and decision making.
* think and develop projects independently.
* develop career as computer professional.

**PLACEMENT OPPORTUNITY**

Technical UG programs are basically a foundation for technical PG programs and research. Now a day because of the economy boom, there is high placement opportunities in industries in India and across the world as well. UG program of mechanical engineering includes study of various aspects of mechanical engineering to meet the requirements of various industries. A technical graduate can work for any industry big or small as a mechanical engineer and handle various roles like –

* Automobile engineer
* Production engineer
* Maintenance engineer
* Executive engineer

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| **SURESH GYAN VIHAR UNIVERSITY, JAGATPURA JAIPUR.** | | | | | | | | | |
| **Department Of Mechanical Engineering B.Tech Syllabus 3rd Sem Session 2013-2017 (Onwards)**  **to be implemented session 2014­15** | | | | | | | | | |
|  | | | | | | | | | |
| Year-II Sem-III | | | | | | | | | |
| S.NO | Course Code | Course Name | Credit | Contact Hours/Week | | | Exam Hours | Weightage (%) | |
| L | T | P | CE | ESE |
| **A. THEORY PART** | | | | | | | | | |
| 1 | ME 201 | Mechanics of Solids | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 2 | ME 203 | Engineering Thermodynamics | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 3 | ME 205 | Casting , Welding & Forming | 3 | 3 |  |  | 3 | 30 | 70 |
| 4 | ME 207 | Material Science | 3 | 3 |  |  | 3 | 30 | 70 |
| 5 | MA 209 | Advance Engg. Mathematics | 4 | 3 | 1 | - | 3 | 30 | 70 |
| 6 | HS 203 | Economics | 3 | 3 |  |  | 3 | 30 | 70 |
| **B. PRACTICALS** | | | | | | | | | |
| 7 | ME 251 | Mechanics of Solid Lab | 2 |  |  | 3 | 3 | 60 | 40 |
| 8 | ME 253 | Thermal Engineering Laboratory | 2 |  |  | 3 | 3 | 60 | 40 |
| 9 | ME 255 | Casting , Welding & Forming Lab | 1 |  |  | 2 | 3 | 60 | 40 |
| 10 | ME 257 | Material Science Lab | 1 |  |  | 2 | 3 | 60 | 40 |
| **C. DISCIPLINE & CO-CURRICULAR ACTIVITES** | | | | | | | | | |
| 11 | DC 201 | Discipline & Co-Curricular Activities | 2 |  |  |  |  | 100 |  |
|  |  | TOTAL | 29 | 18 | 3 | 10 |  |  |  |
|  |  | GRAND TOTAL |  | 31 |  |  |  |  |  |

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| **SURESH GYAN VIHAR UNIVERSITY, JAGATPURA JAIPUR.** | | | | | | | | | |
| **Department Of Mechanical Engineering B.Tech Syllabus 4th Sem Session 2013-2017 (Onwards)**  **To be implemented in session 2014­15** | | | | | | | | | |
| Year-II Sem-IV | | | | | | | | | |
| S.NO | Course Code | Course Name | Credit | Contact Hours/Week | | | Exam Hours | Weightage (%) | |
| L | T | P | CE | ESE |
| **A. THEROY PART** | | | | | | | | | |
| 1 | ME202 | Mechanics of Fluids | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 2 | ME 204 | Machine Element Design | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 3 | ME 206 | Manufacturing Machines | 3 | 3 |  |  | 3 | 30 | 70 |
| 4 | ME208 | Kinematics and Dynamics | 3 | 3 |  |  | 3 | 30 | 70 |
| 5 | ME 210 | Internal Combustion Engine | 3 | 3 |  |  | 3 | 30 | 70 |
| 6 | ME212 | Control Theory and application | 4 | 3 | 1 |  | 3 | 30 | 70 |
| **B. PRACTICALS** | | | | | | | | | |
| 7 | ME 252 | Fluid Mechanics Lab | 2 |  |  | 3 | 3 | 60 | 40 |
| 8 | ME254 | Machine Element Design Lab | 2 |  |  | 3 | 3 | 60 | 40 |
| 9 | ME256 | Kinematics and Dynamics La | 1 |  |  | 2 | 3 | 60 | 40 |
| 10 | ME258 | Internal Combustion Engine | 1 |  |  | 2 | 3 | 60 | 40 |
| **C. DECIPLINE & CO-CURRICULAR ACTIVITES** | | | | | | | | | |
| 11 | DC 202 | Discipline & Co-Curricular Activities | 2 |  |  |  |  | 100 |  |
|  |  | TOTAL | 29 | 18 | 3 | 10 |  |  |  |
|  |  | GRAND TOTAL |  | 31 |  |  |  |  |  |

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| **SURESH GYAN VIHAR UNIVERSITY, JAGATPURA JAIPUR.** | | | | | | | | | |
| **Department Of Mechanical Engineering B.Tech Syllabus 5th Sem Session 2013-2017 (Onwards)**  **To be implemented in session 2015­16** | | | | | | | | | |
| Year-III Sem-V | | | | | | | | | |
| S.NO | Course Code | Course Name | Credit | Contact Hours/Week | | | Exam Hours | Weightage (%) | |
| L | T | P | CE | ESE |
| **A. THEROY PART** | | | | | | | | | |
| 1 | ME 301 | Turbo Machinery | 3 | 3 |  |  | 3 | 30 | 70 |
| 2 | ME 303 | Machine Design | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 3 | ME 305 | Production Process | 3 | 3 |  |  | 3 | 30 | 70 |
| 4 | ME 307 | Dynamics of Machine | 3 | 3 |  |  | 3 | 30 | 70 |
| 5 | ME 309 | Fundamental of Aerodynamics | 3 | 3 |  |  | 3 | 30 | 70 |
| 6 | ME 311 | Mechanical Vibration & Noise Viberation | 4 | 3 | 1 |  | 3 | 30 | 70 |
| **B. PRACTICALS** | | | | | | | | | |
| 7 | ME 351 | Dynamics of Machine Lab | 1 |  |  | 2 | 3 | 60 | 40 |
| 8 | ME 353 | Machine Design Lab | 2 |  |  | 3 | 3 | 60 | 40 |
| 9 | ME 355 | Production Process Lab | 2 |  |  | 3 | 3 | 60 | 40 |
| 10 | ME 357 | Mechanical Vibration & Noise Viberation Lab | 1 |  |  | 2 | 3 | 60 | 40 |
| **C. DECIPLINE & CO-CURRICULAR ACTIVITES** | | | | | | | | | |
| 11 | DC 301 | Discipline & Co-Curricular Activities | 2 |  |  |  |  | 100 |  |
|  |  | TOTAL | 28 | 18 | 2 | 10 |  |  |  |
|  |  | GRAND TOTAL |  | 30 |  |  |  |  |  |

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| **SURESH GYAN VIHAR UNIVERSITY, JAGATPURA JAIPUR.** | | | | | | | | | |
| **Department Of Mechanical Engineering B.Tech Syllabus 6th Sem Session 2013-2017 (Onwards)**  **To be implemented in session 2015­16** | | | | | | | | | |
| Year-III Sem-VI | | | | | | | | | |
| S.NO | Course Code | Course Name | Credit | Contact Hours | | | Exam Hours | Weightage (%) | |
| L | T | P | CE | ESE |
| **A. THEROY PART** | | | | | | | | | |
| 1 | ME 302 | Heat & Mass Transfer | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 2 | ME 304 | Mechatronics | 3 | 3 |  |  | 3 | 30 | 70 |
| 3 | ME 306 | Automobile Engg. | 3 | 3 |  |  | 3 | 30 | 70 |
| 4 | ME 308 | Gas Dynamics & Propusion | 3 | 3 |  |  | 3 | 30 | 70 |
| 5 | ME 310 | Numerical Analysis & Programming | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 6 | ME 312 | Production Management | 3 | 3 |  |  | 3 | 30 | 70 |
| **B. PRACTICALS** | | | | | | | | | |
| 6 | ME 352 | Heat & Mass Transfer Lab | 2 |  |  | 3 | 3 | 60 | 40 |
| 7 | ME 354 | Automobile lab | 1 |  |  | 2 | 3 | 60 | 40 |
| 8 | ME 356 | Programming Lab­NMAS | 1 |  |  | 2 | 3 | 60 | 40 |
| 9 | ME 358 | Project Stage­I | 2 |  |  | 3 | 3 | 60 | 40 |
| **C. DECIPLINE & CO-CURRICULAR ACTIVITES** | | | | | | | | | |
| 10 | DC 302 | Discipline & Co-Curricular Activities | 2 |  |  |  |  | 100 |  |
|  |  | TOTAL | 28 | 18 | 2 | 10 |  |  |  |
|  |  | GRAND TOTAL |  | 30 |  |  |  |  |  |

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| **SURESH GYAN VIHAR UNIVERSITY, JAGATPURA JAIPUR.** | | | | | | | | | |
| **Department Of Mechanical Engineering B.Tech Syllabus 7th Sem Session 2013-2017 (Onwards)**  **To be implemented in session 2016­17** | | | | | | | | | |
| Year-IV Sem-VII | | | | | | | | | |
| S.NO | Course Code | Course Name | Credit | Contact Hours/Week | | | Exam Hours | Weightage (%) | |
| L | T | P | CE | ESE |
| **A. THEROY PART** | | | | | | | | | |
| 1 | ME 401 | Refrigeration & Air-conditioning | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 2 | ME 403 | Power Plant Technologies | 3 | 3 |  |  | 3 | 30 | 70 |
| 3 | ME 405 | Operation Research | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 4 | ME 407 | Metrology | 3 | 3 |  |  | 3 | 30 | 70 |
| 5 | ME409 | Renewable Energy | 3 | 3 |  |  | 3 | 30 | 70 |
| **B. PRACTICALS** | | | | | | | | | |
| 5 | ME 451 | R.A.C Lab | 2 |  |  | 3 | 3 | 60 | 40 |
| 6 | ME 453 | Programming Lab­ II ( Matlab ) | 1 |  |  | 2 | 3 | 60 | 40 |
| 7 | ME 455 | Project Stage­II | 3 |  |  | 6 | 3 | 60 | 40 |
| 8 | ME 457 | Industrial Traning Seminar | 2 |  |  | 3 | 3 | 60 | 40 |
| **C. DECIPLINE & CO-CURRICULAR ACTIVITES** | | | | | | | | | |
| 10 | DC 401 | Discipline & Co-Curricular Activities | 2 |  |  |  |  | 100 |  |
|  |  | TOTAL | 27 | 15 | 2 | 14 |  |  |  |
|  |  | GRAND TOTAL |  | 31 |  |  |  |  |  |

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| **SURESH GYAN VIHAR UNIVERSITY, JAGATPURA JAIPUR.** | | | | | | | | | |
| **Department Of Mechanical Engineering B.Tech Syllabus 8th Sem Session 2013-2017 (Onwards)**  **To be implemented in session 2016­17** | | | | | | | | | |
| Year-IV Sem-VIII | | | | | | | | | |
| S.NO | Course Code | Course Name | Credit | Contact Hours/Week | | | Exam Hours | Weightage (%) | |
| L | T | P | CE | ESE |
| **A. THEROY PART** | | | | | | | | | |
| 1 | ME 402 | Robotics Engineering | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 2 | ME 404 | CNC Machines & Programming | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 3 | ME 406 | Computer Aided Mechanical Design | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 4 | ME 408 | Machining and Machine Tool Design | 4 | 3 | 1 |  | 3 | 30 | 70 |
| **B. PRACTICALS** | | | | | | | | | |
| 5 | ME 452 | CAD Lab | 2 |  |  | 3 | 3 | 60 | 40 |
| 6 | ME 454 | CAM lab | 2 |  |  | 3 | 3 | 60 | 40 |
| 7 | ME 456 | Machining and Machine Tool Design Lab | 2 |  |  | 3 | 3 | 60 | 40 |
| 8 | ME 458 | Software Lab (Autocad­3D¸Solid Works¸Pro­E Lab¸Ansys) | 2 |  |  | 3 | 3 | 60 | 40 |
|  |  | TOTAL | 24 | 12 | 4 | 12 |  |  |  |
|  |  | GRAND TOTAL |  | 26 |  |  |  |  |  |

**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**LIST OF COURSES OFFERED**

**EDITION-2014**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course  Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam  Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
| **MECHANICAL ENGINEERING** | | | | | | | | |
| ME 201 | Mechanics of Solids | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME202 | Mechanics of Fluids | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME 203 | Engineering Thermodynamics | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME 204 | Machine Element Design | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME205 | Casting , Welding & Forming | 3 | 3 |  |  | 3 | 30 | 70 |
| ME 206 | Manufacturing Machines | 3 | 3 |  |  | 3 | 30 | 70 |
| ME207 | Material Science | 3 | 3 |  |  | 3 | 30 | 70 |
| ME208 | Kinematics and Dynamics | 3 | 3 |  |  | 3 | 30 | 70 |
| ME 209 | Object Oriented Programming | 3 | 3 |  |  | 3 | 30 | 70 |
| ME 210 | Internal Combustion Engine | 3 | 3 |  |  | 3 | 30 | 70 |
| ME212 | Control Theory and application | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME 251 | Mechanics of Solid Lab | 2 |  |  | 3 | 3 | 60 | 40 |
| ME 252 | Fluid Mechanics Lab | 2 |  |  | 3 | 3 | 60 | 40 |
| ME 253 | Thermal Engineering Laboratory | 2 |  |  | 3 | 3 | 60 | 40 |
| ME254 | Machine Element Design Lab | 2 |  |  | 3 | 3 | 60 | 40 |
| ME 255 | Casting , Welding & Forming Lab | 1 |  |  | 2 | 3 | 60 | 40 |
| ME256 | Kinematics and Dynamics | 1 |  |  | 2 | 3 | 60 | 40 |
| ME 257 | Material Science Lab | 1 |  |  | 2 | 3 | 60 | 40 |
| DE 201 | Discipline & Co-curricular activities | 2 |  |  |  |  | 100 |  |
| DE 202 | Discipline & Co-curricular activities | 2 |  |  |  |  | 100 |  |
| ME 301 | Turbo Machinery | 3 | 3 |  |  | 3 | 30 | 70 |
| ME 302 | Heat & Mass Transfer | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME 303 | Machine Design | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME 304 | Mechatronics | 3 | 3 |  |  | 3 | 30 | 70 |
| ME 305 | Production Process | 3 | 3 |  |  | 3 | 30 | 70 |
| ME 306 | Automobile Engg. | 3 | 3 |  |  | 3 | 30 | 70 |
| ME 307 | Dynamics of Machine | 3 | 3 |  |  | 3 | 30 | 70 |
| ME 308 | Gas Dynamics & Propusion | 3 | 3 |  |  | 3 | 30 | 70 |
| ME 309 | Fundamental of Aerodynamics | 3 | 3 |  |  | 3 | 30 | 70 |
| ME 310 | Numerical Methods | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME 311 | Mechanical Vibration & Noise Viberation | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME 312 | Production Management | 3 | 3 |  |  | 3 | 30 | 70 |
| DE 301 | Discipline & Co-curricular activities | 2 |  |  |  |  | 100 |  |
| DE 302 | Discipline & Co-curricular activities | 2 |  |  |  |  | 100 |  |
| ME 351 | Dynamics of Machine Lab | 1 |  |  | 2 | 3 | 60 | 40 |
| ME 352 | Heat & Mass Transfer Lab | 2 |  |  | 3 | 3 | 60 | 40 |
| ME 353 | Machine Design Lab | 2 |  |  | 3 | 3 | 60 | 40 |
| ME 354 | Automobile lab | 1 |  |  | 2 | 3 | 60 | 40 |
| ME 355 | Production Process Lab | 2 |  |  | 3 | 3 | 60 | 40 |
| ME 356 | Programming Lab­NMAS | 1 |  |  | 2 | 3 | 60 | 40 |
| ME 357 | Energy Conversion Lab | 1 |  |  | 2 | 3 | 60 | 40 |
| ME 358 | Project Stage­I | 2 |  |  | 3 | 3 | 60 | 40 |
| ME 401 | Refrigeration & Air-conditioning | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME 402 | Robotics Engineering | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME 403 | Power Plant Technologies | 3 | 3 |  |  | 3 | 30 | 70 |
| ME 404 | CNC Machines & Programming | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME 405 | Operation Research | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME 406 | Computer Aided Mechanical Design | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME 407 | Metrology | 3 | 3 |  |  | 3 | 30 | 70 |
| ME 408 | Machining and Machine Tool Design | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME409 | Renewable Energy | 3 | 3 |  |  | 3 | 30 | 70 |
| ME 451 | R.A.C Lab | 2 |  |  | 3 | 3 | 60 | 40 |
| ME 452 | CAD Lab | 2 |  |  | 3 | 3 | 60 | 40 |
| ME 453 | Programming Lab­ II ( Matlab ) | 1 |  |  | 2 | 3 | 60 | 40 |
| ME 454 | CAM lab | 2 |  |  | 3 | 3 | 60 | 40 |
| ME 455 | Project Stage­II | 3 |  |  | 6 | 3 | 60 | 40 |
| ME 456 | Metal Cutting & Tool Design Lab | 2 |  |  | 3 | 3 | 60 | 40 |
| ME 457 | Industrial Training Seminar | 2 |  |  | 3 | 3 | 60 | 40 |
| ME 458 | Software Lab (Autocad­3D¸Solid Works¸Pro­E Lab¸Ansys) | 2 |  |  | 3 | 3 | 60 | 40 |
| DC 401 | Discipline & Co-curricular activities | 2 |  |  |  |  | 100 |  |
| HS 203 | Economics | 3 | 3 |  |  | 3 | 30 | 70 |
| MA 209 | Advance Engg. Mathematics | 4 | 3 | 1 | - | 3 | 30 | 70 |

**ME 201 MECHANICS OF SOLID C (L, T, P) = (3, 1, 0)**

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| Units | Course Contents | Hrs. |
| 1 | **Introduction to Stress and strain:** Definition of Stress, Normal Stress in axially loaded Bar, Stress on inclined sections in axially loaded bar, Shear Stress, Analysis of normal and shear stress, Deterministic design of members, probabilistic basis for structural design. Tension test and normal Strain, Stress strain relation and Hooke's law. Poisson's ratio, Thermal strain and deformation. | 7 |
| 2 | **Stress as a tensor:** stress at point, Cauchy stress tensor, equilibrium equations, analysis of deformation and definition of strain components  **Some properties of Stress and Strain Tensor:** Principal stresses and strains, stress and strain invariants, Mohr's circle representation. | 7 |
| 3 | **Application of Mechanics of Material in Different Problems:**   * Shear Force and Bending Moment diagrams. * Axially loaded members. * Torsion of circular shafts. * Stresses due to bending: pure bending theory, combined stresses. Deflections due to bending: moment-curvature relation, load-defection differential equation, area moment method, and superposition theorem. * Stresses and deflections due to transverse shears. | 7 |
| 4 | **Constitutive relations:** An short introduction to material symmetry transformations, Isotropic material, true and engineering stress-strain curves, Material properties for isotropic materials and their relations. Theories of failures for isotropic materials | 7 |
| 5 | **Energy Methods:** Strain energy due to axial, torsion, bending and transverse shear. Castigliano's theorem, reciprocity theorem etc. | 7 |

**Text and Reference Books:**

* S. C. Crandall, N. C. Dahl, and T. J. Lardner, An Introduction to the Mechanics of Solids, 2nd Ed, McGraw Hill, 1978.
* E. P. Popov, Engineering Mechanics of Solids, Prentice Hall, 1990.
* I. H. Shames, Introduction to Solid Mechanics, 2nd Ed, Prentice Hall, 1989.
* S. P. Timoshenko, Strength of Materials, Vols. 1 & 2, CBS publ., 1986.

**ME 202 MECHANICS OF FLUID C (L, T, P) = (3, 1, 0)**

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| Units | Course Contents | Hrs. |
| 1 | **Introduction to fluids:** Definition of fluid, Difference between solid and fluid, Application of fluid dynamics  **Properties of fluids:** Intensive and Extensive properties, Continuum, density, specific gravity, specific heat, viscosity, surface tension etc. | 7 |
| 2 | **Fluid statics:** pressure, manometer, hydrostatic forces on submerged on plane surfaces, stability of immersed and floating bodies, fluids in rigid body motion etc.  **Fluid kinematics:** Lagrangian and Eulerian description of fluid flow, Velocity and Acceleration Fields, Fundamentals of flow visualization, streamlines, stream tubes, pathlines, streaklines and timelines, deformation of fluid elements | 7 |
| 3 | Orifice discharging free, Jet, vena contracts, co-efficient of contraction, velocity and discharge, coefficient of resistance. Orifices and mouthpieces Nozzles and weires. Flow Through Pipes : Reynold’s experiment Darcy’s Weisback equation. Loss of head due to sudden enlargements, contraction, entrance, exit obstruction, bend, pipe fittings. Total and Hydraulic grandient lines, Flow through pipe line. Pipes in series, parallel Transmission of power through pipes. | 7 |
| 4 | Laminar Flow: Simple solution of Navier Stokes equations. Hagen – Poiseuille flow. Plans Poiseuille flow and coutte flow. Turbulent Flow; Variation of friction factor with Reynold’s number. The Prandt Mixing length hypothesis applied to pipe flow, velocity distribution in smooth pipes, Rough pipes. The Universal pipe friction laws, Colebrook. White formula. Dimensional Analysis: Buckingham variables, Model Similitude, Force ratio, Reynolds, Froude’s Mach, Weber and Euler numbers and their applications. Undistorted model distorted model scale effect. | 7 |
| 5 | The Boundary Layer: Description of the boundary layer. Boundary Layer thickness boundary layer separation and control. The Prandtl boundary layer equation. Solution for laminar boundary layer. The momentum equation for the boundary layer. The flat plate in uniform free stream with no pressures gradients. Approximate momentum analysis laminar boundary Aerofoils Theory. Flow round a body ; Drag skin friction drag, pressure drag, combined skin friction & pressure drag (Profile drag) wave drag, lift induced drag. Flow past sphere & Cylinder. | 7 |

**Text and Reference Books:**

* F. M. White, 1999, Fluid Mechanics, 4th Ed, McGraw-Hill.
* B. R. Munson, D. F. Young and T. H. Okhiishi, Fundamentals of Fluid Mechanics, 4th Ed, John Wiley, 2002.
* R. W. Fox and A. T. McDonald, 1998, Introduction to Fluid Mechanics, 5th Ed, John Wiley.
* S. W. Yuan, 1988, Foundations of Fluid Mechanics, Prentice Hall of India.
* Pijush Kundu, 2002, Fluid Mechanics, 2nd Ed., Academic Press.
* Irwing Shames, Mechanics of Fluids, 4th Ed., McGraw Hill.
* Batchelor G.K., 2000, An Introduction to Fluid Dynamics,2nd edition, Cambridge University press.

**ME 203 ENGINEERING THERMOGYNAMICS C (L, T, P) = (3, 1, 0)**

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| Units | Course Contents | Hrs. |
| 1 | Thermodynamic Systems, properties & state, process & cycle  **Heat & Work:** Definition of work and its identification, work done at the moving boundary, Zeroth law,  **Properties of pure substance:** Phase equilibrium, independent properties, and equations of state, compressibility factor, Tables of thermodynamic properties & their use, Mollier Diagram | 7 |
| 2 | **First law:** First law for control mass & control volume for a cycle as well as for a change of state, internal energy & enthalpy, Specific heats; internal energy, enthalpy & specific heat of ideal gases. SS process, Transient processes | 7 |
| 3 | **Second Law of Thermodynamics:** Reversible process; heat engine, heat pump, refrigerator; Kelvin-Planck & Clausius statements ,Carnot cycle for pure substance & ideal gas, Concept of entropy; the Need of entropy definition of entropy; entropy of a pure substance; entropy change of a reversible & irreversible processes; principle of increase of entropy, thermodynamic property relation, corollaries of second law, Second law for control volume; SS & Transient processes; Reversible SSSF process; principle of increase of entropy, Understanding efficiency. | 7 |
| 4 | **Irreversibility and availability:** Available energy, reversible work & irreversibility for control mass and control volume processes; second law efficiency. | 7 |
| 5 | **Thermodynamic relations:** Clapeyron equation, Maxwell relations, Thermodynamic relation for enthalpy, internal energy, and entropy, expansively and compressibility factor, equation of state, generalized chart for enthalpy  **Thermodynamic Cycles:** Otto,Diesel, Duel and Joul  Third Law of Thermodynamics | 7 |

**Text and Reference Books:**

* Sonntag R.E., Claus B. & Van Wylen G., "Fundamentals of Thermodynamics", John Wiley & Sons, 2000, 6th ed.
* GFC Rogers and Y R Mayhew, Engineering Thermodynamics Work and Heat Transfer 4e, Pearson 2003
* J P Howell and P O Bulkins, Fundamentals of Engineering Thermodynamics, McGraw Hill,1987
* Y A Cengal and M A Boles, Thermodynamics, An Engineering Approach, 4e Tata McGraw Hill, 2003.
* Michael J. Moran & Howard N. Shapiro, Fundaments of Engineering Thermodynamics, John Wiley & Sons, 2004, 4th ed

**ME 204 MACHINE ELEMENT DESIGN C (L, T, P) = (3, 1, 0)**

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| --- | --- | --- |
| Units | Course Contents | Hrs. |
| 1 | Materials: Properties and IS coding of various materials, Selection of material from properties and economic aspects. Manufacturing aspects in Design : Selection of manufacturing processes on the basis of design and economy, Influence of rate of production, standard size, Influence of limits, fits tolerances and surface finish. Change in the shape of the designed element to facilitate its production, Design of castings, working drawing. | 7 |
| 2 | Design for strength: Allowable stresses, detailed discussion on factor of safety (factor of ignorance): Stress concentration. Causes & mitigation. Introduction of various design considerations like strength, stiffness, weight, cost, space etc. Concept of fatigue failures. Design of machine elements subjected to direct stress, Pin, cotter and keyed joints, Design of screw fastening. | 7 |
| 3 | Design of members in Bending: Beams, levers and laminated springs. | 7 |
| 4 | Design of members in torsion : Shafts and shaft couplings. | 7 |
| 5 | Design of shafts, brackets under combined stresses, Calculation of transverse & torsional deflections. Screw fasteners subjected to eccentric loading. | 7 |

**Text and Reference Books:**

* J. E. Shigley, Mechanical Engineering Design, McGraw Hill, 1989.
* Design Data, PSG Tech, Coimbatore, 1995
* M. F. Spotts, Design of Machine Elements, 6th ed., Prentice Hall, 1985
* A. H. Burr and J. B. Cheatham, Mechanical Analysis and Design, 2nd ed., Prentice Hall, 1997

**ME 205 CASTING ,WELDING AND FORMING C (L, T, P) = (3, 1, 0)**

|  |  |  |
| --- | --- | --- |
| Units | Course Contents | Hrs. |
| 1 | **Casting Processes**:  Principles of metal casting: Pattern materials, types and allowance; Study of moulding, sand moulding, tools, moulding materials, classification of moulds, core, elements of gating system, casting defects, description and operation of cupola: special casting processes e.g. die-casting,permanent mould casting, centrifugal casting, investment casting. | 7 |
| 2 | **Welding** principles, classification of welding techniques; Oxyacetylene Gas welding, equipment and field of application, Arc-welding, metal arc, Carbon arc, submerged arc and atomic hydrogen welding, Electric resistance welding: spot, seam, butt, and percussion welding; Flux:  composition, properties and function; Electrodes, Types of joints and edge preparation, Brazing and soldering. | 7 |
| 3 | **Smithy and Forging**:  Basic operation e.g. upsetting, fullering, flattening, drawing, swaging: tools and appliances: drop forging, press forging. | 7 |
| 4 | **Sheet Metal Work**:  Common processes, tools and equipments; metals used for sheets,standard specification for sheets, spinning, bending, embossing and coining. | 7 |
| 5 | **Bench Work and Fitting**  Fitting, sawing, chipping, thread cutting (die), tapping; Study of hand tools, Marking and marking tools. | 7 |

**Text and Reference Books:**

 James S Campbell, Principles of Manufacturing Materials and Processes, Tata McGraw Hill, 1995.

 F.C. Flemmings, Solidification processing, Tata McGraw Hill, 1982

 M J Rao, Manufacturing Technology: Foundry, Forming and Welding, Tata McGraw Hill, 1987.

 G E Linnert, Welding Metallurgy, AWS, 1994.

 P C Pandey and C K Singh, Production Engineering Sciences, Standard Publishers Ltd. 1980.

**ME 206 Manufacturing Machines C (L, T, P) = (3, 1, 0)**

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| --- | --- | --- |
| Units | Course Contents | Hrs. |
| 1 | **Elements of metal cutting processes**: Elements of tool geometry, cutting tool materials and applications.  **Lathe**: Various types of lathe: Centre lathe, facing lathe, gap-bed lathe, capstan and turret lathe, CNC lathe, major difference between CNC lathe and conventional lathe. Major sub-assemblies of a lathe: Bed, headstock, tail stock,carriage consisting of saddle, cross-slide, compound slide,  tool post and apron. Work holding devices: self centering three jaw chuck, independent four jaw chuck, collets, face plates, dog carriers, centers and mandrels. | 7 |
| 2 | **Lathe contd...**Driving mechanisms, apron mechanism, thread cutting mechanism and calculations, features of half-nut engagement – disengagement, indexing dial mechanism. Operations on lathe: taper turning, related calculations, thread cutting, facing, under-cutting,drilling, boring, parting-off, knurling, chamfering. | 7 |
| 3 | **Drilling Machines**: Constructional features of bench drilling machine, radial drilling machine,multi-spindle drilling machine, feed mechanism, work holding devices, Tool – holding devices.Different drilling operations: Drilling, reaming, counter boring and countersinking etc.,  estimation of drilling time. | 7 |
| 4 | **Milling Machines**: Types of general purpose milling machines: horizontal, vertical and  universal. Types of milling cutters and their applications, different milling operations, workholding  devices: vice, clamps, chucks, dividing head and its use, simple, compound and  differential indexing. Indexing calculations and machining time calculations. Introduction to  machining centers | 7 |
| 5 | **Grinding Machines**: Different types of grinding machines: cylindrical, surface and centre-less  grinding machines, basic constructional features and mechanisms, specifications, different  grinding operations, honing, lapping and super-finishing processes. | 7 |

**Text and Reference Books:**

1. P.N. Rao, “Manufacturing Technology: Metal Cutting & Machine Tools”, Tata McGraw

Hill, Delhi, 2004.

2. B.S. Raghuwanshi, “Workshop Technology”, Vol.2, Dhanpat Rai & Sons, 2003.

3. Hazra Chandhari S.K., “Elements of Workshop Technology”, Vol.2, Media Promoters,

2003.

**ME 207 Material Scinece C (L, T, P) = (3, 1, 0)**

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| Units | Course Contents | Hrs. |
| 1 | **Structure of metal**: Crystal structure, miller indices, lattices, imperfections, elementarytreatment of point and line defects and their relation to mechanical properties.  **Deformation**: Slip, twinning, effect of cold and hot working on mechanical properties, principles of recovery, re-crystallization and gain growth. | 7 |
| 2 | **Creep:** Basic consideration in the selection of material for high and low temperature service,creep curve, effect of material variables on creep properties, brittle failure at low temperature.  **Solidification**: Phases in metal system, lever rule, solidification of metal and alloys, solid solution, eutectic, eutectoid and inter-metallic  compounds, Iron carbon equilibrium diagram, TTT-diagram. | 7 |
| 3 | **Heat Treatment**: Principles and purpose of heat treatment of plain carbon steels, annealing,normalizing, hardening, tempering, isothermal treatment, case hardening – carburizing, nitriding etc, precipitating hardening of aluminum alloys. | 7 |
| 4 | **Engineering Materials:** PlainCarbon steels, Effects of alloying elements , properties, uses, springs, and wear resisting steels, IS standards codes for steels. Low alloy steels. Stainless, Magnetic materials for high and low temperature service. Brasses and bronzes; Aluminum base alloys. Bearing Materials, | 7 |
| 5 | **Corrosion**:Types of corrosion, Galvanic cell, rusting of Iron, Methods of protection from corrosion.  **Fiber Reinforced Composites**: General characteristics, Applications, Introduction to Fibers –glass, carbon, Kevlar 49 fibers. Matrix –Polymeric, Metallic, Ceramic Matrix, Coupling agents and fillers. | 7 |

**Text and Reference Books:**

* William D. Callister, Material science and Engineering and Introduction, Wiley, 2006.
* V. Raghavan, Materials Science and Engineering, Fifth Edition, Prentice Hall Of India, 2008.
* G. E. Dieter, Mechanical Metallurgy, McGraw Hill, 1988.
* W. F. Smith, Materials Science and Engineering (SIE), Tata-McGraw Hill, 2008.
* AVNER, Introduction to Physical Metallurgy, Tata-McGraw Hill, 2008.

**ME 208 Kinemtics and Dynamics C (L, T, P) = (3, 1, 0)**

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| --- | --- | --- |
| Units | Course Contents | Hrs. |
| 1 | **General concepts, Velocity and Acceleration Analysis:** Introduction of Simple mechanism, Different types of Kinematics pair, Grublers rule for degree of freedom, Grashof’s Criterion formobility determination Inversions of 3R-P, 2R-2P chains, Kinematic analysis of planar mechanism by graPrentice Hall Indiacal and vectorial analysis. | 7 |
| 2 | **Cams:** Classification, Cams with uniform acceleration and retardation, SHM, Cylcloidal motion,oscillating followers.  **Vibrations:** Vibration analysis of SDOF systems, natural, damped forced vibrations, basedexcited vibrations, transmissibility ratio. | 7 |
| 3 | **Gears:** Geometry of tooth profiles, Law of gearing, involute profile, interference, helical, spiral and worm gears, simple, compound gear trains. Epicyclic gear trains – Analysis by tabular and relative velocity method, fixing torque.  **Dynamic Analysis:** Slider-crank mechanism, turning moment computations**[** | 7 |
| 4 | **Inertia force analysis**: Velocity and acceleration of slider crank and four bar mechanism, inertia force, piston thrust and forces on connecting rod, Turning moment diagram and flywheel | 7 |
| 5 | **Gears:** Law of gearing, terminology, tooth form, standard interchangeable tooth profile, minimum number of teeth on pinion in contact with gear or rack, interference and undercutting, helical and spiral gears. **Gear trains**: Simple, compound, reverted and epicyclic gear trains, analytical, tabular, graphical and vector methods for velocity ratio. | 7 |

**Text and Reference Books:**

 J. E. Shighley and J.J. Uicker, Theory of Machines and Mechanisms, McGraw Hill, 1995

 A. K. Mallik, A. Ghosh, G. Dittrich, Kinematic analysis and synthesis of Mechanisms, CRC, 1994.

 A. G. Erdman and G. N. Sandor, Mechanism Design, Analysis and Synthesis Volume 1, PHI, Inc., 1997.

 J. S. Rao and R. V. Dukkipati, Mechanism and Machine Theory, New Age International, 1992.

 S. S. Rattan, Theory of Machines, Tata McGraw Hill,

**MA 209 ADVANCE ENGG.MATHEMATICS- III C (L, T, P) = 4(3, 1, 0)**

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| --- | --- | --- |
| **Units** | **Course Contents** | **Total Contact Hrs. 34** |
| **I** | **Boundary value problems:** Method of separation of variables - in the solution of wave equation in one dimension, Laplace’s equation in two dimensions, Diffusion equation in one dimension. | 7 |
| **II** | **Transform calculus :** Laplace transform with its simple properties, applications to the solutions of ordinary and partial differential equations having constant co-efficient with special reference to wave and diffusion equation. | 7 |
| **III** | **Transform calculus :** Laplace transform with its simple properties, applications to the solutions of ordinary and partial differential equations having constant co-efficient with special reference to wave and diffusion equation. | 7 |
| **IV** | **Complex variable:** Taylor’s series, Laurent’s series, poles, residues. Evaluations of simple definite real integrals using the theorem of residues. Simple contour integration. | 6 |
| **V** | **Numerical Methods:** Finite differences and interpolation Numerical Differentiation and Integration. Solution of Algebraic and transcendental equations by graphical method, trisection method, regula – falsi method and Newton raphson method | 7 |

**Reference Books:**

1. Advanced Mathematics for Engineers by Chandrika Prasad.

2 Higher Engineering Mathematics by B.S.Grewal

3. Higher Engineering Mathematics by Y.N.Gaur and C.L.Koul.

4. Higher Engineeringh Mathematics by K.C.Jain and M.L.Rawat

**ME 209 OBJECT ORIENTED PROGRAM C (L, T, P) = 3(3, 0, 0)**

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| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| **I** | Introduction to Object Oriented Programming: Basic concepts: Class, Object, Method, Message passing, Inheritance, Encapsulation, Abstraction, Polymorphism. | 7 |
| **II** | Basics of C++ Environment: Variables; Operators; Functions; user defined, passing by reference, passing an array to the function, inline function, scope, overloading; Pointers: objects and lvalue, arrays and pointers, the new and delete operators, dynamic arrays, arrays of pointers and pointers to arrays, pointers to pointers and functions; Strings: String I/O, character functions in ctype.h, string functions in string.h. | 7 |
| **III** | Object oriented concepts using C++: Classes: Member functions, Friend functions, Constructors, Access functions, Private member functions, class destructor, static data and function members; Overloading: inline functions, this operator, overloading various types of operators, conversion operators; the String Class; Composition and Inheritance: Hierarchy and types of inheritance, protected class members, private versus protected access, virtual functions and polymorphism, virtual destructors, abstract base classes. | 7 |
| **IV** | Templates and Iterators: function and class templates, container classes, subclass templates, iterator classes; Libraries: standard C++ library, contents of a standard C headers, string streams, file processing: Files and streams classes, text files, binary files, classification of files, the standard template library. | 7 |
| **V** | Data Structures Using C++: Linked lists – Singly linked list, Doubly linked lists, Circularlists, Stacks and Queues priority Queues, Stacks, Queues. | 7 |
|  | **Total** | **35** |

**ME 210 I C ENGINES C (L, T, P) = (3, 1, 0)**

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| Units | Course Contents | Hrs. |
| 1 | **I.C. Engines:** Air Standard Cycles: Internal and external combustion engines; classification of I.C. Engines, Cycles of operation in four stroke and two stroke I.C. Engines, Wankel Engines, Assumptions made in air standard cycle; Otto cycle; diesel cycle, dual combustion cycle, comparison of Otto, diesel and dual combustion cycles; sterling and Ericsson cycles; air standard efficiency, specific work output, specific weight; work ratio; mean effective pressure; deviation of actual engine cycle from ideal cycle | 7 |
| 2 | **Combustion in S.I. and C.I. Engines:** Normal & Abnormal Combustion. Pre-ignition.Detonation. Knocking. Comparison of knocking in S.I. and C.I. Engines. Rating of Fuels. Ignition limits; stages of combustion in S.I. Engines; Ignition lag; velocity of flame propagation; theories of detonation; octane rating of fuels; S.I. engine combustion chambers, Stages of combustion in C.I. Engines; delay period; variables affecting delay period; knock in C.I. engines, Cetane rating; C.I. engine combustion chambers | 7 |
| 3 | **Stratified charged engines.** Gasoline Direct injection, Various Methods for stratification;,Honda CVCC engine.  **Engine Fuels:** Types of Hydrocarbon, Gasoline, Diesel specifications, Alternate Fuels –Properties of CNG, LPG, Alcohol, Bio- Fuel as vehicular Fuels. | 7 |
| 4 | **Engine Testing and Performance**: Performance parameters: BHP, IHP, mechanical efficiency, brake mean effective pressure and indicative mean effective pressure, torque, volumetric efficiency; specific fuel consumption (BSFC, ISFC), thermal efficiency; heat balance; Basic engine measurements; | 7 |
| 5 | **Lubrication and Cooling Systems:** Functions of a lubricating system, Types of lubrication system; mist, wet sump and dry sump systems; properties of lubricating oil; SAE rating of lubricants, engine performance and lubrication, Necessity of engine cooling; disadvantages of overcooling; cooling systems; air-cooling, water cooling radiators.; Lubrication; Cooling; Supercharging and Turbocharging;Modern developments in IC engines | 7 |

**Text Books:**

1. R.P. Sharma and M.L. Mathur, “Internal Combustion Engine”, Dhanpat Rai Publications

2. V. Ganeshan, “Internal Combustion Engine”, Tata McGraw Hill

**Reference Books:**

1. Angli M Course., “Automotive Engines”, CBS Publications

2. Harper, “Fuel Systems Emission Control”, CBS Publications

**ME 251 MECHANICS OF SOLID LAB C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENTS**  1. Izod Impact testing.  2. Rockwell Hardness Testing.  3. Spring Testing  4. Column Testing for buckling  5. Torsion Testing  6. Tensile Testing  7. Compression Testing  8. Shear Testing  9. Brinell Hardness Testing  10. Bending Test on UTM.  11. Study of Fatigue Testing Machine. |

**ME 252 FLUID MECHANICS LAB**.  **C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENTS**  1. Determine Metacentric height of a given body.  2. Determine Cd, Cv & Cc for given orifice.  3. Determine flow rate of water by V-notch.  4. Determine velocity of water by pitot tube.  5. Verify Bernoulli’s theorem.  6. Determine flow rate of air by Venturi meter  7. Determine flow rate of air by orifice meter  8. Determine head loss of given length of pipe.  9. Determine flow rate of air by nozzle meter. |

**ME 253 THERMAL ENGINEERING LAB-1 C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENTS**  1. Comparative study of four stroke diesel and petrol engines.  2. Comparative study of two stroke petrol and diesel engines.  3. Studies of fuel supply systems of diesel and petrol engines.  4. Study of cooling, lubrication and ignition system in diesel and petrol engines.  5. To study various types of Boilers and to study Boiler mounting and accessories.  6. To study various types of Dynamometers.  7. To study Multi Stage Air Compressors.  8. To find the BHP, Thermal efficiency of four stroke diesel engine.  9. To prepare a comparison sheet of various automobiles (4 Wheeler and 2 Wheeler). |

**ME 254 MACHINE DESIGN LAB C (L, T, P) = 2(0, 0, 3)**

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| **LIST OF EXPERIMENTS**  1. Selection of material & IS coding  2. Selecting fit & assigning tolerances  3. Examples of Production considerations.  **Problems on**   1. Knuckle & Cotter joints 2. Torque: Keyed joints & shaft couplings 3. Design of screw fastening 4. Bending: Beams, Levers etc. 5. Combined stresses: Shafts, brackets, eccentric loading |

**ME 255 CASTING,WELDING,FORMING Lab C (L, T, P) = 2(0, 0, 3)**

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| **LIST OF EXPERIMENTS**  1. Study of lathe machine, lathe tools cutting speed, feed and depth of cut.  2. To perform step turning, knurling and chamfering on lathe machine as per drawing.  3. Taper turning by tailstock offset method as per drawing.  4. To cut metric thread as per drawing.  5. To perform square threading, drilling and taper turning by compound rest as per drawing.  6. To study shaper machine, its mechanism and calculate quick return ratio.  7. To prepare mould of a given pattern requiring core and to cast it in aluminium.  8. Moisture test and clay content test.  9. Strength Test (compressive, Tensile, Shear Transverse etc. in green and dry conditions) and Hardness Test (Mould and Core).  10. Permeability Test.  11. A.F.S. Sieve analysis Test. |

**ME 256 KINEMATICS AND DYNAMICS LAB.** -**I C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENTS**  1. To study inversion of four bar chain  2. Coupling Rod  3. Beam Engine  4. Steering Mechanism  (a) Study of quick return mechanism.(Crank and Slotted lever mech.)  (b) To draw velocity and acceleration diagram for Crank and slotted lever mechanism.  5. Study of inversion of Double slider chain  Oldhan Coupling  Scotch Yoke  Elleptical Trammel  6. To plot displacement v/s θ curve for various cams.  7. Study of various cam- follower arrangements.  8. To determine co-efficient of friction.  9. Study of various types of dynamometers, Brakes and Clutches.  10. To determine moment of inertia of the given object using of Trifler suspension.  11. To Verify the relation T=I.W.Wp. for gyroscope. |

**ME 257 MATERIAL SCIENCE LAB C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENTS**  1. To study the Engineering Materials, significance and classifications.  2. Study of crystals structures, Study of Models BCC, FCC, HCP, stacking sequence, tetrahedral and Octahedral voids  3. To calculate the effective numbers of atoms, co-ordination no. packing factors, c/a ratio for BCC, FCC & HCP structures.  4. To prepare metallic samples for metallographic examination and to study the principle and construction of the Metallurgical Microscope.  5. Effect of carbon percentage on hardness of steel  6. Study of Phase Diagrams: concept of phase rule: Fe-C & Cu-Zn.  7. Study of Creep, Study of anistropy: Glass 'Fibre and Carbon' Fibre Composites.  9. Study of various types of fractures, Brittle fracture/ductile.  10. Study of Iron-Carbon Equilibrium Diagram and sketch the various structures present at room temperature. |

**ME 258 INTERNAL COMBUSTION LAB. C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENT**   1. To study the constructional details & working principles of two-stroke/ four stroke petrol engine. 2. To study the constructional detail & working of two-stroke/ four stroke diesel engine. 3. Analysis of exhaust gases from single cylinder/multi cylinder diesel/petrol engine by Orsat Apparatus. 4. To prepare heat balance sheet on multi-cylinder diesel engine/petrol engine. 5. To find the indicated horse power (IHP ) on multi-cylinder petrol engine/diesel engine by Morse Test. 6. To prepare variable speed performance test of a multi-cylinder/single cylinder petrol engine/diesel engine and prepare the curves (i) bhp, ihp, fhp, vs speed ( ii) volumetric efficiency & indicated specific fuel consumption vs speed. 7. To find fhp of a multi-cylinder diesel engine/petrol engine by Willian’s line method & by motoring method.   **NOTE:**   1. To perform constant speed performance test on a single cylinder/multi-cylinder diesel engine & draw curves of (i) bhp vs fuel rate, air rate and A/F and (ii) bhp vs mep, mech efficiency & sfc. 2. To measure CO & Hydrocarbons in the exhaust of 2- stroke / 4-stroke petrol engine. 3. To find intensity of smoke from a single cylinder / multi-cylinder diesel engine. 4. To draw the scavenging characteristic curves of single cylinder petrol engine. 5. To study the effects of secondary air flow on bhp, sfc, Mech. Efficiency & emission of a two-stroke petrol engine. |

**ME 301 TURBO MACHINERY C (L, T, P) = (3, 1, 0)**

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| Units | Course Contents | Hrs. |
| 1 | **Fluid Machinery:** Euler-equation for turbo-machines; Turbines: Impulse turbine- Pelton wheel; Reaction turbine- Francis turbine, propeller turbine; Pumps: Centrifugal pump; Cavitation; Net positive suction head (NPSH); Role of dimensional analysis and similitude; Performance parameters and characteristics of pumps and turbines; Positive displacement pumps. | 7 |
| 2 | Types of turbomachines and their applications.Air compressor¸ centrifugal comprssor gas compressor ¸ reciprocating compressor¸ Dimensional analysis and performance parameters. Cascade theory: types of cascades, flow and geometric parameters, boundary layer development. | 7 |
| 3 | Axial flow turbines, axial flow compressors, propellers, centrifugal fans,blowers and compressors – fluid flow, types of blading, velocity triangles,diffusers and nozzles, pressure change, multi-staging, stall, enthalpy-entropy diagram, efficiency, acoustics, applications. | 7 |
| 4 | Wind turbines – types, analysis,site, atmospheric aspects. | 7 |
| 5 | Solar plant turbines: principles, construction features and performance. Future trends | 7 |

**Text and Reference Books:**

**ME 302 HEAT & MASS TRANSFER C (L, T, P) = (3, 1, 0)**

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| Units | Course Contents | Hrs. |
| 1 | **Conduction:** One dimensional steady state conduction. Simple convection. Overall heat transfer coefficient. Simple cases of Heat Transfer through, homogenous and composite plane walls,cylinders and spheres with constant and variable thermal conductivity. Critical thickness of insulation. Heat transfer from Fins of uniform cross section.  **Convection:** Concept of Hydrodynamic and Thermal boundary layers. Application of Dimensional analysis to Free and Forced convection. Important Dimensions- less numbers. | 7 |
| 2 | **Thermal Radiation:** Plank distribution law, Krichoff's law; radiation properties, diffuse radiations; Lambert's law. Radiation intensity, heat exchange between two black bodies heat exchanger between gray bodies. Shape factor; electrical analogy; reradiating surfaces heat transfer in presence of reradiating surfaces. | 7 |
| 3 | **Heat transfer during Change of Phase:** Film condensation and Drop wise condensation. Flowregimes. Heat transfer coefficient for Film Condensation. Boiling: Classification. Boiling regimes. Heat transfer correlations in boiling.  **Heat exchangers:** Types of Heat exchangers. LMTD and NTU methods exchangers Design.Simple calculations. | 7 |
| 4 | **Heat transfer enhancement techniques**, special heat transfer processes like transpiration and film cooling, ablative cooling; Mass transfer: molecular diffusion, Fick's law, equimolar counter diffusion, molecular diffusion in a stationary gas, analogy between heat and mass transfer, | 7 |
| 5 | **Introduction to Mass Transfer:** Mass and mole concentrations. molecular diffusion, eddy, diffusion from an evaporation fluid surface. Mass transfer in laminar and turbulent convections. Raynold's analogy. Combined heat and mass transfer the wet and dry build thermometer | 7 |

**Text and Reference Books:**

* F.P. Incropera and D.P. Dewitt, Fundamentals of Heat and Mass Transfer, 4e, John Wiley and Sons. 1996.
* J.P. Holman, Heat Transfer, 8e, McGraw Hill, 1997.
* M.N. Ozisik, Heat Transfer - A basic approach, McGraw Hill, 1985.
* A. Bejan, Convection Heat Transfer, 2e, Interscience, 1994.

**ME 303 MACHINE DESIGN C (L, T, P) = (3, 1, 0)**

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| Units | Course Contents | Hrs. |
| 1 | Mechanical Properties of Metals.Principal Stresses and Principal Planes. Determination of Principal Stresses for a Member Subjected to Bi-axial Stress. Application of Principal Stresses in Designing Machine Members.Combined Steady and Variable Stresses. Gerber Method for Combination of Stresses. Goodman Method for Combination of Stresses. Soderberg Method for Combination of Stresses. | 7 |
| 2 | **Mechanical Drives**: Selection of transmission, helical, bevel and worm gears, belt and chain drives. | 7 |
| 3 | **Friction Clutches & Brakes**: Common friction materials, shoe, band, cone and disc brakes their characteristics and design, friction clutches. | 7 |
| 4 | **Bearings and Lubrication:** Types of sliding bearing, materials, type of lubrication, design of sliding bearing, selection and application of rolling bearing, seals. | 7 |
| 5 | **Hoisting Elements**; Wire ropes, hooks, pulley  **Engine parts**: Piston, connecting rod crank shaft | 7 |

**Text Books:**

1. Maleeve Hartman and O.P.Grover, “Machine Design”, CBS Publication & Publishers

2. V.B. Bhandari, “Machine Design”, Tata McGraw Hill

3. P.C. Sharma and D.K Aggarwal., “Machine Design”, S.K. Kataria & Sons.

**Reference Book:**

1. Mahadevan, “Design Data Book”, CBS Publishers & Distributors

2. I.E. Shigley & C.R. Mischke, "Mechanical Engineering Design”, Tata McGraw Hill

**ME 304 MECHATRONICS C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Introduction about Mechatronics, scope of Mechatronics, application, process control automation and N/c Machines.  **Hydraulic And Pneumatic Actuation Systems:** Overview: Pressure Control Valves, Cylinders, Direction Control Valves, Rotary Actuators, Accumulators, Amplifiers, and Pneumatic Sequencing Problems. | 7 |
| **II** | **Electrical Actuation Systems:** Switching Devices, Mechanical Switches **–** SPST, SPDT, DPDT, Debouncing keypads; Relays, Solid State Switches, Diodes, Thyristors, Transistors, Solenoid, Types Devices: Solenoid Operated Hydraulic and Pneumatic Vlaves, Electro-Pneumatic equencing Problems. Control of DC Motors, Permanent Magnet DC Motors, Control of DCMotors, Bush less Permanent Magnet DC Motors, AC Motors, Stepper Motors, Stepper Motor Controls, Servo Motors. | 7 |
| **III** | **Sensors and transducers and application:** Performance Terminology, Static and Dynamic Characteristics, Displacement, Position and Proximity Sensors, Potentiometer Sensors, Strain Gauge Element, LVDT, Optical Encoders, Pneumatic Sensors, Hall Effect Sensors,Tachogenerators, Strain Gauge Load Cell, Thermostats, Photo Darlington. Interfacing Sensors in Mechantronic System as – Temperature Switch Circuit, Float Systems |  |
| **IV** | **Interfacing controllers:** Interfacing, Buffers, Darlington Pair, I/O Ports, Interface Requirements, Handshaking, Serial and Parallel Port Interfacing, Peripheral Interface, Adapters.  **Data Acquisition and Control System -** Introduction, Quantitizing theory, Analog to Digital Conversion, Digital to Analog (D/A) conversation, transfer function, transient response & frequency response & frequency response, stability criteria. | 7 |
| **V** | **Design of Mechatronic systems -** Introduction, Automatic front and book and cutting in steel rolling mill, lift control system, CNC lathe, temperature control of a heat treatment furnace, EOT crane control panel, Grey grain separators, electrode arm control in electric arc furnace. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Mechatronics Engineering, Tomkinson, D. and Horne, J., McGraw Hill, 1996
2. Mechatronics, Bolton, W., Longman, 1995
3. Mechatronics, HMT Hand Book, 1998
4. Understanding Electro-Mechanical Engineering, Kamm, L.J., IEEE Press, New York, 2000
5. Nitaigour Premchand Mahalik, Mechatronics, Tata Mcgraw-Hill
6. J.P. Holman, Mechanical Measurements,McGraw-Hill
7. T.K.Kundra, P.N.Rao And N.K.Tewari,Numerical Control and Computer AidManufacturing,Tata McGraw-Hill,

**ME 305 PRODUCTION PROCESS C (L, T, P) = 3(3, 0, 0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| **I** | **Jigs And Fixtures:-** Introduction, definition and difference; usefulness of jigs and fixtures; design considerations; materials used; principles and methods of location; clamping elements; jig bushes; drilling jigs; fixtures for milling turning, boring and welding; assembly fixtures; indexing devices; economics of jigs and fixtures; complete design of a jig and a fixtures; complete design of a jig and a fixtures. | 7 |
| **II** | **Plastic Technology:** Introduction, Classification of Plastics, Ingredients of Moulding compounds, General Properties of Plastics, Plastic part manufacturing processes such as compression moulding, transfer moulding, injection moulding, extrusion moulding, blow moulding, calendaring, thermoforming, slush moulding, laminating | 7 |
| **III** | **Precision Measurement :** Standards of linear measurements; linear and angular measurements; screw thread measurement; measurement of effective diameter, pitch and thread angles; Gear measurement, measurement of tooth profile, tooth thickness and pitch, Measurement of surface roughness. Quantitative methods of roughness measurements, Stylus and profilograph methods. **Precision Measuring Instruments:** Comparators types; working principles applications and limitations of various comparators; optical flat; autocollimator indicators, slip gauges, bevel protector. | 7 |
| **IV** | **Design Of Single Point Cutting Tools:** Introduction; functions of various tool angles; design of single point turning too]; parting tool; empirical determination of force components; optimum value of tool angles.. | 7 |
| **V** | **Design of Multipoint Cutting tool:** Introduction; angle of contact; force analysis; approach through dimensional analysis; force and power consumption; tooth forn1 and cutter design | 7 |
|  | **Total** | **35** |

**Reference Books:**

* 1. Manufacturing Science, Ghosh, A. and Mallik, A.K., Affiliated East West Press
  2. Modern Machining Processes, P.C.Pandey, H.S.Shah, TMH
  3. Machine Tool Design: N.K.Mehta, Tata McGraw Hill
  4. Production Engineering Sciences by P.C.Pandey & C.K.Singh, Standard Publishers & Distributors Delhi
  5. Production Engineering by P.C.Sharma, S.Chand & Co.Pvt, Ltd., New Delhi.
  6. Fundamentals of tool design: F.W.Willson, Astme

**ME 306 AUTOMOBILE ENGINEERING C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Power Plant**: Selection of power plant for automotive vehicle, requirements of vehicle. Characteristics of various power plants (Petrol engines, Diesel engines, CNG LPG engine, Gas Turbines); constructional details of C.I. and S.I. engines, crank shafts, connecting rods, pistons, piston pins, piston rings, valves mechanisms, manifolds, air cleaners, mufflers, radiators and oil filters.  **Vehicular Performance** : Load, air and grade resistance; matching of engine output and demand power, performance requirements of various vehicles like Passenger cars, heavy duty trucks etc. performance characteristics of internal combustion engines, drive effectiveness relationship for 2 wheel and 4 wheel drive vehicles. | 7 |
| **II** | Transmission Systems : Transmission requirements, general arrangement of clutch, gear box and rear axle transmission, general arrangement of rear engines and vehicles with live axles. General arrangement of Dead axle and axle-less transmission, De-Dion drive, arrangement of front engine and front wheel drives, four wheel drive transmission.  **Clutches**: Principle of friction clutch, single and multiplate clutches, centrifugal clutch. Friction materials. Bonding materials. Fluid fly wheel clutch. | 7 |
| **III** | Transmission : Description and working of manually operated gearboxes like sliding mesh, constant mesh, synchromesh. Hydraulic torque converter and its construction working and performance. Semi-automatic transmission (Wilson Gear Box). Analysis of differentials, live axles, construction and working. Requirement of overdrive.  **Steering System** : Steering geometry, Ackermann steering, Center point steering, Power steering. | 7 |
| **IV** | **Suspension** : Independent suspension; Perpendicular arm type, Parallel arm type. Dead axle suspension. Live axle suspension, air suspension, shock absorbers.  **Wheels, Tyres and Brakes** : Wheel and tyre requirements, tyre dynamics, mechanical and hydraulic brakes, shoe arrangements and analysis, disc brakes, braking effectiveness relationship for 4 wheel drive. | 7 |
| **V** | **Automotive Air Conditioning**: Introduction, Loads, Air conditioning system Components, Refrigerants, Fault Diagnosis.  **Automotive Safety**: Safety requirements, Safety Devices, Air bags, belts, radio ranging, NVS (Night Vision System) GPS (Global Positioning System) etc. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Automobile Engineering, R.K.Sharma
2. Automobile Engineering, Kirpal Singh, Vol. 1 & 2
3. Automotive Chassis and Body, P.L.Kohli, Vol.1 & 2
4. Vehicle Engine and Technology, Heisler, ELBS

**ME 307 DYNAMICS OF MACHINE - II C (L, T, P) = 4(3, 1, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Governors: Watt, Porter, Proell, Hartnell and spring controlled governors, governor effort, power, stability, inertia effects. | 7 |
| **II** | Inertia force analysis: Velocity and acceleration of slider crank and four bar mechanism, inertia force, piston thrust and forces on connecting rod, turning moment diagram, flywheel. | 7 |
| **III** | Gears: Law of gearing, terminology, tooth form, standard interchangeable tooth profile, minimum number of teeth on pinion in contact with gear or rack, interference and undercutting, bevel, helical and spiral gears. | 7 |
| **IV** | Gear trains: Simple, compound, reverted and epicyclic gear trains, analytical, tabular, graphical and vector methods for velocity ratio, gear boxes- sliding and constant mesh for automobiles. | 7 |
| **V** | **Gyroscopes:** Introduction. Precessional Angular Motion.Gyroscopic Couple.Effect of Gyroscopic Couple on an Aeroplane. Terms Used in a Naval Ship.Effect of Gyroscopic Couple on a Naval Ship during Steering.Effect of Gyroscopic Coupleon a Naval Ship during Pitching. Effect of Gyroscopic Couple on a Navalship during Rolling. Stability of a Four Wheel drive Moving in a Curved Path.Stability of a Two Wheel Vehicle Taking a Turn. Effect of Gyroscopic Coupleon a Disc Fixed Rigidly at a Certain Angle to a Rotating Shaft. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. The Theory of Machines, Thoman Beaven, CBS publishers & Distributors, Delhi
2. Theory of Mechanisms and Machines; Jagdish lal, Metropolitian Book Co. Ltd, New Delhi
3. Theory of Machines; P.L. Ballaney, Khanna Publishers, Delhi

**ME 308 GAS DYNAMICS AND PROPULSION C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Revision of fundamentals**. Thermodynamics of compressible flow – wave motion in compressible medium, Mach number and cone, properties. Steady one-dimensional compressible flow through variable area ducts. Effects of heating and friction in duct flow, Rayleigh and Fanno lines. Flows with normal shocks. Oblique shocks and reflection. Expansion waves. Prandtl- Meyer flow. Flow over bodies. Measurements and applications. | 7 |
| **II** | **Centrifugal Compressors:** Principal of operation; work done and pressure rise; slip diffuser. Design criterion; compressibility effects; non-dimensional quatities used for plotting compressor characteristics surging, choking and rotating stall gas Turbine **Axial Fow Compressors:** Basic constructional features; turbine v/s compressor blades; elementary theory; degree of reaction; vortex theory, simple design calculations; introduction to blade design; cascade test; compressibility effects; operating characteristics; | 7 |
| **III** | **Nozzles:** Application of Nozzles. Types of Nozzles. Converging and converging-diverging nozzles and diffusers.Expansion of steam through a Nozzle. Effect of friction. Critical pressure ratio. Areas at Throat & Exit for maximum discharge conditions. Performance at Off- design conditions. | 7 |
| **IV** | **Jet Propulsion:** Aircraft propulsion- types of jet engines-energy flow through jet engines, study of turbojet engine components-diffuser, compressor, combustion chamber, turbine and exhaust systems, performance of turbo jet engines-thrust, thrust power, propulsive and overall efficiencies, thrust augmentation in turbo jet engines, ram jet and pulse jet engines. | 7 |
| **V** | **Rocket propulsion**– basics, solid and liquid propelled engines, parametric studies,construction features, single and multi-stage rockets. Thrust chamber and nozzle models. Studies of in-use engines. Environmental aspects**.** | **35** |

**Text Books:**

1. R. Yadav, “Steam Turbines”, Asia Publications.

2. D.S. Kumar; “Heat & Mass Transfers”, S.K. Kataria & Sons.

3. M.L. Mathur, F.S. Mehta, “Thermal Engineering”, Jain Publication

4. R.K. Rajput, “Thermal Engineering”, Laxmi Publication

**Reference Books:**

1. J.P. Holman; “Heat Transfers” McGraw Hill, USA

2. Mills; “Heat Transfers”, C.B.S Publications.

3. Kearton; “Steam Turbine”, C.B.S Publications

4. Arora DomkundwaR, “A Course in heat & Mass Transfer”,

**ME 309 FUNDAMENTALS OF AERODYNAMICS C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Aerodynamic forces and moments over the body surface, concept of lift and drag, dimensionless force and moment coefficient, centre of pressure of an aerofoil, nomenclature of aerofoil, angle of attack, circulation and lift over an-aerofoil, Kutta condition, Kelvin's circulation theorem. | 7 |
| **II** | Blade theory; Symmetrical and non-symmetrical aerofoil. Energy transfer in terms of lift and drag, cascade nomenclature, turbine cascade nomenclature, cascade lift and drag coefficient. | 7 |
| **III** | Isentroic Flow: Velocity of sound; Mach angle; Mach number, steady isentropic flow through ducts; use of isentropic tables; condition for maximum discharge; choked flow; flow through convergent and convergent-divergent nozzle, supersaturated flow in nozzle. | 7 |
| **IV** | Adiabatic flow and flow with Heat Transfer: Adiabatic flow; Fanno line tables; entropy change; choking due to friction; flow through long ducts; Diabatic flow ; Rayleigh line; use of tables; change in entropy; effect of change in stagnation temperature. | 7 |
| **V** | Normal Shock: Plane stationary normal shock; Ranking-Hugoniot relations; increase in entropy; Prandtl's relations; change in stagnation pressure across the shock. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Compressible Flow by S.M.Yahya
2. Gas Dynamics, R.K.Prohit
3. Fundamentals Of Aerodynamics by Anderson
4. Basic concept of fluid mechanics by R.K.Bansal

**ME 310 Numerical Analysis & Programming  C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Errors and significant digits, Roots of algebraic equations Bisection method, secant method,Graff’s root- squaring method,  **Numerical Techniques:**The solution of linear and non-linear equations: Direct Iteration method, Regula-Falsi method, Newton – Raphson method.  Solution of system of simultaneous equations by Gauss elimination, Gauss-Jacobi and Gauss-Seidal methods.  **Finite differences**: Forward, backward and Central differences. | 7 |
| **II** | **Interpolation and Numerical Calculus:**Newton’s interpolation for equi-spaced  values. Divided differences and  interpolation formula in terms of divided differences.  Stirling’s central difference interpolation formula,  Lagrange’s  interpolation formula for unequi-spaced values. | 7 |
| **III** | Numerical differentiation, Numerical Integration:- Trapezoidal, Simpson’s rule and Gaussian integration (only formula applications) Differential equations and their solutions. Numerical methods for ordinary differential equations (Picard method, Taylor series method, Euler’s method, Ranga Kutta Method, Predictor- corrector method, Adams- Bashforth method). | 7 |
| **IV** | Sampling theory: Introduction: Moments, Moment generating functions, Skewness, Kurtosis, Correlation and Regression, Normal sampling distributions; Binomial distribution, Poisson distribution, Normal distribution; Sampling distribution of the means; sampling distribution of the differences of the means; sampling distributions of proportions. | 7 |
| **V** | **Computer Programming**:  Writing programmes in C++ for solving numerical problems.  For example, Programme for solving algebraic and transcendental equations by Newton-Rapson Method, solving simultaneous equations by Gauss-Seidal method.  Programme for Interpolation by Lagrange’s method.  Programme for estimating the value an  integral by Simpson’s rule.  Programme for solving differential equation by Runge-Kutta method, etc. | 7 |

**Reference Books:**

1. **B.V.RAMANA.,** McGraw Hill
2. **B.RAM, PEERSON PUBLICATION**
3. **E.KRIZING, WILLY PUBLICATION**

**ME 311 MECHANICAL VIBRATION AND NOISE ENGINEERING C (L, T, P) = 4(3, 1, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Sound level and subjective response to sound; Frequency dependent human response to sound, Sound pressure dependent human response. Decibel scale; Decibel addition, subtraction and averaging. Relationship among sound power, sound intensity and sound pressure level. Sound spectra. Octave band analysis. Loudness. Noise: Effects, Ratings and Regulations; Non-auditory effects of noise on people, Auditory Effects of noise, Noise standards and limits in India. Major sources of the noise; Industrial noise sources. Industrial noise control-strategies; Noise control at the source, Noise control along the path, Acoustic barriers, Noise control at the receiver. | 7 |
| **II** | Scope of vibration, important terminology and classification, Degrees of freedom, Harmonic motion; vectorial representation, complex number representation, addition. Derivation of equation of motion for one dimensional longitudinal, transverse and torsional vibrations without damping using Newton’s second law, D’ Alembert’s principle and Principle of conservation of energy. Compound pendulum and centre of percussion. Damped vibrations of single degree of freedom systems. Viscous damping; under damped, critically damped and over damped systems, Logarithmic decrement. Vibration characteristics of Coulomb damped and Hysteretic damped systems. | 7 |
| **III** | Forced vibrations of single degree of freedom systems. Forced vibration with constant harmonic excitation. Steady state and transient parts. Frequency response curves and phase angle plot. Forced vibration due to excitation of support. Vibration Isolation and transmissibility; Force transmissibility, Motion transmissibility. Forced vibration with rotating and reciprocating unbalance. Materials used in vibration isolation. | 7 |
| **IV** | System with two degrees of freedom; principle mode of vibration, Mode shapes. Undamped forced vibrations of two degrees of freedom system with harmonic excitation. Vibration Absorber; Undamped dynamic vibration absorber and centrifugal pendulum absorber. Many degrees of freedom systems: exact analysis. | 7 |
| **V** | Many degrees of freedom systems: approximate methods; Rayleigh’s, Dunkerley’s, Stodola’s and Holzer’s methods. Vibrations of continuous systems; Transverse vibration of a string, Longitudinal vibration of a bar, Torsional vibration of a shaft. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Mechanical Vibrations; G.K.Grover, Nemi Chand & Bros., Roorkee
2. Vibration Theory & Applications; W.T.Thomson
3. Vibration & Noise for Engineers; K.K.Purja, Dhanpat Rai & Sons, Delhi
4. Theory & Problems of Mechanical Vibrations; W.W.Seto, Schaum's Outline Series, McGraw Hill International Editions
5. Mechanical Vibrations, Den Hartog
6. Vibration Problems in Engineering, Timshenko

**ME 312 PRODUCTION MANAGMENT C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Importance of new product-Definition-importance-Development Process -** Importance of new product for growth of enterprise. Definition of product and new product. Responsibility for new product development. Demands on product development team. Classification of products from new product development. Point of view- Need based/Market pull products, Tech. push, Platform based, Process based and customized products. New product development process and organization. Generic product development process for Market Pull Products. Modification of this process for other types of products. | 7 |
| **II** | **Need analysis- Problem Formulation -** Establishing economic existence of need, Need Identification and Analysis, Engineering Statement of Problem, Establishing Target Specification. | 7 |
| **III** | **Generation of Alternatives and Concept Selection -** Concept generation- a creative process, Creativity, Road Elects to creative thinking- Fear of criticism and Psychological set. Tools of creativity like brain storming, Analogy, Inversion etc., Creative thinking Process. Concept feasibility and Concept Selection, Establishing Engineering Specification of Products. | 7 |
| **IV** | **Preliminary & detailed design- Design Review -** Preliminary design- Identification of subsystems, Subsystem specifications, Compatibility. Detailed design of subsystems, component design, Preparation of assembly drawings. Review of product design from point of view of Manufacturing, Ergonomics and aesthetics. | 7 |
| **V** | **Management of New Product – development and Launch -** New Product Management’s Challenges – Maintaining focus, Promotion of Right Culture, Management of Creativity, Top Management attention. Design Team Staffing and Organization. Setting key mile stone, Identification of Risk Areas, Project Execution and Evaluation Product Launch Strategies.  Project Planning – Project Task matrix, estimation of time & resources, project scheduling. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Product Design and Manufacturing, Chital AK and Gupta RC,PHI
2. Product Design and Manufacturing, Ulrich Ktand Eppinger SD McGraw Hill
3. Product Design and Manufacturing, Lind beck JR, Prentice Hall.
4. Engineering Design Method, Cross, Nigel, John Wiley & Sons.
5. Design for Strength & Production; C.Ritz and F. Koenigsbenger.

**ME 351 DYNAMICS OF MACHINES LAB. C (L, T, P) = 1(0, 0, 2)**

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| **LIST OFEXPERIMENTS**  1. To study inversion of four bar chain  2. Coupling Rod  3. Beam Engine  4. Steering Mechanism  (a) Study of quick return mechanism.(Crank and Slotted lever mech.)  (b) To draw velocity and acceleration diagram for Crank and slotted lever mechanism.  5. Study of inversion of Double slider chain  Oldhan Coupling  Scotch Yoke  Elleptical Trammel  6. To plot displacement v/s θ curve for various cams.  7. Study of various cam- follower arrangements.  8. To determine co-efficient of friction.  9. Study of various types of dynamometers, Brakes and Clutches.  10. To determine moment of inertia of the given object using of Trifler suspension.  11. To Verify the relation T=I.W.Wp. for gyroscope. |

**ME 352 HEAT AND MASS TRANSFER LAB. C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENTS**  1. To find emissivity of a grey body relative to a given block body.  2. Perform parallel and counter flow heat exchanger.  3. To find out the Stefan Boltzmen constant.  4. To perform experiment on pin fin test rig in forced convection by neglecting radiation losses & to calculate. Convective heat transfer coefficient. (Experimentally & empirical correlation), Efficiency, Effectiveness, Comparison of experimental & theoretical temperature profile.  5. Repeat the same exercise by considering radiation losses  6. To find convectively heat transfer coefficient of a given cylinder in vertical position by neglecting radiation losses by assuring, constant surface temperature, constant heat flux & compare with experimental heat transfer coefficient by neglecting radiation losses & by considering radiation losses.  7.Perform the experiment No.5 by using cylinder in horizontal position |

**ME 353 MACHINE DESIGN LAB C (L, T, P) = (0, 0, 3)**

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| **LIST OF EXPERIMENT**  1. Couplings: Pin-type flexible coupling etc.  2. I.C. Engine parts: connecting rod, crank shaft, etc.  3. Boiler Mountings: Steam stop valve/ feed check-valve/ safety valve /three way stop valve blow off cock,etc.  4. Machine Tool Parts: Shaper tool head, Lathe Tail Stock, Turret Tool Post, Turret Bar feeding Mechanism / Universal Dividing Head, Swivel Machine Vice.  5. Miscellaneous: Screw jack and drill-press vice  6. Free Hand Sketches: Pipes and Pipe fittings, clutches, bearings, bearing puller, valve gear mechanisms, machine arbor and cutter, universal dividing head, jigs and fixtures, Step less drive, sliding gear box. |

**ME – 354 AUTOMOBILE ENGG. LAB. C (L, T, P) = (0, 0, 3)**

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| **LIST OF EXPERIMENT**  1 Disassembling and assembling of multi-cylinder petrol and diesel engines and study of their parts.  2. To disassemble and assemble a 2-stroke petrol engine.  3. To disassemble and assemble a 4-stroke motor cycle engine and study of various engine parts.  4. Load test on a single cylinder 4-stroke diesel engine using a rope brake dynamometer and calculate volumetric and thermal efficiency and draw a heat balance-sheet.  5. Study of carburetors and MPFI system and disassembling and assembling of their parts.  6. To calculate valve timing of a multi-cylinder petrol engine and valve tappets adjustment.  7. Disassemble all the parts of a fuel injection pump and its parts study.  8. To disassemble the governor and study its various parts. |

**ME 355 PRODUCTION PROCESS LAB-II**   **C (L, T, P) = 2(0, 0, 3)**

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| **LIST OF EXPERIMENTS**   1. To study of single point cutting tool geometry & to grind the tool to the given tool geometry. Write importance of various angles and to prepare a capacity chart of the Tool & cutter grinder. 2. Prepare a hexagonal/octagonal nut using indexing head on milling m/c and to cut bsw/ metrix internal threads on lathe (to meet with job). 3. To prepare the capacity chart for a lathe machine. 4. To cut multi-start square/metric thread. 5. To cut external metric threads & to mesh it with the nut (drg). 6. Prepare the process chart for the job. 7. To perpare the job by eccetric turning on lathe machine drawing. 8. To study shaper machine & its mechanism and calculate its quick return ratio. 9. To prepare a job on shaper from given mild Steel rod drawing   10. To study the effect of rake angle on chip thickness ratio and the shear angle in orthogonal machining.  11. Using drill dynamometer measure the torque and thrust force in drilling and to plot the characteristics, torque, force & power v/s speed & feeds.  12. To measure effective diameter of a screw thread by three wire method.  13. To perform alignment test on a centre lathe  14. To calibrate pneumatic comparator and measure taper of a given work peice. |

**ME 357 MECHANICAL VIBRATION LAB C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENTS**   1. To verify relation T=2 √L/g for a simple pendulum. 2. To determine radius of gyration of compound pendulum. 3. To determine the radius of gyration of given bar by using bifilar suspension. 4. To determine natural frequency of Spring mass System. 5. Equivalent spring mass system 6. To determine natural frequency of free torsional vibrations of single rotor system (a) Horizontal rotor (b) Vertical rotor. 7. To verify the Dunkerleys rule. 8. Study of free damped torsional vibration to performing the experiment to find out damping co-efficient. 9. To conduct experiment on trifilar suspension   10. Vibration of beams concept of more than one degree of freedom Excrtation using eccentric mass.  11. Critical speed of shafts.  12. Study of vibration measuring instruments. |

**ME 401 REFRIGERATION AND AIR - CONDITIONING**   **C (L, T, P) = 4(3, 1, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Introduction -** Refrigeration and second law of Thermodynamics, Refrigeration effect and unit of Refrigeration, Heat pump, reversed Carnot cycle. **Vapour Compression Refrigeration System -** Analysis of simple vapour compression Refrigeration cycle by p-h and T-S diagram. Effect of operating conditions, liquid vapour heat exchangers, actual refrigeration cycle. **Multiple Evaporator and compressor system -** Application, air compressor system, Individual compressor, compound compression, cascade system. Application, air compressor systems, individual compressor, compound compression, cascade system. | 7 |
| **II** | **Gas cycle Refrigeration -** Limitation of Carnot cycle with gas, reversed Brayton cycle, Brayton cycle with regenerative heat exchanger. **Air cycle for air craft -** Necessity of cooling of air craft, Basic cycle, boot strap, regenerative type air craft refrigeration cycle. | 7 |
| **III** | **Vapour Absorption System -** Simple Vapour absorption system, Electrolux Refrigerator, Analysis of Ammonia absorption refrigeration system, Lithium Bromide Absorption Refrigeration System. **Refrigerants -** Classification, Nomenclature, selection of Refrigerants, global warming potential of CFC Refrigerants. **Refrigeration Equipments -** Compressor, condenser, evaporator, expansion devices – types & working. | 7 |
| **IV** | **Other Refrigeration System:** Principle and applications of steam jet refrigeration system, Performance; vortex tube refrigeration, thermoelectric refrigeration systems. **Psychrometry-** Psychrometric properties, psychometric relations, pyschrormetric charts, psychrometric processes, cooling coils, By-pass factor and air washers. **Human Comfort -** Mechanism of body heat losses, factors affecting human comfort, effective temperature, comfort chart. | 7 |
| **V** | **Cooling load calculations -** Internal heat gain, system heat gain, RSHF, ERSHF, GSHF, cooling load estimation, heating load estimation, psychometric calculation for cooling, selection of air conditioning, apparatus for cooling and dehumidification, Air conditioning system. **Distribution and Duct systems:** Distribution of air in conditioned space et location, return and exhaust grills. Duct materials and sizing, design of Supply and return air ducts. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Refrigeration and Air Conditioning, C.P.Gupta
2. Refrigeration and Air Conditioning, Ballarey
3. Refrigeration and Air Conditioning, C.P.Arora

Modern Air Conditioning-Practice, Narman E.Harris, Tata McGraw Hill

**ME – 402 FUNDAMENTAL OF ROBOTICS C (L, T, P) =3 (3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Introduction to Robotics -** Evolution of Robots and Robotics, Laws of Robotics, What is and What is not a Robot, Progressive Advancement in Robots, Robot Anatomy, Human Arm Characteristics, Design and Control Issues, Manipulation and Control, Sensors and Vision, Programming Robots, The Future Prospects, Notations. | 7 |
| **II** | **Coordinate Frames, Mapping and Transforms -** Coordinate Frames, Description of Objects in Space, Transformation of Vectors, Inverting a Homogeneous Transform, Fundamental Rotation Matrices | 7 |
| **III** | **Symbolic Modeling of Robots – Direct Kinematic Model -** Mechanical Structure and Notations, Description of Links and Joints, Kinematic Modeling of the Manipulator, Denavit – Hartenberg Notation, Kinematic Relationship between Adjacent Links, Manipulator Transformation Matrix. Introduction to Inverse Kinematic model | 7 |
| **IV** | **Robotic Sensors and Vision -** The Meaning of Sensing, Sensors in Robotics, Kinds of Sensors used in Robotics, Robotic vision, Industrial Applications of Vision-Controlled Robotic Systems, Process of Imaging, Architecture of Robotic Vision Systems, Image Acquisition. | 7 |
| **V** | **Robot Applications -** Industrial Applications, Material Handling, Processing Applications, Assembly Applications, Inspection Application, Principles for Robot Application and Application Planning, Justification of Robots, Robot Safety, Non-Industrial Applications. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Introduction to Robotics by John J. Craig,Pearson Education
2. Robotics by K.S.Fu,R.C.Gonzalez and C.S.G.Lee,McGraw-Hill
3. Robotic Engineering by Richard D.Klafter,Thomas A.Chmielewski and Michel Negin

**ME 403 POWER PLANT ENGINEERING C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Introduction:** Introduction to generation of electrical power, Sources of energy, comparative merits, types of power plants. Review of growth of power & development of different types of power plants in India, future possibilities. Review of Steam power plant and gas power plant. | 7 |
| **II** | Diesel Power Plants: General layout; elements of diesel power plants; field of use; systems of diesel power plant; comparison with steam power plants (advantages and disadvantages). combined gas and steam power plants; Advantage of combined cycle, Introduction to integrated coal gasification combined cycle power plants | 7 |
| **III** | Nuclear Power Plants: Elementary concept of physics of generation of nuclear energy, Nuclear materials and waste disposal; nuclear fuels, fuel cycles, coolants, moderating and reflecting materials; cladding materials, shielding materials; Disposal of nuclear waste; General components of nuclear reactor, different types of nuclear reactors, Their construction and working; Location of nuclear power plants; Comparison of nuclear plants with thermal plants. Enrichment; safety and control. Fast breeder reacors and power plants | 7 |
| **IV** | Hydro-elecrtic power PLant: Classification and applications of Hydro-electric plant; Measurement of stream flow; capacity calculation of hydro-power, The hydro plant and its auxiliaries; automatic and remove control of hydro-systems. MHD geothermal, tidal & wind power plants. | 7 |
| **V** | Power Plant Economics: Load curves; different terms and definitions; cost of electrical energy; Selection of type of generation; Performance and operating characteristics of power plants; load division combined operation of power plants; load division between stations. Different systems of tariff. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Power Plant Technology, M.M.El-Wakil, McGraw Hill Book Company
2. A Course in power Plant Engineering, Arora and Domkunwar Dhanpat Rai and Co.(P) Ltd.
3. Power Plant Engineering, Black and Veatch, CBS publication.

**ME 404 COMPUTER AIDED MANUFACTURING**   **C (L, T, P) = 3(3, 0, 0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| **I** | Introduction: Overview of manufacturing processes, types of manufacturing systems, the product cycle, computer’s role in manufacturing, sources and types of data used in manufacturing. The Beginning of CAM: Historical Background, Basic components of NC systems, NC Procedure, NC coordinate system and machine motions, applications and economics of NC. | 7 |
| **II** | Part programming- manual and computer assisted such as APT Language. Computer Controls In NC Systems: Problems with conventional NC computer numerical control, Direct numerical control, combined CNC/ DNC systems, adaptive control machining system computer process interfacing, New development and latest trends. | 7 |
| **III** | Computer Aided Process Planning: Traditional Process Planning, Retrieval process planning system, Generative Process Planning, Machinability data system, computer generated time standards. Group Technology: Introduction, part families, part classification and coding, coding system and machining cells. | 7 |
| **IV** | Compuer Aided Production Management Systems: Introduction to computer aided PPC, Introduction to computer aided inventory management, manufacturing resource planning (MRPII), computer process monitoring and shop floor control, computer process control. Computer Aided Quality Control: Computer in quality control, contact inspection methods, Non contact inspection methods, optical and non optical computer aided testing. Computer Aided Material Handling: Computer control on material handling, conveying, picking. Ware house control, computerized material handling for automated inspection and assembly. | 7 |
| **V** | Computer Integrated Manufacturing Systems: Introduction, types special manufacturing systems, flexible manufacturing systems (FMS). Collaborative Engineering**:** Introduction, Faster Design throughput, Web based design, Changing design approaches, extended enterprises, concurrent engineering, Agile and lean manufacturing. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Automation, Production Systems and Computer Integrated Manufacturing by M.P.Grover, PHI
2. Principal of computer integrated manufacturing by S.Kant Vajpayee.
3. Numerical control and computer aided Manufacturing; Kundra, Rao & Tiwari, TMH.

**ME 405 OPERATION RESEARCH C (L, T, P) = 4(3, 1, 0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| **I** | **Linear Programming-** Introduction & Scope, Problem formulation, Linear Programming: LP formulation, graphical method, simplex method, duality and Sensitivity analysis. | 7 |
| **II** | Transportation Model, Assignment Model, Sequencing problems, Network Flow, constrained optimisation and Lagrange multipliers. **Dynamic Programming-** Multistage decision problems & solution, Principle of optimality. | 7 |
| **III** | **Decision theory-**Decision under various conditions. **Game Theory-**Minimax & maximum strategies. Application of linear programming. **Integer Programming-** Cutting Plane method and Branch & Bound method | 7 |
| **IV** | **Deterministic and Stochastic inventory models-** Single & multi period models with continuous & discrete demands, Service level & reorder Policy. **Replacement Models:** Capital Equipment replacement with time, group replacement of tems subjected to total failure, Industrial staff problem, replacement problems under warranty condition. | 7 |
| **V** | **Simulations-** Need of simulation, advantages and disadvantages of simulation method of simulation. Generation of Random numbers, Generation of normal Random numbers, Generation of random numbers with any given distribution. Use of random numbers for system simulation, Application of simulation for solving queueing Inventory Maintenance, Scheduling and other industrial problems. Simulation V/S mathematical modeling, Monte Carlo simulation, simulation language ARENA, Example & cases. **Queing models-** Introduction Model types, M.M. 1 & M/M/S system cost consideration. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Introduction of Operations Research, Hiller F.S. & Liberman G.J.CBS Publishers
2. Operations Research,Taha H.A., McMillan Publishing Company
3. Foundation of Optimisdation, Heightler, C.S. & Philips D.T. Prentice Hall

**ME 406 COMPUTER AIDED DESIGN C (L, T, P) = 3(3, 0, 0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| **I** | Overview of Computer Graphics, Picture representation, Coordinate Systems, Output Graphcis Display devices. Raster Scan Graphics : DDA for line generation and Bresenham’s algorithm for line and circle generation. | 7 |
| **II** | Wire frame models, Parametric representation of curves, Plane curves : line, circle, ellipse, parabola and hyperbola. Space curves : Cubic spline curve, Bezier Curve and B Spline Curves. Blending of Curves. | 7 |
| **III** | Surface models and entities Parametric representation of Hermite Bicubic surfaces, Bezier surfaces and B-spline surfaces. Solid Models and entities, Solid Representation : B-rep. and CSG.Comparison between three types of models**.** | 7 |
| **IV** | Two and three dimensional transformation of Geometric models: Translation, Scaling Reflection, Rotation and Shearing. Homogeneous Representation, Combined Transformation. Projection of Geometric models: Parallel and Perspective Projection. | 7 |
| **V** | Clipping : Point clipping, Line clipping, Cohen- Sutherland algorithm etc. Viewing Transformation, Hidden Line and surface Removal : Techniques and Algorithms. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Mathematical Elements for Computer Graphics, Rogers and Admas.
2. CAD/CAM Theory and Practice, Zied Ibrahim, Tata McGraw Hill.
3. Computer Graphics (Schaum Series), Plastock and Kalley.

**ME 407 METROLOGY C (L, T, P) = 3(3, 0, 0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| **I** | **Principles of measurement**: Definition of Metrology, difference between precision andaccuracy. Sources of errors: Controllable and Random Errors, Effects of Environment and Temperature, Effects of support, alignment errors, application of Least Square principles, errors in measurement of a quality which is function of other variables.  **Length Standards:** Line standards, end standards and wavelength standards, transfer from line standards to end standards. Numerical based on line standards. Slip gauges – its use and care, methods of building different heights using different sets of slip gauges.  **Limits, fits and tolerances**: Various definitions, IS919-1963, different types of fits and methods to provide these fits. Numerical to calculate the limits, fits and tolerances as per IS 919- 1963. ISO system of limits and fits; Gauges and its types, limit gauges – plug and ring gauges. Gauge Design – Taylor’s Principle, wear allowance on gauges. Different methods of giving  tolerances on gauges, Numericals. | 7 |
| **II** | **Comparators:** Mechanical Comparators: Johanson Mikrokator and Signma Mechanical Comparator. Mechanical – optical comparator. Principles of Electrical and electronic comparators. Pneumatic comparators – advantages, systems of Penumatic gauging:- Flow type and back pressure type, Principle of working of back pressure gauges, different type of sensitivities and overall magnification, Solex Penumatic gauges and differential comparators. Numericals based on pneumatic comparators.  **Angular Measurement**: Sine Bar – different types of sine bars, use of sine bars in conjuction with slip gauges, precautions and calibration of sine bars. Use of angle gauges, spirit level, errors in use of sine bars. Numericals. Principle and working of Micro-optic autocollimator. Circular Division: dividing head and circular tables, circular division by precision Polygons. Caliper Principle, Calibration of polygons. Numerical based on circular division. | 7 |
| **III** | **Straightness and flatness**: Definition of Straightness and Flatness error. Numericals based on determination of straightness error of straight edge with the help of spirit level and auto collimator. Numericals based on determination of flatness error of a surface plate with the help of spirit level or auto collimator.  **Machine Tool Alignment**: Machine tool tests and alignment tests on lathe. Alignment tests on milling machine. Alignment tests on a radial drilling machine. | 7 |
| **IV** | **Screw Thread Measurement** :Errors in threads, Measurement of elements of screw threads –major dia, minor dia, pitch, flank angle and effective diameter (Two and three wire methods).Effect of errors in pitch and flank angles and its mathematical derivation. Numericals.  **Gear Measurement**: Measurement of tooth thickness – Gear tooth vernier caliper, Constant chord method, base tangent method and derivation of mathematical formulae for each method.Test plug method for checking pitch diameter and tooth spacing. Measurement of Gear Pitch,Parkinson Gear Tester, Numericals. | 7 |
| **V** | **Interferometry:** Principle of measurement, Interferometry applied to flatness testing, surface contour tests, optical flats, testing of parallelism of a surface with the help of optical flat. Quantitative estimate of error in parallelism, Flatness Interferometer NPL-Gauge length interferometer for checking the error in slip gauges. Numericals based on Interferometry.  **Surface texture**: Introduction, different types of irregularities, standard measures for assessment and measurement of surface finish | 7 |
|  | **Total** | **35** |

**ME 408 METAL CUTTING AND TOOL DESIGN C (L, T, P) = 3(3, 0, 0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| **I** | **Mechanics of Metal Cutting:** Elements of a cutting process: geometry of single point cutting tool; tool angles, chip formation; types of chips; chip breakers effects of cutting parameters; Typical cutting speeds and feeds for different tool and job materials; Orthogonal and obligue cutting; Theories of mechanics of metal cutting; cutting force measurement; various types of tool dynameter; thermal aspects of metal machining measurement of chip tool interface temperature; friction in metal cutting. | 7 |
| **II** | **Evaluation of machinability:** Tool life; types of tool failure; mechanism of tool wear, failure and their remedies; reconditioning of tools, relationship between cutting force and power required tool life and cutting speed, surface finish; nose radius, feed; economics of metal machining - cutting tool materials; cutting fluids and methods of their application | 7 |
| **III** | **Gear manufacturing process:-** Introduction: methods of forming gears, hot rolling stamping, powder metallurgy, extruding of coining etc. shear cutting of gear template process, gear generating process, gear hobbing, gear shaping ,bevel gear generating , lapping, shot blasting , phosphate coating, gear testing. | 7 |
| **IV** | . **New Machining Methods:** Types of machining methods; hot machining; electric discharge machining (E.D.M.) ultrasonic machining (U.S.M.) ; Electron beam machining (E.B.M.) laser beam Machining (L.B.M.); abrasive jet machining (A.J.M.) ; plasma arc machining (PAM); economics of machining | 7 |
| **V** | **Grinding:** Abrasives: manufacturing and selection of grinding wheels; theory of grinding; characteristic terms used in grinding; classification; constructional features; principle of working; applications and limitations of different grinding machines. Honing, lapping super finishing, buffing and polishing processes. | 7 |
|  | **Total** | **35** |

**ME 409 METAL CUTTING AND TOOL DESIGN C (L, T, P) = 3(3, 0, 0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| **I** | **FUNDAMENTALS OF ENERGY** Introduction to Energy-Energy consumption and standard of living-classification of energy resources-consumption trend of primary energy resources-importance of renewable energy sources-energy chain-common forms of energy-advantages and disadvantages of conventional energy sources-salient features of nonconventional energy sources-environmental aspects of energy-energy for sustainable development-energy density of various fuels-availability of resources and future trends. Energy scenario in India – Overall production and consumption-Availability of primary energy resources: Conventional, Non-Conventional-Estimated potential and achievement-Growth of energy sector and its planning in india – Energy conservation: Meaning and importance. | 7 |
| **II** | **SOLAR ENERGY** Introduction – Solar radiation at the earth's surface-Solar Radiation measurements-Estimation of average solar Radiation. Solar energy collectors- Classifications-Flat plate collectors-Concentrating collectors-Comparison. Solar water heaters-Solar industrial heating system – Solar Refrigeration and Air-Conditioning Systems-Solar cookers-Solar furnaces- Solar greenhouse-Solar Distillation-Solar pond Electric power plant-Distributed Collector- Solar thermal Electric power plant. Principles of photovoltaic conversion of solar energy – types of solar cells – solar Photo Voltaic applications. | 7 |
| **III** | **WIND ENERGY** Introduction-Basic principles of wind energy conversion: Nature of the wind, power in the wind, forces on the blades and wind energy conversion-wind data and energy estimation-site selection-classification of wind energy conversion systems-Advantages and Disadvantages-Types of wind machines-Horizontal axis machine-Vertical axis machine-Generating system-Energy Storage– Application of wind energy-Safety and environmental aspects. | 7 |
| **IV** | **BIO – ENERGY** Introduction – photo synthesis – usable forms of bio mass, their composition and fuel properties-Biomass resources – Biomass conversion technologies – Urban waste to energy conversion – Biomass gasification – biomass liquification – biomass to ethanol production – Biogas production from waste Biomass – types of bio gas plants - applications – Bio diesel production – Biomass energy programme in india. | 7 |
| **V** | **OCEAN AND GEOTHERMAL ENERGY** Ocean energy resources – principle's of ocean thermal energy conversion (OTEC) – Methods of Ocean thermal electric power generation – Energy utilisation – basic principle of tidal power – components and operations of tidal power plant – Energy and Power forms of waves – Wave energy conversion devices. Geothermal Energy – Geothermal Sources – Prime movers for Geothermal energy conversion – Advantages and Disadvantages – Applications – Material selection for geothermal power plants – Geo thermal exploration – Operational and Environmental problems – Prospects of geothermal energy in india. | 7 |
|  | **Total** | **35** |

**Text Books:**

1. Non Conventional Energy Sources - G.D. Rai – Khanna Publishers, New Delhi,1999.
2. Non Conventional Energy Sources and Utilisation - R.K. Rajput - S.Chand & Company Ltd., 2012.
3. Renewable Energy Sources - Twidell, J.W. and Weir, A. - EFN Spon Ltd., 1986.
4. "Non-Conventional Energy Resources - B.H.Khan - Tata Mc Graw Hill, 2nd Edn, 2009

**ME 451 REFRIGERATION AND AIR CONDITIONING LAB. C (L, T, P) = 1(0, 0, 2)**

|  |
| --- |
| **LIST OF EXPERIMENTS**   1. Study of a vapour absorbtion refrigeration system. (Electrolux refrigerator). 2. To determne the C.O.P. of vapour compression cycle. 3. To determine actual and theopritical C.O.P. of heat pump setup. 4. To study various refrigeration accessories. 5. Three Ton air-conditioner performance test. 6. Energy analysis of parallel and counter flow heat exchanger. |

**ME 452 CAD LAB. C (L, T, P) = 1(0, 0, 2)**

|  |
| --- |
| **LIST OF EXPERIMENTS**   1. Introduction & different features of the CAD Software 2. 2-D Drafting 3. 3-D Modeling 4. 3-D Advanced Modeling 5. Assembly modeling 6. Feature Modification and Manipulation 7. Detailing 8. Sheet Metal Operations   9. Surface Modeling  10. One Dimensional problems of Finite Element Method.  (These exercises may be performed by any of the following Advanced CAD Software such as Pro E /Unigraphics/ Aoto CAD Inventor) |

**ME 454 CAM LAB.**  **C (L, T, P) = 2(0, 0, 3)**

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| --- |
| **LIST OF EXPERIMENT**  1. To prepare part programming for plain turning and taper turning operation.  2. To prepare part programming for turning operation in absolute mode.  3. To prepare part program for threading operation.  4. To prepare part program for slot milling operation.  5. To prepare part program for drilling operation.  6. To prepare part program for multiple drilling operation in Z-axis.  7. To prepare part program for multiple drilling in X-axis.  8. To prepare part program for multiple drilling in X and Z axis using drilling cycle. |

**ME 456 Metal Cutting And Tool Design Lab C (L, T, P) = 2(0, 0, 3)**

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| --- |
| **LIST OF EXPERIMENTS**   1. To study of single point cutting tool geometry & to grind the tool to the given tool geometry. Write importance of various angles and to prepare a capacity chart of the Tool & cutter grinder. 2. Prepare a hexagonal/octagonal nut using indexing head on milling m/c and to cut bsw/ metrix internal threads on lathe (to meet with job). 3. To prepare the capacity chart for a lathe machine. 4. To cut multi-start square/metric thread. 5. To cut external metric threads & to mesh it with the nut (drg). 6. Prepare the process chart for the job. 7. To perpare the job by eccetric turning on lathe machine drawing. 8. To study shaper machine & its mechanism and calculate its quick return ratio. 9. To prepare a job on shaper from given mild Steel rod drawing   10. To study the effect of rake angle on chip thickness ratio and the shear angle in orthogonal machining.  11. Using drill dynamometer measure the torque and thrust force in drilling and to plot the characteristics, torque, force & power v/s speed & feeds.  12. To measure effective diameter of a screw thread by three wire method.  13. To perform alignment test on a centre lathe  14. To calibrate pneumatic comparator and measure taper of a given work piece. |

**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**Teaching and Examination Scheme for B. Tech. (Mechanical Engineering 4 Year Program)**

**For the students of session 2012­13 batches**

**To be implemented in session 2014­15**

**Year: III Semester: V**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | ME 301 | Production Process – II | 3 | 3 | - |  | 3 | 30 | 70 |
| 2 | ME 303 | Fluid Machines | 3 | 3 | - |  | 3 | 30 | 70 |
| 3 | ME 305 | Dynamics of Machine – I | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 4 | ME 307 | Fundamental of Aerodynamics | 3 | 3 | - |  | 3 | 30 | 70 |
| 5 | ME 309 | Mechanical Vibration & Noise Engg. | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 6 |  | **B.Elective (any one of the following)** | 3 | 3 |  |  | 3 | 30 | 70 |
|  | ME 311 | Mechatronics | - | - | - | - | - | - | - |
|  | EC 317 | Principle of Communication Systems | - | - | - | - | - | - | - |
|  |  | **C. Practicals / Sessionals** |  |  |  |  |  |  |  |
| 7 | ME 351 | Production Process Lab – II | 2 | 0 |  | 3 | 3 | 60 | 40 |
| 8 | ME 353 | Fluid Machine Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 9 | ME 355 | Dynamics of Machine Lab – I | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 10 | ME 357 | Mechanical Vibration Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
|  |  | **Discipline and Co-Curricular Activities** |  |  |  |  |  |  |  |
| 11 | DC 301 | Discipline & Co-Curricular Activitiess – V | 2 |  |  |  |  | 100 |  |
|  |  | **Total** | **27** | **18** | **2** | **9** |  |  |  |
|  |  | **Total Teaching Load** |  | **29** |  |  |  |  |  |

**Year: III Semester: VI**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | ME 302 | Dynamics of Machine – II | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 2 | ME 304 | Heat & Mass Transfer | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 3 | ME 306 | Steam Turbine & Steam Power Plant | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 4 | ME 308 | Automobile Engg. | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 5 | ME 310 | Industrial Engg. – II | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  |  | **B. Elective (any one of the following)** | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  | ME 312 | Computational fluid Dynamics and Heat Transfer | - | - | - | - | - | - | - |
|  | ME 314 | Numerical Methods and Applied Statistics | - | - | - | - | - | - | - |
|  |  | **C. Practicals / Sessionals** |  |  |  |  |  |  |  |
| 7 | ME 352 | Dynamics of Machine – II Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 8 | ME 354 | Heat & Mass Transfer Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 9 | ME 356 | Automobile Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 10 | PE 401 | Project Stage -I | 2 | 0 |  | 3 | 3 | 60 | 40 |
|  |  | **Discipline and CO- Curricular Activities** |  |  |  |  |  |  |  |
| 11 | DC 302 | Discipline & Co-Curricular Activities – VI | 2 |  |  |  |  | 100 |  |
|  |  | **Total** | **26** | **18** | **2** | **8** |  |  |  |
|  |  | **Total Teaching Load** |  | **28** |  |  |  |  |  |

**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**Teaching and Examination Scheme for B. Tech. (Mechanical Engineering 4 Year Program)**

**For the students of session 2012­13 batches**

**To be implemented in session 2015­16**

**Year: IV Semester: VII**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | ME 401 | Computer Aided Design | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 2 | ME 403 | Refrigeration and Air-Conditioning | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 3 | ME 405 | Operation Research | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 4 | ME 407 | Reliability and Maintenance | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 5 | ME 409 | Gas Turbine & Jet Propulsion | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 6 |  | **B. Elective (any one of the following)** | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  | ME 411 | Finite Element Analysis | - | - | - | - | - | - | - |
|  | HS401 | Technical Aptitute | - | - | - | - | - | - | - |
|  | BM 449 | Entrepreneurship Development | - | - | - | - | - | - | - |
|  |  | **C. Practicals / Sessionals** |  |  |  |  |  |  |  |
| 7 | ME 451 | CAD Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 8 | ME 453 | RAC Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 9 | PT 401 | Training Seminar | 2 | 0 |  | 3 | 3 | 60 | 40 |
| 10 | PE 402 | Project Stage­II | 3 | 0 |  | 6 |  | 60 | 40 |
|  |  | **Discipline & Co-Curricular Activities** |  |  |  |  |  |  |  |
| 11 | DC 401 | Discipline & Co-Curricular Activities – VII | 2 |  |  |  |  | 100 |  |
|  |  | **Total** | **28** | **18** | **2** | **10** |  |  |  |
|  |  | **Total Teaching Load** |  | **30** |  |  |  |  |  |

**Year: IV Semester: VIII**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | ME 402 | Computer Aided Manufacturing | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 2 | ME 404 | Power Plant Engg. | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 3 | ME 406 | Production Process – III | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 4 | ME 408 | Product Design and Development | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 5 |  | **B.Elective (any one of the following)** | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  | ME 410 | Facility Planning & Material Handling | - | - | - | - | - | - | - |
|  | ME 412 | Operation Management | - | - | - | - | - | - | - |
|  |  | **C. Practicals / Sessionals** |  |  |  |  |  |  |  |
| 6 | ME 452 | CAM Lab | 1 | 0 |  | 2 |  | 60 | 40 |
| 7 | ME 454 | Production Process – III Lab | 2 | 0 |  | 3 |  | 60 | 40 |
| 8 | SM 402 | Seminar | 2 | 0 |  | 3 |  | 60 | 40 |
| 9 | ME 460 | Product Design and Development | 2 |  |  |  |  | 60 | 40 |
|  |  | **Total** | **22** | **12** | **0** | **14** |  |  |  |
|  |  | **Total Teaching Load** |  | **26** |  |  |  |  |  |

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**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**Teaching and Examination Scheme for B.Tech. (Mechanical Engineering 4 Year Course)**

**For the students of Session 2011­12 batches**

**To be implemented in session 2014­15**

**Year: IV Semester: VII**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | ME 401 | Computer Aided Design | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 2 | ME 403 | Refrigeration and Air-Conditioning | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 3 | ME 405 | Operation Research | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 4 | ME 407 | Reliability and Maintenance | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 5 | ME 409 | Gas Turbine & Jet Propulsion | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 6 |  | **B. Elective (any one of the following)** | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  | ME 411 | Finite Element Analysis | - | - | - | - | - | - | - |
|  | ME 413 | Computational fluid Dynamics and Heat Transfer | - | - | - | - | - | - | - |
|  | BM 449 | Entrepreneurship Development | - | - | - | - | - | - | - |
|  |  | **C. Practicals / Sessionals** |  |  |  |  |  |  |  |
| 7 | ME 451 | CAD Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 8 | ME 453 | RAC Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 9 | PT 401 | Training Seminar | 2 | 0 |  | 3 | 3 | 60 | 40 |
| 10 | PE 401 | Project Stage­I | 2 | 0 |  | 3 |  | 60 | 40 |
|  |  | **Discipline and Co-Curricular Activities** |  |  |  |  |  |  |  |
| 11 | DC 401 | Discipline and Co- Curricular Activities – VII | 2 |  |  |  |  | 100 |  |
|  |  | **Total** | **28** | **18** | **2** | **10** |  |  |  |
|  |  | **Total Teaching Load** |  | **30** |  |  |  |  |  |

**Year: IV Semester: VIII**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | ME 402 | Computer Aided Manufacturing | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 2 | ME 404 | Power Plant Engg. | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 3 | ME 406 | Production Process – III | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 4 | ME 408 | Product Design and Development | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 5 |  | **B.Elective (any one of the following)** | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  | ME 410 | Facility Planning & Material Handling | - | - | - | - | - | - | - |
|  | ME 412 | Operation Management | - | - | - | - | - | - | - |
|  |  | **C. Practicals / Sessionals** |  |  |  |  |  |  |  |
| 6 | ME 452 | CAM Lab | 1 | 0 |  | 2 |  | 60 | 40 |
| 7 | ME 454 | Production Process – III Lab | 2 | 0 |  | 3 |  | 60 | 40 |
| 8 | SM 402 | Seminar | 2 | 0 |  | 3 |  | 60 | 40 |
| 9 | PE 402 | Project Stage­II | 3 | 0 |  | 6 |  | 60 | 40 |
|  |  | **Total** | **23** | **15** | **0** | **14** |  |  |  |
|  |  | **Total Teaching Load** |  | **29** |  |  |  |  |  |

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**TEACHING & EXAMINATION SCHEMES**

**M. Tech. (Energy Engineering)**

**M. Tech. (Manufacutring & Industrial Engineering)**

**Dual Degree (B.Tech – Mechanical Engg. + M. Tech. – Eneryg Engg)**

**Dual Degree (B.Tech – Mechanical Engg. + M. Tech – Manuf. & Indust. Engg)**

**DEPARTMENT OF**

**MECHANICAL ENGINEERING**

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**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**Teaching and Examination Scheme for M. Tech. FULL-TIME (Core) (Energy Engineering)**

**EFFECTIVE FROM ACADEMIC SESSION 2014-15**

**To be implemented in session 2014­15**

**Year I Semester – I**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | ME 501 | Design of Thermal Systems | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 2 | ME 503 | Electrical Power Generation, Transmission and Distribution | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 3 | ME 505 | Solar Power Engineering | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 4 | ME 509 | Alternative Fuels in I.C.Engines | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 5 |  | **B. Elective Paper** |  |  |  |  |  |  |  |
|  | ME 507 | Modeling & Planning of Energy System | 3 | - | - | - | - | - | - |
|  | HS 501 | Soft Skills Training I | 3 | - | - | - | - | - | - |
|  |  |  | 3 |  |  |  |  |  |  |
|  |  | **C.Discipline and Co-Curricular Activities** |  |  |  |  |  |  |  |
| 6 | DC 501 | Discipline and Co-Curricular Activities | 2 |  |  |  |  | 100 |  |
|  |  | **Total** | **17** |  |  |  |  |  |  |
|  |  | **Total Teaching Load** |  |  |  |  |  |  |  |

**Year I Semester – II**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | | **Course Name** | | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | | **A. Theory** | |  |  |  |  |  |  |  |
| 1 | ME 502 | | Design of Combustion System | | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 2 | ME 504 | | Wind Energy Utilization | | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 3 | ME 506 | | Pollution Control Technologies | | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 4 | ME 510 | | Energy Management | | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 5 |  | | **B. Elective Paper** | |  |  |  |  |  |  |  |
|  | ME 508 | | Energy Conservation (Electrical) | | - | - | - | - | - | - | - |
|  | HS-502 | | Soft Skills Training II | | - | - | - | - | - | - | - |
|  |  | |  | |  |  |  |  |  |  |  |
|  |  | | **C.Discipline and Co-Curricular Activities** | |  |  |  |  |  |  |  |
| 6 | DC 502 | | **Discipline and Co- Curricular Activities** | | 2 |  |  |  |  | 100 |  |
|  |  | | **Total** | | **17** |  |  |  |  |  |  |
|  |  | | **Total Teaching Load** | |  |  |  |  |  |  |  |
|  | |  | |

**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**Teaching and Examination Scheme for M. Tech. FULL-TIME (Core) (Energy Engineering)**

**EFFECTIVE FROM ACADEMIC SESSION 2014-15**

**To be implemented in session 2015­16**

**Year II Semester – III**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory Papers** |  |  |  |  |  |  |  |
| 1 | ME 601 | Energy Conservation Technologies | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  |  | **B. Elective Paper** |  |  |  |  |  |  |  |
| 2 | ME 603 | Direct EnergyConversion | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  | HS-601 | Soft Skills Training III |  |  |  |  |  |  |  |
|  |  | **B. Practical & Sessional:** |  |  |  |  |  |  |  |
| 3 | ME 651 | Energy Engineering Lab | 2 | 0 |  | 3 |  | 60 | 40 |
| 4 | ME 653 | Seminar | 5 | 0 |  | 9 | - | 60 | 40 |
|  |  | **C.Discipline and Co-Curricular Activities** |  |  |  |  |  |  |  |
| **5** | DC 601 | **Discipline and Co- Curricular Activities** | 2 |  |  |  |  | 100 |  |
|  |  | **Total** | **15** | **6** | **0** | **12** |  |  |  |
|  |  | **Total Teaching Load** |  | **18** |  |  |  |  |  |

**Year II Semester – IV**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Practical & Sessional:** |  |  |  |  |  |  |  |
| 1 | DI 602 | M. Tech. Dissertation / Thesis | 16 | 0 | 0 | 18 |  | 60 | 40 |
|  |  | **Total** | **16** | **0** | **0** | **18** |  |  |  |
|  |  | **Total Teaching Load** |  | **0** |  |  |  |  |  |

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**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**Teaching and Examination Scheme for M. Tech. FULL-TIME (Core) (Manufacturing and Industrial Engineering)**

**EFFECTIVE FROM ACADEMIC SESSION 2014-15**

**To be implemented in session 2014­15**

**Year I Semester – I**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory Papers** |  |  |  |  |  |  |  |
| 1 | ME 511 | Advanced Manufacturing Process | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 2 | ME 515 | Quality Engineering And Management | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 3 | ME 517 | Reliability And Failure Analysis | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 4 | ME 519 | CAD/CAM/CIM | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 5 |  | **B. Elective Paper** | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  | ME 513 | Metal Forming Analysis & Technology | - |  |  |  |  |  |  |
|  | HS 501 | Soft Skills Training I | - |  |  |  |  |  |  |
|  |  | **C.Discipline and Co-Curricular Activities** |  |  |  |  |  |  |  |
| **6** | DC 601 | **Discipline and Co- Curricular Activities** | 2 |  |  |  |  | 100 |  |
|  |  | **Total** | **17** | **15** | **0** |  | **15** |  |  |
|  |  | **Total Teaching Load** |  | **15** |  |  |  |  |  |

**Year I Semester – II**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory Papers** |  |  |  |  |  |  |  |
| 1 | ME 512 | Engineering Economics & Accounting | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 2 | ME 514 | Tool And Cutter Design | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 3 | ME 516 | Manufacturing Management | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 4 | ME 520 | Supply Chain Management | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 5 |  | **B. Elective Paper** | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  | ME 518 | Industrial Automation | - |  |  |  |  |  |  |
|  | HS 502 | Soft Skills Training II | - |  |  |  |  |  |  |
|  |  | **C.Discipline and Co-Curricular Activities** |  |  |  |  |  |  |  |
| **6** | DC 502 | **Discipline and Co- Curricular Activities** | 2 |  |  |  |  | 100 |  |
|  |  | **Total** | **17** | **15** | **0** |  | **15** |  |  |
|  |  | **Total Teaching Load** |  | **15** |  |  |  |  |  |

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**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**Teaching and Examination Scheme for M. Tech. FULL-TIME (Core) (Manufacturing and Industrial Engineering)**

**EFFECTIVE FROM ACADEMIC SESSION 2014-15**

**To be implemented in session 2015­16**

**Year II Semester – III**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory Papers** |  |  |  |  |  |  |  |
| 1 | ME 605 | Machine Tool Design | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 2 |  | **B. Elective Paper** | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  | ME 607 | Research Methodology |  |  |  |  |  |  |  |
| 3 |  | **B. Practical & Sessional:** |  |  |  |  |  |  |  |
| 4 | ME 651 | Energy Engineering Lab | 2 | 0 |  | 3 |  | 60 | 40 |
|  | ME 653 | Seminar | 5 | 0 |  | 9 | - | 60 | 40 |
|  |  | **Total** | **13** | **6** | **0** | **12** | **15** |  |  |
|  |  | **Total Teaching Load** |  | **18** |  |  |  |  |  |

**Year II Semester – IV**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Practical & Sessional:** |  |  |  |  |  |  |  |
| 1 | DI 602 | M. Tech. Dissertation / Thesis | 16 | 0 | 0 | 0 |  | 60 | 40 |
|  |  | **Total** | **16** | **0** | **0** | **0** |  |  |  |
|  |  | **Total Teaching Load** |  | **18** |  |  |  |  |  |

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**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**Teaching and Examination Scheme for Full-Time Dual Degree (B. Tech Mechanical Engineering + M. Tech. Manufacturing and Industrial Engineering) (5 Year Course)**

**To be implemented in session 2014­15**

**Year: IV Semester: VII**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | ME 401 | Computer Aided Design | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 2 | ME 403 | Refrigeration and Air-Conditioning | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 3 | ME 405 | Operation Research | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 4 | ME 407 | Reliability and Maintenance | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 5 | ME 409 | Gas Turbine & Jet Propulsion | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 6 |  | **B. Elective (any one of the following)** | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  | ME 411 | Finite Element Analysis | - | - | - | - | - | - | - |
|  | ME 413 | Computational fluid Dynamics and Heat Transfer | - | - | - | - | - | - | - |
|  | BM 449 | Entrepreneurship Development | - | - | - | - | - | - | - |
|  | ME 511 | Advanced Manufacturing Process |  |  |  |  |  |  |  |
|  |  | **C. Practicals / Sessionals** |  |  |  |  |  |  |  |
| 7 | ME 451 | CAD Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 8 | ME 453 | RAC Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 9 | PT 401 | Training Seminar | 2 | 0 |  | 3 | 3 | 60 | 40 |
| 10 | PE 401 | Project Stage­I | 2 | 0 |  | 3 |  | 60 | 40 |
|  |  | **Discipline and Co- Curricular Activities** |  |  |  |  |  |  |  |
| 11 | DC 401 | Discipline and Co- Curricular Activities – VII | 2 |  |  |  |  | 100 |  |
|  |  | **Total** | **28** | **18** | **2** | **10** |  |  |  |
|  |  | **Total Teaching Load** |  | **30** |  |  |  |  |  |

**Year: IV Semester: VIII**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | ME 402 | Computer Aided Manufacturing | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 2 | ME 404 | Power Plant Engg. | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 3 | ME 406 | Production Process – III | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 4 | ME 408 | Product Design and Development | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 5 |  | **B.Elective (any one of the following)** | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  | ME 410 | Facility Planning & Material Handling | - | - | - | - | - | - | - |
|  | ME 412 | Operation Management | - | - | - | - | - | - | - |
|  | ME 512 | Engineering Economics & Accounting |  |  |  |  |  |  |  |
|  |  | **C. Practicals / Sessionals** |  |  |  |  |  |  |  |
| 6 | ME 452 | CAM Lab | 1 | 0 |  | 2 |  | 60 | 40 |
| 7 | ME 454 | Production Process – III Lab | 2 | 0 |  | 3 |  | 60 | 40 |
| 8 | SM 402 | Seminar | 2 | 0 |  | 3 |  | 60 | 40 |
| 9 | PE 402 | Project Stage­II | 3 | 0 |  | 6 |  | 60 | 40 |
|  |  | **Total** | **23** | **15** | **0** | **14** |  |  |  |
|  |  | **Total Teaching Load** |  | **29** |  |  |  |  |  |

**Year: IV Semester: IX Summer**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | ME 518 | Industrial Automation | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 2 | ME 520 | Supply Chain Management | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 3 | ME 514 | Tool And Cutter Design | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  |  | **Total** | **9** | **9** | **0** | **0** |  |  |  |
|  |  | **Total Teaching Load** |  | **9** |  |  |  |  |  |



**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**Teaching and Examination Scheme for Full-Time Dual Degree (B. Tech Mechanical Engineering + M. Tech. Manufacturing and Industrial Engineering) (5 Year Course)**

**For students of Session 2015-16 batches**

**Year: V Semester: IX REGULAR**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory Papers** |  |  |  |  |  |  |  |
| 1 | ME 519 | CAD/CAM/CIM | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 2 | ME 515 | Quality Engineering And Management | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 3 | ME 517 | Reliability And Failure Analysis | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 4 | ME 605 | Machine Tool Design | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 5 | ME 607 | Research Methodologies | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 6 | ME 516 | Manufacturing Management | 3 | 3 | 0 |  |  |  |  |
| 7 |  | **B. Elective paper** | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  | ME 513 | Metal Forming Analysis & Technology | - | - | - | - | - | - | - |
|  | HS 502 | Soft Skills Training II | - | - | - | - | - | - | - |
|  |  | **C. Practical & Sessional:** |  |  |  |  |  |  |  |
| 8 | ME 653 | Advanced Manufacturing Lab | 2 | 0 |  | 3 |  | 60 | 40 |
| 9 | ME 653 | Seminar | 5 | 0 |  | 9 |  | 60 | 40 |
|  |  | **D. Discipline and Co-Curricular Activities** |  |  |  |  |  |  |  |
| **10** | **DC 601** | **Discipline and Co-Curricular Activities** | **2** |  |  |  |  | **100** |  |
|  |  | **Total** | **30** | **21** | **0** | **12** |  |  |  |
|  |  | **Total Teaching Load** |  | **43** |  |  |  |  |  |

**Year: V Semester: X**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Practical & Sessional:** |  |  |  |  |  |  |  |
| 1 | DI 602 | M. Tech. Dissertation / Thesis | 16 | 0 | 0 | 18 |  | 60 | 40 |
|  |  | **Total** | **16** | **0** | **0** | **18** |  |  |  |
|  |  | **Total Teaching Load** |  | **18** |  |  |  |  |  |



**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**Teaching and Examination Scheme for Full-Time Dual Degree (B. Tech Mechanical Engineering + M. Tech. Energy Engineering) (5 Year Course)**

**For students of Session 2014-15 batches**

**Year: IV Semester: VII**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | ME 401 | Computer Aided Desigining | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 2 | ME 403 | Refrigeration and Air-Conditioning | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 3 | ME 405 | Operation Research | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 4 | ME 407 | Reliability and Maintenance | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 5 | ME 409 | Gas turbine & jet propulsion | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 6 |  | **B. Elective III (any one of the following)** | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  | ME 411 | Finite Element Analysis | - | - | - | - | - | - | - |
|  | BM 449 | Entrepreneurship Development | - | - | - | - | - | - | - |
|  | ME 401 | Technical Aptitude | - | - | - | - | - | - | - |
| 7 | ME 501 | Design of Thermal Systems | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  |  | **C . Practicals / Sessionals** |  |  |  |  |  |  |  |
| 8 | ME 451 | CAD lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 9 | ME 453 | RAC Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 10 | PT 401 | Training Seminar | 2 | 0 |  | 3 | 3 | 60 | 40 |
| 11 | PE 401 | Major Project (Stage I) | 2 | 0 |  | 3 | 3 | 60 | 40 |
|  |  | **D. Discipline and Co- Curricular Activities** |  |  |  |  |  |  |  |
| 12 | DC 401 | Discipline and Co- Curricular Activities - VII | 2 |  |  |  |  | 100 |  |
|  |  | **Total** | **31** | **21** | **2** | **10** | **33** |  |  |
|  |  | **Total Teaching Load** |  | **33** |  |  |  |  |  |



**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**Teaching and Examination Scheme for Full-Time Dual Degree (B. Tech Mechanical Engineering + M. Tech. Energy Engineering) (5 Year Course)**

**For students of Session 2014-15 batches**

**Year: IV Semester: VIII**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | ME 402 | Computer Aided Manufacturing | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 2 | ME 404 | Power Plant Engg. | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 3 | ME 406 | Production Process – III | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 4 | ME 408 | Product Design and Development | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 5 |  | **B.Elective (any one of the following)** | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  | ME 410 | Facility Planning & Material Handling | - | - | - | - | - | - | - |
|  | ME 412 | Operation Management | - | - | - | - | - | - | - |
| 6 | ME 502 | Design of combustion system | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  |  | **C. Practicals / Sessionals** |  |  |  |  |  |  |  |
| 7 | ME 452 | CAM Lab | 1 | 0 |  | 2 |  | 60 | 40 |
| 8 | ME 454 | Production Process – III Lab | 2 | 0 |  | 3 |  | 60 | 40 |
| 9 | SM 402 | Seminar | 2 | 0 |  | 3 |  | 60 | 40 |
| 10 | PE 402 | Major Project | 3 | 0 |  | 6 |  | 60 | 40 |
|  |  | **D. Discipline and Co-Curricular Activities** |  |  |  |  |  |  |  |
| 11 | DC 402 | Discipline and Co-Curricular Activities – VIII | 2 |  |  |  |  | 100 |  |
|  |  | **Total** | **28** | **18** | **0** | **14** |  |  |  |
|  |  | **Total Teaching Load** |  | **32** |  |  |  |  |  |

**Year: IV Semester: IX Summer**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | ME 508 | Energy Conservation (Electrical) | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 2 | ME 510 | Energy Management | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 3 | ME 504 | Wind Energy Utilization | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  |  | **Total** | **9** | **9** | **0** | **0** |  |  |  |
|  |  | **Total Teaching Load** |  | **9** |  |  |  |  |  |



**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**Teaching and Examination Scheme for Full-Time Dual Degree (B. Tech Mechanical Engineering + M. Tech. Energy Engineering) (5 Year Course)**

**For stude nts of Session 2015-16 batches**

**Year: V Semester: IX REGULAR**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory Papers** |  |  |  |  |  |  |  |
| 1 | ME 503 | Electrical Power Generation, Transmission and Distribution | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 2 | ME 505 | Solar Power Engineering | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 3 | ME 507 | Modeling & Planning of Energy System | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 4 | ME 509 | Alternative Fuels in I.C.Engines | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 5 | ME 603 | Direct Energy Conversion | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 6 | ME 506 | Pollution Control Technologies | 3 | 3 | 0 |  |  | 30 | 70 |
| 7 |  | **B.Elective paper** | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  | ME 601 | Energy Conservation Technologies | - | - | - | - | - | - | - |
|  | HS 502 | Soft Skills Training II | - | - | - | - | - | - | - |
|  |  | **C. Practical & Sessional:** |  |  |  |  |  |  |  |
| 8 | ME 651 | Energy Engineering Lab | 2 | 0 |  | 3 |  | 60 | 40 |
| 9 | ME 653 | Seminar | 5 | 0 |  | 9 |  | 60 | 40 |
|  |  | **D. Discipline and Co- Curricular Activities** |  |  |  |  |  |  |  |
| 10 | DC 601 | Discipline and Co- Curricular Activities | **2** |  |  |  |  | **100** |  |
|  |  | **Total** | **30** | **21** | **0** | **12** |  |  |  |
|  |  | **Total Teaching Load** |  | **43** |  |  |  |  |  |

**Year: V Semester: X**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Practical & Sessional:** |  |  |  |  |  |  |  |
| 1 | DI 602 | M. Tech. Dissertation / Thesis | 16 | 0 | 0 | 0 |  | 60 | 40 |
|  |  | **Total** | **16** | **0** | **0** | **0** |  |  |  |
|  |  | **Total Teaching Load** |  | **18** |  |  |  |  |  |

|  |  |
| --- | --- |
|  |  |

**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**LIST OF COURSES OFFERED**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course  Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam  Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
| 1 | ME 201 | Fundamentals of Thermodynamics | 4 | 3 | 1 | - | 3 | 30 | 70 |
| 2 | ME 202 | Machine Design | 3 | 3 | - |  | 3 | 30 | 70 |
| 3 | ME 203 | Mechanics of Solid | 4 | 3 | 1 | - | 3 | 30 | 70 |
| 4 | ME 204 | Industrial Engg. – I | 3 | 3 | - |  | 3 | 30 | 70 |
| 5 | ME 205 | Material Science | 3 | 3 | - | - | 3 | 30 | 70 |
| 6 | ME 206 | Production Process – I | 3 | 3 | - |  | 3 | 30 | 70 |
| 7 | ME 207 | Elements of Machine Design | 4 | 3 | 1 | - | 3 | 30 | 70 |
| 8 | ME 208 | Fluid Mechanics | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 9 | ME 209 | Object Oriented Programming | 3 | 3 | - | - | 3 | 30 | 70 |
| 10 | ME 210 | Internal Combustion Engines | 3 | 3 | - |  | 3 | 30 | 70 |
| 11 | ME 212 | Instrumentation & Control | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 12 | ME 251 | Thermal Engg. Lab. – I | 1 | - | - | 2 | 3 | 60 | 40 |
| 13 | ME 252 | Machine Design Lab. | 2 | 0 |  | 3 | 3 | 60 | 40 |
| 14 | ME 253 | Strength of Material Lab. | 1 | - | - | 2 | 3 | 60 | 40 |
| 15 | ME 254 | Production Process – I Lab | 2 | 0 |  | 3 | 3 | 60 | 40 |
| 16 | ME 255 | Material Science Lab. | 1 | -- | - | 2 | 3 | 60 | 40 |
| 17 | ME 256 | Fluid Mechanics Lab. | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 18 | ME 257 | Machine Drawing Lab | 2 | - | - | 3 | 3 | 60 | 40 |
| 19 | ME 258 | Internal Combustion Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 20 | ME 301 | Production Process – II | 3 | 3 | - |  | 3 | 30 | 70 |
| 21 | ME 302 | Dynamics of Machine – II | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 22 | ME 303 | Fluid Machines | 3 | 3 | - |  | 3 | 30 | 70 |
| 23 | ME 304 | Heat & Mass Transfer | 3 | 3 | - |  | 3 | 30 | 70 |
| 24 | ME 305 | Dynamics of Machine – I | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 25 | ME 306 | Steam Turbine and Steam Power plant | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 26 | ME 307 | Fundamentals of Aerodynamics | 3 | 3 | - |  | 3 | 30 | 70 |
| 27 | ME 308 | Automobile Engg. | 3 | 3 | - |  | 3 | 30 | 70 |
| 28 | ME 309 | Mechanical Vibration & Noise Engg. | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 29 | ME 310 | Industrial Engg. – II | 3 | 3 | - |  | 3 | 30 | 70 |
| 30 | ME 311 | Mechatronics | 3 | 3 | - |  | 3 | 30 | 70 |
| 31 | ME 312 | Computational fluid Dynamics and Heat Transfer | 3 | 3 | - |  | 3 | 30 | 70 |
| 32 | ME 314 | Numerical Methods and Applied Statistics | 3 | 3 | 1 |  | 3 | 30 | 70 |
| 33 | ME 351 | Production Process Lab – II | 2 | 0 |  | 3 | 3 | 60 | 40 |
| 34 | ME 352 | Dynamics of Machine – II Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 35 | ME 353 | Fluid Machine Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 36 | ME 354 | Heat & Mass Transfer Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 37 | ME 355 | Dynamics of Machine Lab – I | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 38 | ME 356 | Automobile Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 39 | ME 357 | Mechanical Vibration Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 40 | ME 358 | Industrial Engg. Lab. | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 41 | ME 401 | Computer Aided Design | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 42 | ME 402 | Computer Aided Manufacturing | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 43 | ME 403 | Refrigeration and Air-Conditioning | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 44 | ME 404 | Power Plant Engg. | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 45 | ME 405 | Operation Research | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 46 | ME 406 | Production Process – III | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 47 | ME 407 | Reliability and Maintenance | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 48 | ME 408 | Product Design and Development | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 49 | ME 409 | Gas Turbine & Jet Propulsion | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 50 | ME410 | Facility Planning & Material Handling | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 51 | ME 411 | Finite Element Analysis | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 52 | ME 412 | Operation Management | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 52 | ME – 415 | Fundamental Of Robotics | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| 53 | ME 451 | CAD Lab | 1 | 0 |  | 2 |  | 60 | 40 |
| 54 | ME 452 | CAM Lab | 2 | 0 |  | 3 |  | 60 | 40 |
| 55 | ME 453 | RAC Lab | 1 | 0 |  | 2 |  | 60 | 40 |
| 56 | ME 454 | Production Process – III Lab | 2 | 0 |  | 3 |  | 60 | 40 |
| 57 | ME 501 | Design of Thermal Systems | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 58 | ME 502 | Design of Combustion System | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 59 | ME 503 | Electrical Power Generation, Transmission and Distribution | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 60 | ME 504 | Wind Energy Utilization | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 61 | ME 505 | Solar Power Engineering | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 62 | ME 506 | Pollution Control Technologies | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 63 | ME 507 | Modeling & Planning of Energy System | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 64 | ME 508 | Energy Conservation (Electrical) | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 65 | ME 509 | Alternative Fuels in I.C.Engines | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 66 | ME 510 | Energy Management | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 67 | ME 511 | Advanced Manufacturing Process | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 68 | ME 512 | Engineering Economics & Accounting | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 69 | ME 513 | Metal Forming Analysis & Technology | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 70 | ME 514 | Tool And Cutter Design | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 71 | ME 515 | Quality Engineering And Management | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 72 | ME 516 | Manufacturing Management | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 73 | ME 517 | Reliability & Failure Analysis | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 74 | ME 518 | Industrial Automation | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 75 | ME 519 | CAD/CAM/CIM | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 76 | ME 520 | Supply Chain Management | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 77 | ME 552 | Automobile design lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| 78 | ME 601 | Energy Conservation Technologies | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 79 | ME 603 | Direct Energy Conversion | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 80 | ME 605 | Machine Tool Design | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 81 | ME 607 | Research Methodology | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 82 | ME 651 | Energy Engineering Lab | 3 | 0 |  | 3 |  | 60 | 40 |
| 83 | ME 653 | Advanced Manufacturing Lab | 3 | 0 |  | 3 |  | 60 | 40 |
| 84 | ME 655 | Seminar | 5 | 0 |  | 3 |  | 60 | 40 |
| 85 | MA 205 | Advance Engg. Mathematics-III | 4 | 3 | 1 | - | 3 | 30 | 70 |
| 86 | BM 449 | Entrepreneurship Development | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 87 | PE 401 | Major Project (Stage I) | 2 | 0 |  | 3 |  | 60 | 40 |
| 88 | PE 402 | Major Project(stage 2) | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| 89 | PT 401 | Training Seminar | 2 | 0 |  | 3 |  | 60 | 40 |
| 90 | SM 402 | B. Tech Seminar | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| 91 | DC 201 | Discipline and Co- Curricular Activities – III | 2 |  |  |  |  | 100 |  |
| 92 | DC 202 | Discipline and Co- Curricular Activities – IV | 2 |  |  |  |  | 100 |  |
| 93 | DC 301 | Discipline and Co- Curricular Activities – V | 2 |  |  |  |  | 100 |  |
| 94 | DC302 | Discipline and Co- Curricular Activities – VI | 2 |  |  |  |  | 100 |  |
| 95 | DC401 | Discipline and Co- Curricular Activities – VII | 2 |  |  |  |  | 100 |  |
| 96 | DC402 | Discipline and Co-Curricular Activities – VIII | 2 |  |  |  |  | 100 |  |
| 97 | DI 602 | M. Tech. Dissertation / Thesis | 16 | 0 | 0 | 0 |  | 60 | 40 |
| 98 | EE205 | Electro Mechanical Energy Conversion ­­-I | 3 | 3 |  |  | 3 | 30 | 70 |
| 99 | EE204 | Electro Mechanical Energy Conversion ­­-II | 3 | 3 |  |  | 3 | 30 | 70 |
| 100 | EC317 | Principle of Communication Systems | 3 | 3 |  |  | 3 | 30 | 70 |
| 101 | HS201 | Communication Skill | 3 | 3 |  |  | 3 | 30 | 70 |
| 102 | HS202 | Cognitive Skill | 3 | 3 |  |  | 3 | 30 | 70 |
| 103 | HS301 | Verbal Non-Verbal Reasoning | 3 | 3 |  |  | 3 | 30 | 70 |
| 104 | HS302 | Employability Skills-IV:Technical Writing | 3 | 3 |  |  | 3 | 30 | 70 |
| 105 | HS401 | Technical Aptitude | 3 | 3 |  |  | 3 | 30 | 70 |
| 106 | DC501 | Discipline and Co-Curricular Activities – VIII | 2 |  |  |  |  | 100 |  |
| 107 | DC502 | Discipline and Co-Curricular Activities – VIII | 2 |  |  |  |  | 100 |  |
| 108 | HS 201 | Communication Skill | 3 | 3 |  |  | 3 | 30 | 70 |
| 109 | HS 202 | Cognitive Skill | 3 | 3 |  |  | 3 | 30 | 70 |
| 110 | HS 301 | Verbal Non-Verbal Reasoning | 3 | 3 |  |  | 3 | 30 | 70 |
| 111 | HS 302 | Employability Skills-IV:Technical Writing | 3 | 3 |  |  | 3 | 30 | 70 |
| 112 | HS 401 | Technical Aptitute | 3 | 3 |  |  | 3 | 30 | 70 |
| 113 | HS 501 | Soft Skills Training I | 3 | 3 |  |  | 3 | 30 | 70 |
| 114 | HS-502 | Soft Skills Training II | 3 | 3 |  |  | 3 | 30 | 70 |
| 115 | HS-601 | Soft Skills Training III | 3 | 3 |  |  | 3 | 30 | 70 |

**ME 201 FUNDAMENTALS OF THERMODYNAMICS C (L, T, P) = 4 (3, 1, 0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| **I** | Basic Concepts and Properties of Pure Substances: System, Properties, State and equilibrium, Processes and cycles, Temperature and pressure, Energy and Environment, Work and heat. Properties of Pure Substance: Definition and laws of ideal gas, phases of pure substances & phase charge processes, property diagrams for phase change processes, Property tables for different state of liquid and vapour, Internal energy, Enthalpy and specific heats of ideal gas, solids and liquids . | 7 |
| **II** | Laws of Thermodynamics: Zeroth law of thermodynamics, temperature scale, First law of thermodynamics, steady flow energy equation, applications of steady flow energy equation, limitations of first law of thermodynamics, second law of thermodynamics , heat engine, Carnot cycle, absolute thermodynamics temperature scale, entropy, change of entropy for different process, equivalence of Kelvin-Planck and Clausius statement, Clausius inequality, second law efficiency and third law of thermodynamics. | 7 |
| **III** | Availability and Thermodynamic Relations: Available and unavailable energy, availability of steady flow and non-flow system. Helmholtz and Gibb’s function, important mathematical relations, Maxwell relations, T-ds relations, Joule-Thomson coefficient, clausius-claperyon equation. | 7 |
| **IV** | Gas Power Cycle: Otto cycle, Diesel cycle, dual cycle, Stirling cycle, Ericsson cycle, Atkinson cycle, Brayton cycle, mean effective pressure and efficiencies, four stroke and two stroke petrol and diesel engine, experimental determination of IHP,BHP and volumetric efficiency. | 7 |
| **V** | Vapor Power Cycle: Rankine cycle, Reheat cycle, Regeneration cycle, co-generation cycle, binary vapor and trinary vapour power cycle. Calculation at efficiency, work ratio, back-work ratio, specific steam consumption rate, heat consumptions rate for vapor power cycle, vapor compression refrigeration cycle and properties of refrigerants. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Engineering Thermodynamics, P.K.Nag, Tata McGraw Hill.
2. Engineering Thermodynamics, C.P.Gupta, Rajendra Prakash Nemi Chand & Bros.
3. Thermal Engineering, Mathur & Mehta.

**ME 202 MACHINE DESIGN C (L, T, P) = 3(3, 0, 0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Contents of the Subject** | **Hours** |
| **I** | Fatigue Considerations in Design: Variable load, loading pattern, Endurance stresses, influence of size, surface finite, notch sensitivity & stress concentration, Goodman line, soderberg, designof machine members subjected to combined, steady and alternating stresses. Design of finite life. Design of shafts under Variable Stresses. | 7 |
| **II** | Design of machine elements ; Pin cotter and keyed joints, Design of screw fastening. Design of Helical compression, torsional and leaf springs. Springs under Variable Stresses. Design of cylinder; Thin and Thick | 7 |
| **III** | Design of members in Torsion: Shafts and Shaft couplings. Design of weldments, welds subjected to eccentric loading and combined stresses. Design of members which are curved like crane hook, body of C-clamp, machine frame etc., Power screws like lead screw, Screw Jack. | 7 |
| **IV** | Design of components like crank shafts and connecting rod. Design of Gear teeth, lewis and Buckkhingam equations; wear and Dynamic load considerations, design and force analysis of spur, helical, beval and worm analysis of spur, helical, bevel and worm gears. Bearing reactions due to gear tooth forces, Detailed design of fixed ratio gear boxes. | 6 |
| **V** | Design of sliding & journal bearing: method of lubrication, hydrodynamic, hydrostatic, boundary etc. Minimum film thickness and thermal equilibrium. Selection of anti-friction bearings for different loads and load cycle Mounting of the bearings. Methods of lubrication, selection of oil seals. | 7 |
|  | **Total** | **34** |

**List of Recommended Books:**

* Elements of Machine Design, N.C.Pandya & C.S.Shah, Charotar Book Stall, Anand.
* Design of Machine Elements; V.B.Bhandari, Tata McGraw Hill Publishing Co. Ltd.
* 'Mechanical Machine Design; R.C.Bahl & V.K.Goyal, Standard Publishing Distributors, Delhi
* 'Mechanical Engineering Design; J.E.Shigley,McGraw Hill Book Co.
* Machine Design; K.K.Puraja, B.L.Juneja & N.C.Bhandari, Dhanpat Rai & Sons, Delhi

**ME 203 MECHANICS OF SOLID C (L, T, P) = 4(3, 1, 0)**

|  |  |  |
| --- | --- | --- |
| **Unit** | **Course Contents** | **Hours** |
| **I** | **Stress and Strain:** Tension, compression, shearing stress and strain: Poission's ratio; Stress - strain relationship, Hooke's law; Elastic constants and their relations for a isotropic hookean material, anisotropy and orthotropy, thermal stresses, composite bars; simple elastic, plastic and visco-elastic behaviour of common materials in tension and compression test, stress - strain curve. Concept of factor of safety and permissible stress. Bolt, pin, cotter, key etc. subjected to direct stresses. Conditions for equilibrium. Concept of free body diagram; introduction to mechanics of deformable bodies. | 7 |
| **II** | **Members subjected to flexural loads:** Theory of simple bending, bending moment and shear force diagrams for different types of static loading and support conditions on beam. Bending stresses, Section modulus and transverse shear stress distribution in circular, hollow circular, I, Box, T, angle sections etc. | 7 |
| **III** | **Transverse deflection of beams:** Relation between deflection, bending moment, transverse deflection of beams and shaft under static loading area moment method, direct integration method: method of superposition and conjugate beam method. Variational approach to determine deflection and stresses in beam. Application to beam, lever, leaf spring etc. | 7 |
| **IV** | **Principles planes, stresses & strains:** Members subjected to combined axial, bending & Torsional loads, maximum normal and shear stresses; Concept of equivalent bending and equivalent twisting moments: Mohr;s circle of stress and strain. **Theories of Elastic Features:** The necessity for a theory, different theories, significance and comparision, applications. | 7 |
| **V** | **Torsion & Stability of equilibrium:** Torsional shear stress in solid, hollow and stepped circular shafts, angular deflection and power transmission capicity. Application to helical springs, shaft couplings.Instability and elatic stability. Long and short coloumns, ideal strut, Euler's formula for cripping load for columns of different ends, concept of equivalent length, ecentric loading, Rankine formulae and other empirical relations. Applications like connecting rod, piston rod, screw of screw-jack etc. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Mechanics of Solids: S.H. Crandall, N.C.Dahi & T.J.Lardner, McGraw Hill International Edition
2. Strength of Materials; G.H.Ryder, ELBS Publications Co., London
3. Element of Strength of Materials. J.P.Tinnoshnko & G.H.Young. Affiliated East West Press, New Delhi
4. Solid Mechanics , G.M.A.Kazmi, Tata McGraw Hill Publishing Co.Ltd., New Delhi
5. Machanics of Solids : Dr.Ashish Dutt Sharma, Vardhan Publication

**ME 204 INDUSTRIAL ENGINEERING - I C (L, T, P) = 3(3, 0, 0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| **I** | **Introduction To Management**: Management Theory and Functions: Evolution of management, scientific management, Contribution to scientific management: Reactions and criticisms of Taylor, Fayol, Mayo, Levels of 'Management Administration and Management, functions of management. Decision-making. | 7 |
| **II** | **Business Forms and Organization:** Forms of Business:(i)Single proprietorship (ii) Partnership (iii) Joint stock company (iv) Private Ltd- Companies and public limited companies Forming Joint Stock Companies (a) Registration (b) issue of Prospectus (c) Commencement Certificate (iv) co-operative Society choice of Business forms (v) State undertaking. Organization meaning. Types of organization; (i) Line organization (ii) Functional Organization (iii) Line Staff organization (iv) Line Staff Committee organization, span of control. | 7 |
| **III** | **Finance & Financial statements:**. Introduction, Needs of Finance, Kinds of Capital Sources of fixed capital, Shares - (i) Ordinary Shares (ii) Preference Shares. Borrow capital. Surplus profits. Sources of Working capital. Management of working capital. Financial Institutions. Introduction to Profit & Loss Statement, Balance Sheet, Financial ratio: Liquidity ratio, Profits investment ratio, equity ratio, inventory ratio. | 7 |
| **IV** | **Interest and Depreciation**: interest meaning, Compound interest. Annuities capital recovery Annuity present worth annuity sinking funds annuity compound Amount Annuity Nominal and effective rate of interest. Depreciation Meaning and causes. Need of Depreciation calculation, Methods of Depreciation. Straight line Methods. Sinking funds methods. Declining Balance Method, sum of years digits method (Syd Method). | 7 |
| **V** | **Labour relations and legislation**: Profit sharing, fringe benefits etc.Trade Unions. Methods of setting disputes (i) Collective bargaining (ii) Conciliation (iii) Mediation(iv) Arbitration industrial disputes in India, Machinery for setting disputes. Trade Disputes Acts. The factory Act 1944, payment of wages act. Workman’s compensationact. | 7 |
|  | **Total** | **35** |

**List of Recommended Books:**

1. Works Organisation & Management, Basu & Sahu, IBH
2. Modern Production Management, Buffa, Willey
3. Industrial Organisation & Management, Bethel, Alwater, Smith & Stachmax, McGraw Hill
4. Principles of Industrial Organisation, Kimbal & Kimbal, McGraw Hill
5. Principles of Industrial Management, Alford, Ronald Press

**ME 205 MATERIAL SCIENCE C (L, T, P) = 3(3, 0, 0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| **I** | **Engineering Materials:** Effects of alloying elements in steel. Low alloy steels. Stainless , Magnetic materials for high and low temperature service. Brasses and bronzes; Aluminum base alloys. Bearing Materials. | 7 |
| **II** | Atomic structure of METALS:Crystal structure, crystal lattice of (i) Body centred cubic (ii) Face centred cubic (iii) Closed packed hexagonal, crystallographic Notation of atomic planes and Directions (Miller Indices), polymorphism and allotropy, Crystal imperfection. | 7 |
| **III** | **Plastic Deformation of Metals and Alloys:** Mechanism of plastic deformation, role of dislocation; slip and twining. Elementary treatment theory of work hardening, Theories of recrystallation and grain growth. Elementary treatment of creep; Fatigue and fracture. | 7 |
| **IV** | **Phase and Phase Equilibrium:** Solidification of alloys, Phase Diagrams, relationship with structure and properties; Eutectic systems. Iron Carbon alloys, Iron-Carbon equilibrium diagram. | 7 |
| **V** | **Heat Treatment of Alloys:** Phase transformation in steel. 'S' Curves Detailed study of various heat treatment Processes- hardening, annealing and tempering, case hardening. Hardenability, Precipification hardening. Heat treatment Furnaces. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Material Science by I.P. Singh

2. Material Science by Narulla and Narulla

3. Material Science & Engineering by V. Raghavan. Pub. PHI

4. Engineering Materials by B.K.Agarwal. Pub. TMH

5.Material Science & Processes by S.K.Hazra; Chowdhary, Media Promotors & Publications Pvt. Ltd., Bombay

6. Engg. Metallurgy, Part - I by Raymond A. Higgins, ELBS

7. Heat Treatment Principles & Technology by T.V.Rajan, O.P. Sharma & Ashok Sharma

**ME 206 PRODUCTION PROCESSES - I C (L, T, P) = 3(3, 0, 0)**

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| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| **I** | Importance of manufacturing, economic and technological definition of Manufacturing, survey of manufacturing processes. **Foundry Technology:** Patterns practices: Types of patterns, allowances and material used for patterns, moulding materials, moulding sands, Moulding sands; properties and sand testing; grain fineness; moisture content, clay content and permeability test, core materials and core making, core print; core boxes, chaplets, gating system design. Moulding practices**:** Green, dry and loam sand moulding, pit and floor moulding; shell moulding; permanent moulding; carbon dioxide moulding. | 7 |
| **II** | **Casting practices:** Fundamental of metal casting, sand casting, Shell-Mould casting, mold casting (plaster and ceramic), investment casting, vacuum casting, Permanent mould casting, slush casting, pressure casting, die casting, centrifugal casting, continuous casting, squeeze casting, casting alloys, casting defects, design of casting, gating system design, and riser design. Melting furnaces-rotary, pit electric, tilting and cupola. | 7 |
| **III** | **Metal Joining Processes**: Principle of welding, soldering, brazing and adhesive bonding. Survey of welding and allied processes. Arc welding: power sources and consumables. Gas welding and cutting: Processes and equipments. Resistance welding: principle and equipments. Spot, projection and seam welding process. Atomic hydrogen, ultrasonic, plasma and laser beam welding, electron beam welding, and special welding processes e.g. TIG, MIG, friction and explosive welding, welding of C.I. and Al, welding defects. Electrodes and Electrode Coatings | 7 |
| **IV** | **Machine Tools:** Constructional, details and main operation of Center Lathes,. Capston and Turret Lathe: Shaper and Planner, Drilling and Boring machines, Milling machines, indexing methods. | 7 |
| **V** | **Powder Metallurgy:** Powder manufacturing, mechanical pulverization, sintering, Electrolytic Process, chemical reduction, atomization, properties of metal powders, compacting of powders sintering, advantages and applications of P/M. **Rapid Prototyping Operations:** Introduction, subtractive processes, additive processes, Virtual Prototyping and applications | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Production Technology by O.P.Khanna, Dhanpat Rai Publications, New Delhi
2. Workshop Technology, Vol. I by S.K. Hazra Choudhary and A.K. Hazra Choudhary Media Promotors & Publishers Pvt. Ltd., Bombay
3. Production technology by P.C.Sharma S.Chand & Company Ltd, New Delhi
4. Manufacturing process by Begeman
5. Manufacturing Processes & Material: I.E.Doyle,Carl Kayser, Schrade, Leech.
6. Manufacturing Processes, Schey.

**ME 207 ELEMENTS OF MACHINE DESIGN C (L, T, P) = 4(3, 1, 0)**

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| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| **I** | Materials: Properties and IS coding of various materials, Selection of material from properties and economic aspects. Manufacturing aspects in Design : Selection of manufacturing processes on the basis of design and economy, Influence of rate of production, standard size, Influence of limits, fits tolerances and surface finish. Change in the shape of the designed element to facilitate its production, Design of castings, working drawing. | 7 |
| **II** | Design for strength: Allowable stresses, detailed discussion on factor of safety (factor of ignorance): Stress concentration. Causes & mitigation. Introduction of various design considerations like strength, stiffness, weight, cost, space etc. Concept of fatigue failures. Design of machine elements subjected to direct stress, Pin, cotter and keyed joints, Design of screw fastening. | 7 |
| **III** | Design of members in Bending: Beams, levers and laminated springs. | 7 |
| **IV** | Design of members in torsion : Shafts and shaft couplings. | 7 |
| **V** | Design of shafts, brackets under combined stresses, Calculation of transverse & torsional deflections. Screw fasteners subjected to eccentric loading. | 7 |
|  | **Total** | **35** |

**List of Recommended Books:**

1. Elements of Machine Design, N.C.Pandya & C.S.Shah, Charotar Book Stall, Anand.
2. Design of Machine Elements; V.B.Bhandari, Tata McGraw Hill Publishing Co. Ltd.
3. 'Mechanical Machine Design; R.C.Bahl & V.K.Goyal, Standard Publishing Distributors, Delhi
4. 'Mechanical Engineering Design; J.E.Shigley,McGraw Hill Book Co.
5. Machine Design; K.K.Puraja, B.L.Juneja & N.C.Bhandari, Dhanpat Rai & Sons, Delhi

**ME 208 FLUID MECHANICS C (L, T, P) = 4(3, 1, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Basic Definitions and Fluid Properties ; Definition of Fluid, Incompressible and compressible fluids, Fluid as a continuum, Mass, Density, specific weight, relative density, specific volume, Bulk modulus, velocity of sound Ideal fluid Viscosity. Newtonian and Non - Newtonian fluid, Kinematic viscosity, Effect of temperature and pressure on viscosity, surface tension capillarity, vapour pressure and cavitation. Fluid Statics: General differential equation, Hydrostatics Manometry, Fluid forces on submerged surfaces. Curved surfaces, submerged bodies. Floating bodies. | 7 |
| **II** | Kinematics and conservation of Mass : Flow classifications. Fluid velocity and acceleration, streamlines and the stream function. Pathlines and streak lines. Deformation of a fluid element, vertIcity and circulation. Irrotational and Rotational flow. Flownet, Laplace equation. Conservation of mass and the continuity equation for three dimensions. Fluid Momentum: The Momentum theorem Applications of the momentum theorem Equation of motion, Euler’s equation of motion Integration of Euler’s equation of motion. Bernoulli’s equation. Applications of Bernoulli’s Pitot tube, Equation of motion for Viscous fluid, Navier Stoke’s equation. | 7 |
| **III** | Orifice discharging free, Jet, vena contracts, co-efficient of contraction, velocity and discharge, coefficient of resistance. Orifices and mouthpieces Nozzles and weires. Flow Through Pipes : Reynold’s experiment Darcy’s Weisback equation. Loss of head due to sudden enlargements, contraction, entrance, exit obstruction, bend, pipe fittings. Total and Hydraulic grandient lines, Flow through pipe line. Pipes in series, parallel Transmission of power through pipes. | 7 |
| **IV** | Laminar Flow: Simple solution of Navier Stokes equations. Hagen – Poiseuille flow. Plans Poiseuille flow and coutte flow. Turbulent Flow; Variation of friction factor with Reynold’s number. The Prandt Mixing length hypothesis applied to pipe flow, velocity distribution in smooth pipes, Rough pipes. The Universal pipe friction laws, Colebrook. White formula. Dimensional Analysis: Buckingham variables, Model Similitude, Force ratio, Reynolds, Froude’s Mach, Weber and Euler numbers and their applications. Undistorted model distorted model scale effect. | 7 |
| **V** | The Boundary Layer: Description of the boundary layer. Boundary Layer thickness boundary layer separation and control. The Prandtl boundary layer equation. Solution for laminar boundary layer. The momentum equation for the boundary layer. The flat plate in uniform free stream with no pressures gradients. Approximate momentum analysis laminar boundary Aerofoils Theory. Flow round a body ; Drag skin friction drag, pressure drag, combined skin friction & pressure drag (Profile drag) wave drag, lift induced drag. Flow past sphere & Cylinder. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Engineering Fluid Mechanics K.L.Kumar, Eurasia Publishing House (P) Ltd.
2. Fluid Mechanics & Machine, F.M.White, John Wiley & Sons
3. Fluid Mechnaics & Machine, A.K. Jain
4. Fluid Mechanics, V.L.Streeper, McGraw Hill
5. Fluid Machanics with Applications. S.K.Gupta V.Gupta, New Age Publications

**ME 209 OBJECT ORIENTED PROGRAMMING C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Introduction to Object Oriented Programming: Basic concepts: Class, Object, Method, Message passing, Inheritance, Encapsulation, Abstraction, Polymorphism. | 7 |
| **II** | Basics of C++ Environment: Variables; Operators; Functions; user defined, passing by reference, passing an array to the function, inline function, scope, overloading; Pointers: objects and lvalue, arrays and pointers, the new and delete operators, dynamic arrays, arrays of pointers and pointers to arrays, pointers to pointers and functions; Strings: String I/O, character functions in ctype.h, string functions in string.h. | 7 |
| **III** | Object oriented concepts using C++: Classes: Member functions, Friend functions, Constructors, Access functions, Private member functions, class destructor, static data and function members; Overloading: inline functions, this operator, overloading various types of operators, conversion operators; the String Class; Composition and Inheritance: Hierarchy and types of inheritance, protected class members, private versus protected access, virtual functions and polymorphism, virtual destructors, abstract base classes. | 7 |
| **IV** | Templates and Iterators: function and class templates, container classes, subclass templates, iterator classes; Libraries: standard C++ library, contents of a standard C headers, string streams, file processing: Files and streams classes, text files, binary files, classification of files, the standard template library. | 7 |
| **V** | Data Structures Using C++: Linked lists – Singly linked list, Doubly linked lists, Circularlists, Stacks and Queues priority Queues, Stacks, Queues. | 7 |
|  | **Total** | **35** |

**ME 210 INTERNAL COMBUSTION ENGINES C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Air Standard Cycles: Internal and external combustion engines; classification of I.C. Engines, Cycles of operation in four stroke and two stroke I.C. Engines, Wankel Engines, Assumptions made in air standard cycle; Otto cycle; diesel cycle, dual combustion cycle, comparison of Otto, diesel and dual combustion cycles; sterling and Ericsson cycles; air standard efficiency, specific work output, specific weight; work ratio; mean effective pressure; deviation of actual engine cycle from ideal cycle. Problems. Carburetion, fuel Injection and Ignition systems: Mixture requirements for various operating conditions in S.I. Engines; elementary carburetor, Requirements of a diesel injection system; types of inject systems; petrol injection, Requirements of ignition system; types of ignition systems ignition timing; spark plugs. Problems. | 7 |
| **II** | Combustion in I.C. Engines : S.I. engines; Ignition limits; stages of combustion in S.I. Engines; Ignition lag; velocity of flame propagation; detonation; effects of engine variables on detonation; theories of detonation; octane rating of fuels; pre-ignition; S.I. engine combustion chambers, Stages of combustion in C.I. Engines; delay period; variables affecting delay period; knock in C.I. engines, Cetane rating; C.I. engine combustion chambers. Lubrication and Cooling Systems: Functions of a lubricating system, Types of lubrication system; mist, wet sump and dry sump systems; properties of lubricating oil; SAE rating of lubricants, engine performance and lubrication, Necessity of engine cooling; disadvantages of overcooling; cooling systems; air-cooling, water cooling; radiators. | 7 |
| **III** | Engine Testing and Performance: Performance parameters: BHP, IHP, mechanical efficiency, brake mean effective pressure and indicative mean effective pressure, torque, volumetric efficiency; specific fuel consumption (BSFC, ISFC), thermal efficiency; heat balance; Basic engine measurements; fuel and air consumption, brake power, indicated power and friction power, heat lost to coolant and exhaust gases; performance curves. Problems. | 7 |
| **IV** | Air pollution from I.C. Engine and Its remedies: Pollutants from S.I. and C.I. Engines, Methods of emission control; alternative fuels for I.C. Engines; the current scenario on the pollution front. Rotary Compressors: Root and vane blowers; Static and total head values; Centrifugal compressors- Velocity diagrams, slip factor, ratio of compression, pressure coefficient, pre-whirl; Axial flow compressor- Degree of reaction, polytrophic efficiency, surging, choking and stalling, performance characteristics, Problems. | 7 |
| **V** | Gas Turbines: Brayton cycle; Components of a gas turbine plant; open and closed types of gas turbine plants; Optimum pressure ratio; Improvements of the basic gas turbine cycle; multi stage compression with inter-cooling; multi stage expansion with reheating between stages; exhaust gas heat exchanger, Applications of gas turbines. Problems. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Internal Combustion Engines –V. Ganesan, Pub.-Tata McGraw-Hill.

2. Gas Turbines - V. Ganesan, Pub.- Tata McGraw Hill.

3. Engineering fundamental of the I.C.Engine – Willard W. Pulkrabek Pub.-PHI,India

4. Internal Combustion Engines & Air pollution- Obert E.F, Pub.-Hopper & Row Pub., New York

5. Internal Combustion Engines Fundamentals- John B. Heywood, Pub.-McGraw Hill, New York

**ME 212 INSTRUMENTATION AND CONTROL C (L, T, P) = 4(3, 1, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | System configuration, basic characteristic, calibration, classification and performance characteristics of a instrumentation system, Specification and testing of dynamic response. Strain Measurement : Electric Strain Gauges - Types ; Selection and Installation, Strain gauge circuits; temperature compensation and calibration; Use of Strain Gauges on Rotating Shafts, Load Cells, Mechanical and Optical Strain Gauges. | 7 |
| **II** | Various Mechanical, Electro- Mechanical & Photoelectrical Sensors for sensing of Displacement, Velocity, Acceleration, Torque, Force, Temperature from Low to High Range, flow, level of fluid , pressure, angular speed, voltage, frequency and current. Introduction to Multi-Channel Data-Acquisition System, Measurement Pods, Interface Hardware, Data Analysis Software, Interfacing. | 7 |
| **III** | Concepts and examples of automatic control systems, systems by differential equations, transfer function, block diagram, open and feedback control systems, signal flow graphs & its constructions. Control System components, error sensing devices and servo motors. | 7 |
| **IV** | Control for mechanical systems & processes ; speed control system for steam/gas turbines. A constant tension ;reeling system, Electro-mechanical systems. Thermal systems, Pneumatic systems; Mathematical Models of physical systems, Feedback characteristics of Control Systems. Time response analysis; transient response analysis, time response specifications, steady state-error. | 7 |
| **V** | Concepts of stability, Routh- Hurwiz stability criterion, relative stability. The root locus technique, use of construction rules without any derivation. Frequency response analysis, Polar plots; stability in frequency domain, Bode / Logrithmic plots. Nyquist stability criterion. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Mechanical Measurements and Instrumentation, A.K. Sawhney, Puneet Sawhney, Dhanpat Rai
2. Mechanical Measurements, Thomas G. Backwith, N. Lewis Buck, Roy, D., Marangoni, Narosa Publishing House
3. Industrial Instrumentation and Control, S.K.Singh, Tata McGraw Hill
4. Control Systems Engineering; I.J.Nagrath & M.Gopal, Wilay Eastern Limited
5. Automatic Control Engineering; Raxen, McGraw Hill, International Edition

**ME 251 THERMAL ENGINEERING LAB-1 C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENTS**  1. Comparative study of four stroke diesel and petrol engines.  2. Comparative study of two stroke petrol and diesel engines.  3. Studies of fuel supply systems of diesel and petrol engines.  4. Study of cooling, lubrication and ignition system in diesel and petrol engines.  5. To study various types of Boilers and to study Boiler mounting and accessories.  6. To study various types of Dynamometers.  7. To study Multi Stage Air Compressors.  8. To find the BHP, Thermal efficiency of four stroke diesel engine.  9. To prepare a comparison sheet of various automobiles (4 Wheeler and 2 Wheeler). |

**ME 252 MACHINE DESIGN LAB C (L, T, P) = 2(0, 0, 3)**

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| **(PERFORM ANY SIX EXPERIMENTS)**  1. Selection of material & IS coding  2. Selecting fit & assigning tolerances  3. Examples of Production considerations.  **Problems on**   1. Knuckle & Cotter joints 2. Torque: Keyed joints & shaft couplings 3. Design of screw fastening 4. Bending: Beams, Levers etc. 5. Combined stresses: Shafts, brackets, eccentric loading |

**ME 253 STRENGTH OF MATERIAL LAB C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENTS**  1. Izod Impact testing.  2. Rockwell Hardness Testing.  3. Spring Testing  4. Column Testing for buckling  5. Torsion Testing  6. Tensile Testing  7. Compression Testing  8. Shear Testing  9. Brinell Hardness Testing  10. Bending Test on UTM.  11. Study of Fatigue Testing Machine. |

**ME 254 PRODUCTION PROCESS – I LAB C (L, T, P) = 2(0, 0, 3)**

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| **LIST OF EXPERIMENTS**  1. Study of lathe machine, lathe tools cutting speed, feed and depth of cut.  2. To perform step turning, knurling and chamfering on lathe machine as per drawing.  3. Taper turning by tailstock offset method as per drawing.  4. To cut metric thread as per drawing.  5. To perform square threading, drilling and taper turning by compound rest as per drawing.  6. To study shaper machine, its mechanism and calculate quick return ratio.  7. To prepare mould of a given pattern requiring core and to cast it in aluminium.  8. Moisture test and clay content test.  9. Strength Test (compressive, Tensile, Shear Transverse etc. in green and dry conditions) and Hardness Test (Mould and Core).  10. Permeability Test.  11. A.F.S. Sieve analysis Test. |

**ME 255 MATERIAL SCIENCE LAB C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENTS**  1. To study the Engineering Materials, significance and classifications.  2. Study of crystals structures, Study of Models BCC, FCC, HCP, stacking sequence, tetrahedral and Octahedral voids  3. To calculate the effective numbers of atoms, co-ordination no. packing factors, c/a ratio for BCC, FCC & HCP structures.  4. To prepare metallic samples for metallographic examination and to study the principle and construction of the Metallurgical Microscope.  5. Effect of carbon percentage on hardness of steel  6. Study of Phase Diagrams: concept of phase rule: Fe-C & Cu-Zn.  7. Study of Creep, Study of anistropy: Glass 'Fibre and Carbon' Fibre Composites.  9. Study of various types of fractures, Brittle fracture/ductile.  10. Study of Iron-Carbon Equilibrium Diagram and sketch the various structures present at room temperature. |

**ME 256 FLUID MECHANICS LAB**.  **C (L, T, P) = 1(0, 0, 2)**

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| **(PERFORM ANY SIX EXPERIMENTS)**  1. Determine Metacentric height of a given body.  2. Determine Cd, Cv & Cc for given orifice.  3. Determine flow rate of water by V-notch.  4. Determine velocity of water by pitot tube.  5. Verify Bernoulli’s theorem.  6. Determine flow rate of air by Venturi meter  7. Determine flow rate of air by orifice meter  8. Determine head loss of given length of pipe.  9. Determine flow rate of air by nozzle meter. |

**ME 257 MACHINE DRAWING LAB C (L, T, P) = 2(0, 0, 3)**

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| **(PERFORM ANY SIX EXPERIMENTS)**  1. Couplings: Pin-type flexible coupling etc.  2. I.C. Engine parts: connecting rod, crank shaft, etc.  3. Boiler Mountings: Steam stop valve/ feed check-valve/ safety valve /three way stop valve blow off cock,etc.  4. Machine Tool Parts: Shaper tool head, Lathe Tail Stock, Turret Tool Post, Turret Bar feeding Mechanism / Universal Dividing Head, Swivel Machine Vice.  5. Miscellaneous: Screw jack and drill-press vice  6. Free Hand Sketches: Pipes and Pipe fittings, clutches, bearings, bearing puller, valve gear mechanisms, machine arbor and cutter, universal dividing head, jigs and fixtures, Step less drive, sliding gear box. |

**ME 258 INTERNAL COMBUSTION LAB. C (L, T, P) = 1(0, 0, 2)**

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| **(LIST OF EXPERIMENT)**   1. To study the constructional details & working principles of two-stroke/ four stroke petrol engine. 2. To study the constructional detail & working of two-stroke/ four stroke diesel engine. 3. Analysis of exhaust gases from single cylinder/multi cylinder diesel/petrol engine by Orsat Apparatus. 4. To prepare heat balance sheet on multi-cylinder diesel engine/petrol engine. 5. To find the indicated horse power (IHP ) on multi-cylinder petrol engine/diesel engine by Morse Test. 6. To prepare variable speed performance test of a multi-cylinder/single cylinder petrol engine/diesel engine and prepare the curves (i) bhp, ihp, fhp, vs speed ( ii) volumetric efficiency & indicated specific fuel consumption vs speed. 7. To find fhp of a multi-cylinder diesel engine/petrol engine by Willian’s line method & by motoring method.   **NOTE:**   1. To perform constant speed performance test on a single cylinder/multi-cylinder diesel engine & draw curves of (i) bhp vs fuel rate, air rate and A/F and (ii) bhp vs mep, mech efficiency & sfc. 2. To measure CO & Hydrocarbons in the exhaust of 2- stroke / 4-stroke petrol engine. 3. To find intensity of smoke from a single cylinder / multi-cylinder diesel engine. 4. To draw the scavenging characteristic curves of single cylinder petrol engine. 5. To study the effects of secondary air flow on bhp, sfc, Mech. Efficiency & emission of a two-stroke petrol engine. |

**ME 260 PRODUCTION PROCESS – I LAB C (L, T, P) = (0, 0, 3)**

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| **(PERFORM ANY SIX EXPERIMENTS)**  1. Study of lathe machine, lathe tools cutting speed, feed and depth of cut.  2. To perform step turning, knurling and chamfering on lathe machine as per drawing.  3. Taper turning by tailstock offset method as per drawing.  4. To cut metric thread as per drawing.  5. To perform square threading, drilling and taper turning by compound rest as per drawing.  6. To study shaper machine, its mechanism and calculate quick return ratio.  7. To prepare mould of a given pattern requiring core and to cast it in aluminum.  8. Moisture test and clay content test.  9. Strength Test (compressive, Tensile, Shear Transverse etc. in green and dry conditions) and Hardness Test (Mould and Core).  10. Permeability Test.  11. A.F.S. Sieve analysis Test. |

**ME 261 MACHINE DRAWING LAB C (L, T, P) = (0, 0, 3)**

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| **(PERFORM ANY SIX EXPERIMENTS)**  1. Couplings: Pin-type flexible coupling etc.  2. I.C. Engine parts: connecting rod, crank shaft, etc.  3. Boiler Mountings: Steam stop valve/ feed check-valve/ safety valve /three way stop valve blow off cock,etc.  4. Machine Tool Parts: Shaper tool head, Lathe Tail Stock, Turret Tool Post, Turret Bar feeding Mechanism / Universal Dividing Head, Swivel Machine Vice.  5. Miscellaneous: Screw jack and drill-press vice  6. Free Hand Sketches: Pipes and Pipe fittings, clutches, bearings, bearing puller, valve gear mechanisms, machine arbor and cutter, universal dividing head, jigs and fixtures, Step less drive, sliding gear box. |

**ME 301 PRODUCTION PROCESS - II C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Jigs And Fixtures:-** Introduction, definition and difference; usefulness of jigs and fixtures; design considerations; materials used; principles and methods of location; clamping elements; jig bushes; drilling jigs; fixtures for milling turning, boring and welding; assembly fixtures; indexing devices; economics of jigs and fixtures; complete design of a jig and a fixtures; complete design of a jig and a fixtures. | 7 |
| **II** | **Plastic Technology:** Introduction, Classification of Plastics, Ingredients of Moulding compounds, General Properties of Plastics, Plastic part manufacturing processes such as compression moulding, transfer moulding, injection moulding, extrusion moulding, blow moulding, calendaring, thermoforming, slush moulding, laminating | 7 |
| **III** | **Precision Measurement :** Standards of linear measurements; linear and angular measurements; screw thread measurement; measurement of effective diameter, pitch and thread angles; Gear measurement, measurement of tooth profile, tooth thickness and pitch, Measurement of surface roughness. Quantitative methods of roughness measurements, Stylus and profilograph methods. **Precision Measuring Instruments:** Comparators types; working principles applications and limitations of various comparators; optical flat; autocollimator indicators, slip gauges, bevel protector. | 7 |
| **IV** | **Design Of Single Point Cutting Tools:** Introduction; functions of various tool angles; design of single point turning too]; parting tool; empirical determination of force components; optimum value of tool angles.. | 7 |
| **V** | **Design of Multipoint Cutting tool:** Introduction; angle of contact; force analysis; approach through dimensional analysis; force and power consumption; tooth forn1 and cutter design | 7 |
|  | **Total** | **35** |

**Reference Books:**

* 1. Manufacturing Science, Ghosh, A. and Mallik, A.K., Affiliated East West Press
  2. Modern Machining Processes, P.C.Pandey, H.S.Shah, TMH
  3. Machine Tool Design: N.K.Mehta, Tata McGraw Hill
  4. Production Engineering Sciences by P.C.Pandey & C.K.Singh, Standard Publishers & Distributors Delhi
  5. Production Engineering by P.C.Sharma, S.Chand & Co.Pvt, Ltd., New Delhi.
  6. Fundamentals of tool design: F.W.Willson, Astme

**ME 302 DYNAMICS OF MACHINE - II C (L, T, P) = 4(3, 1, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Governors: Watt, Porter, Proell, Hartnell and spring controlled governors, governor effort, power, stability, inertia effects. | 7 |
| **II** | Inertia force analysis: Velocity and acceleration of slider crank and four bar mechanism, inertia force, piston thrust and forces on connecting rod, turning moment diagram, flywheel. | 7 |
| **III** | Gears: Law of gearing, terminology, tooth form, standard interchangeable tooth profile, minimum number of teeth on pinion in contact with gear or rack, interference and undercutting, bevel, helical and spiral gears. | 7 |
| **IV** | Gear trains: Simple, compound, reverted and epicyclic gear trains, analytical, tabular, graphical and vector methods for velocity ratio, gear boxes- sliding and constant mesh for automobiles. | 7 |
| **V** | Balancing: Balancing of rotating masses, balancing of reciprocating masses, locomotives, IC engines, balancing machines. | 7 |
|  | **Total** | **35** |

**Reference Books:**

* The Theory of Machines, Thoman Beaven, CBS publishers & Distributors, Delhi
* Theory of Mechanisms and Machines; Jagdish lal, Metropolitian Book Co. Ltd, New Delhi
* Theory of Machines; P.L. Ballaney, Khanna Publishers, Delhi
* Theory of Mechanisms & Machines; A Ghosh & A.K.Malik. Affiliated East West Press Pvt. Ltd., new Delhi
* Theory of Machines & Mechanisms; J.E.Shigley & J.J. Ulcker, McGraw Hill International Edition
* Kinetics & Dynamics of Machines; G.H. Martin, McGraw Hill

**ME 303 FLUID MACHINES C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Review of fundamentals -** Euler’s turbine equation, principles of similarity applied to hydraulic machines, non-dimensional specific speed. Classification of turbines on the basis of non-dimensional specific speed. Unit and specific quantities.  **Impact of Free Jets -** Impulse momentum principle, force exerted by the jet on stationary flat and curved plate, hinged plate, moving plate and moving curve vanes. | 7 |
| **II** | **Impulse Turbine -** Classification of turbine, impulse turbines, Pelton wheel, Construction, working. Work done, head, efficiency and design aspects. Governing of impulse turbine. | 7 |
| **III** | **Reaction Turbine -** Radial flow reaction turbine, Francis turbine: construction and working. Work done, efficiency, design aspects. **Axial flow reaction turbine -** Propeller and Kaplan turbine, bulb or tubular turbine- construction and working. Draft tube, governing of reaction turbine. Performance characteristics and comparison of all the turbines. Cavitation Phenomenon in hydraulic machines | 7 |
| **IV** | **Reciprocating Pumps -** Classification, component and working, single acting and double acting, discharge, work done and power required, coefficient of discharge, indicator diagram, slip, effect of friction and acceleration theory of air vessels. **Fluid system -** Hydraulic accumulator, Hydraulic intensifier, Hydraulic Press, hydraulic crane, hydraulic lift, hydraulic Ram, hydraulic coupling, hydraulic torque converter, air lift pump, jet pump. | 7 |
| **V** | **Rotodynamic Pump**: Classification, Centrifugal pumps, Vector diagrams, Specific speed head, power and efficiency calculations model testing performance characteristics. Experimental determination of pump characteristics, Pump Characteristics curves from flow versus specific speed Parallel and series connection of pump of common pipe line, Selection of pumps, Cavitation and abraisive wear of pumps, Non-stable operation of pump. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Engineering Fluid Mechanics K.L.Kumar, Eurasia Publishing House (P) Ltd.
2. Fluid Mechanics & Machine, F.M.White, John Wiley & Sons
3. Fluid Mechnaics & Machine, A.K. Jain
4. Fluid Mechanics, V.L.Streeper, McGraw Hill
5. Fluid Machanics with Applications. S.K.Gupta V.Gupta, New Age Publications

**ME 304 HEAT AND MASS TRANSFER C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Introduction to heat transfer processes, conduction and radiation. Fourier’s law of heat conduction, thermal conductivity, thermal conductivity of solids, liquids and gases, effect of temperature on thermal conductivity. Newton’s law of cooling, definition of overall heat transfer coefficient. General parameters influence the value of heat transfer coefficient.  **Conduction :** General 3-Dimensoinal conduction equation in Cartesian , cylindrical and spherical coordinates; different kinds of boundary conditions; nature of differential equations; one dimensional heat conduction with and without heat generation; electrical analogy; heat conduction through composite walls; critical thickness of insulation. | 7 |
| **II** | Heat transfer from finned surfaces; fin efficiency and effectiveness, two dimensional steady state heat conduction using analytical and numerical methods, periodic heat conduction. **Heat exchanger:** Different types of heat exchangers, arithmetic and logarithmic mean temperature differences, heat transfer coefficient for parallel, counter and cross flow type heat exchanger; effectiveness of heat exchanger, N.T.U. method, fouling factor. Constructional and manufacturing aspects of Heat Exchangers. | 7 |
| **III** | **Natural convection:** Dimensional analysis, Granhoff number, boundary layers in external flows (flow over a flat plate only), boundary layer equations and their solutions, heat transfer correlations. Convection: review of Navier – Stokes and energy equation, hydrodynamic and thermal boundary layers; laminar boundary layer equations; forced convection appropriate non dimensional members; effect of Prandtl number; empirical relations for flow over a flat plate and flow through pipes. **Heat transfer with change of phase**: nature of vaporization phenomena; different regimes of boiling heat transfer; correlations for saturated liquid vaporization; condensation on flat plates; correlation of experimental results, drop wise condensation. | 7 |
| **IV** | **Thermal Radiation:** Plank distribution law, Krichoff's law; radiation properties, diffuse radiations; Lambert's law. Radiation intensity, heat exchange between two black bodies heat exchanger between gray bodies. Shape factor; electrical analogy; reradiating surfaces heat transfer in presence of reradiating surfaces. | 7 |
| **V** | **Introduction to Mass Transfer:** Mass and mole concentrations. molecular diffusion, eddy, diffusion from an evaporation fluid surface. Mass transfer in laminar and turbulent convections. Raynold's analogy. Combined heat and mass transfer the wet and dry build thermometer | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Fundamental of heat and mass transfer, R.C.Schdeva, New Age Publication
2. Fundamental of heat and mass transfer, C.P.Kothandaraman, New Age Publication
3. Process Heat and Mass transfer, KERN, TMH
4. Heat and Mass transfer, Dr. D.S.Kumar, S.K.Kataria & Sons
5. Heat and Mass transfer, Alan J. Chapman, Macmillan Publishing company, New York
6. Heat transfer, J.P.Holman. TMH

**ME 305 DYNAMICS OF MACHINE - I C (L, T, P) = 4(3, 1, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Kinematics:** Element. pairs, mechanisms, four bar chain and its inversions, velocity and acceleration, Klein construction, corolis component, Instantaneous centre method, synthesis of mechanism, panto graph, Scott-Russel, Tchbeicheff staright line, indicator diagram mechanisms. | 7 |
| **II** | **Automotive vehicle mechanisms:** Overhead value mechanism, Davis and Ackerman steering mechanism, Triffler suspension and Hookes Joint | 7 |
| **III** | **Brakes and dynometers:** Band, Block and band & block brakes, braking action, absorption and transmission type dynamometers, prony, rope and hydraulic dynamometers braking system of automobiles. | 7 |
| **IV** | **Cams:** Types of cams, displacement, velocity and acceleration curves for different cam flowers, consideration of pressure angle and wear, analysis of motion of followers for cams with specified contours. | 7 |
| **V** | **Gyroscope:** Principle of gyroscope couple, effect of gyroscopic couple and centrifugal force on vehicle taking a turn, stabilization of sea vessels. | 7 |
|  | **Total** | **35** |

**List of Recommended Books:**

1. The Theory of Machines, Thoman Beaven, CBS publishers & Distributors, Delhi
2. Theory of Mechanisms and Machines; Jagdish lal, Metropolitian Book Co. Ltd, New Delhi
3. Theory of Machines; P.L. Ballaney, Khanna Publishers, Delhi
4. Theory of Mechanisms & Machines; A Ghosh & A.K.Malik. Affiliated East West Press Pvt. Ltd., new Delhi
5. Theory of Machines & Mechanisms; J.E.Shigley & J.J. Ulcker, McGraw Hill International Edition
6. Kinetics & Dynamics of Machines; G.H. Martin, McGraw Hill

**ME 306 STEAM TURBINE AND STEAM POWER PLANT C (L, T, P) = 4(3, 1, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Steam Turbines:** Principle and working of steam turbines, type of turbines, impulse and reactions, compounding for pressure and velocity. Velocity triangles for various types. | 7 |
| **II** | Stage efficiency, diagram efficiency, steam speed to blade, speed ratio for optimum performance. Energy losses in steam turbine, turbine performance at various loads and governing of steam turbines. Constructional details and description of steam turbine components in brief. | 7 |
| **III** | **Regenerative feed heating cycles:**Introduction : Most Ideal Regenerative feed heating cycle. Regenerative feed heating cycles and their representation on T-s and h-s Diagram. Representation of actual process on T-s and h-s Diagram Regenerative cycles. Other types of feed heating arrangements. Optimum feed water temperature and saving in Heat Rate. Feed Heaters, Direct Contact Heaters, Surface Heaters. **Reheating – Regenerative and Regenerative water – Extraction Cycles.** Reheating of steam, Practical reheating and Non- reheating cycles, advantage & disadvantages of reheating, regenerative water extraction cycles, practical feed heating arrangements. | 7 |
| **IV** | Governing and performance of Steam Turbines. Description of back pressure Turbines, pass-out Turbines and Mixed Pressure Turbines. | 7 |
| **V** | **Steam Power Plant -** Steam power plants selection of location, working medium. Fuels and fuel handling equipments, ash handling equipments. Air pre-heater, feed water treatment. Methods of combustion and various type of combustors. Types of boilers. Modern developments in steam boilers. Description of cooling tower. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Steam and Gas Turbines, R. Yadav, Central Publishing House, Allahabad

2. Thermodynamics and heat Power Engineering. Vol. I, M.L.Mathur and F.S.Mehta, Jain

**ME 307 FUNDAMENTALS OF AERODYNAMICS C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Aerodynamic forces and moments over the body surface, concept of lift and drag, dimensionless force and moment coefficient, centre of pressure of an aerofoil, nomenclature of aerofoil, angle of attack, circulation and lift over an-aerofoil, Kutta condition, Kelvin's circulation theorem. | 7 |
| **II** | Blade theory; Symmetrical and non-symmetrical aerofoil. Energy transfer in terms of lift and drag, cascade nomenclature, turbine cascade nomenclature, cascade lift and drag coefficient. | 7 |
| **III** | Isentroic Flow: Velocity of sound; Mach angle; Mach number, steady isentropic flow through ducts; use of isentropic tables; condition for maximum discharge; choked flow; flow through convergent and convergent-divergent nozzle, supersaturated flow in nozzle. | 7 |
| **IV** | Adiabatic flow and flow with Heat Transfer: Adiabatic flow; Fanno line tables; entropy change; choking due to friction; flow through long ducts; Diabatic flow ; Rayleigh line; use of tables; change in entropy; effect of change in stagnation temperature. | 7 |
| **V** | Normal Shock: Plane stationary normal shock; Ranking-Hugoniot relations; increase in entropy; Prandtl's relations; change in stagnation pressure across the shock. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Compressible Flow by S.M.Yahya
2. Gas Dynamics, R.K.Prohit
3. Fundamentals Of Aerodynamics by Anderson
4. Basic concept of fluid mechanics by R.K.Bansal

**ME 308 AUTOMOBILE ENGINEERING C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Power Plant**: Selection of power plant for automotive vehicle, requirements of vehicle. Characteristics of various power plants (Petrol engines, Diesel engines, CNG LPG engine, Gas Turbines); constructional details of C.I. and S.I. engines, crank shafts, connecting rods, pistons, piston pins, piston rings, valves mechanisms, manifolds, air cleaners, mufflers, radiators and oil filters.  **Vehicular Performance** : Load, air and grade resistance; matching of engine output and demand power, performance requirements of various vehicles like Passenger cars, heavy duty trucks etc. performance characteristics of internal combustion engines, drive effectiveness relationship for 2 wheel and 4 wheel drive vehicles. | 7 |
| **II** | Transmission Systems : Transmission requirements, general arrangement of clutch, gear box and rear axle transmission, general arrangement of rear engines and vehicles with live axles. General arrangement of Dead axle and axle-less transmission, De-Dion drive, arrangement of front engine and front wheel drives, four wheel drive transmission.  **Clutches**: Principle of friction clutch, single and multiplate clutches, centrifugal clutch. Friction materials. Bonding materials. Fluid fly wheel clutch. | 7 |
| **III** | Transmission : Description and working of manually operated gearboxes like sliding mesh, constant mesh, synchromesh. Hydraulic torque converter and its construction working and performance. Semi-automatic transmission (Wilson Gear Box). Analysis of differentials, live axles, construction and working. Requirement of overdrive.  **Steering System** : Steering geometry, Ackermann steering, Center point steering, Power steering. | 7 |
| **IV** | **Suspension** : Independent suspension; Perpendicular arm type, Parallel arm type. Dead axle suspension. Live axle suspension, air suspension, shock absorbers.  **Wheels, Tyres and Brakes** : Wheel and tyre requirements, tyre dynamics, mechanical and hydraulic brakes, shoe arrangements and analysis, disc brakes, braking effectiveness relationship for 4 wheel drive. | 7 |
| **V** | **Automotive Air Conditioning**: Introduction, Loads, Air conditioning system Components, Refrigerants, Fault Diagnosis. **Automotive Safety:** Safety requirements, Safety Devices, Air bags, belts, radio ranging, NVS (Night Vision System) GPS (Global Positioning System) etc. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Automobile Engineering, R.K.Sharma
2. Automobile Engineering, Kirpal Singh, Vol. 1 & 2
3. Automotive Chassis and Body, P.L.Kohli, Vol.1 & 2
4. Vehicle Engine and Technology, Heisler, ELBS

**ME 309 MECHANICAL VIBRATION AND NOISE ENGINEERING C (L, T, P) = 4(3, 1, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Sound level and subjective response to sound; Frequency dependent human response to sound, Sound pressure dependent human response. Decibel scale; Decibel addition, subtraction and averaging. Relationship among sound power, sound intensity and sound pressure level. Sound spectra. Octave band analysis. Loudness. Noise: Effects, Ratings and Regulations; Non-auditory effects of noise on people, Auditory Effects of noise, Noise standards and limits in India. Major sources of the noise; Industrial noise sources. Industrial noise control-strategies; Noise control at the source, Noise control along the path, Acoustic barriers, Noise control at the receiver. | 7 |
| **II** | Scope of vibration, important terminology and classification, Degrees of freedom, Harmonic motion; vectorial representation, complex number representation, addition. Derivation of equation of motion for one dimensional longitudinal, transverse and torsional vibrations without damping using Newton’s second law, D’ Alembert’s principle and Principle of conservation of energy. Compound pendulum and centre of percussion. Damped vibrations of single degree of freedom systems. Viscous damping; under damped, critically damped and over damped systems, Logarithmic decrement. Vibration characteristics of Coulomb damped and Hysteretic damped systems. | 7 |
| **III** | Forced vibrations of single degree of freedom systems. Forced vibration with constant harmonic excitation. Steady state and transient parts. Frequency response curves and phase angle plot. Forced vibration due to excitation of support. Vibration Isolation and transmissibility; Force transmissibility, Motion transmissibility. Forced vibration with rotating and reciprocating unbalance. Materials used in vibration isolation. | 7 |
| **IV** | System with two degrees of freedom; principle mode of vibration, Mode shapes. Undamped forced vibrations of two degrees of freedom system with harmonic excitation. Vibration Absorber; Undamped dynamic vibration absorber and centrifugal pendulum absorber. Many degrees of freedom systems: exact analysis. | 7 |
| **V** | Many degrees of freedom systems: approximate methods; Rayleigh’s, Dunkerley’s, Stodola’s and Holzer’s methods. Vibrations of continuous systems; Transverse vibration of a string, Longitudinal vibration of a bar, Torsional vibration of a shaft. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Mechanical Vibrations; G.K.Grover, Nemi Chand & Bros., Roorkee
2. Vibration Theory & Applications; W.T.Thomson
3. Vibration & Noise for Engineers; K.K.Purja, Dhanpat Rai & Sons, Delhi
4. Theory & Problems of Mechanical Vibrations; W.W.Seto, Schaum's Outline Series, McGraw Hill International Editions
5. Mechanical Vibrations, Den Hartog
6. Vibration Problems in Engineering, Timshenko

**ME 310 INDUSTRIAL ENGINEERING - II C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | ****EVALUATION OF WORK STUDY:**** Work of F.W. Taylor, Frank and Lillian Gilbreth and others; Productivity definition, Means of increasing productivity work study, Human Factor in the application of work Study. **Motion Study; Definition, aims;** Procedure for method study: selection of jobs; Recording Techniques: Micro motion study: Therbligs; Cychography and Chronocycle graph: Principles of motion economy. design of work place layout: Analysis in the form of a chart; operation chart; flow process chart; flow diagrams; string diagram; Man Machine chart; Two hand chart; Simon chart. | 7 |
| **II** | **Work Measurement (Time Study):** Definition; uses; procedure; time study equipment; performance rating; allowances, number of cycles to be studied. Determination of standard time: Predetermined Motion Time Systems. **Job Evaluation:** Objective of job evaluation; Methods of Job evaluation; Non-quatative and quantative. | 7 |
| **III** | ****Production Planning and Control:**** Types of production; function of production planning and control; planning Preplanning, sales forecasting; routing; Scheduling; dispatching and control with other departments.  **Plant Location and Layout:** Selection of site, layout contributing factors. Facilities available from Govt. and autonomous agencies, Material handling system and equipments; layout according to the manufacturing system. Procedure and techniques of layout and line balancing. | 7 |
| **IV** | **QUALITY CONTROL:** Operational and economic definition of quality control, objectives of quality control; Statistical quality control, Process capability studies: Control charts for variable, control charts for average outgoing quality | 7 |
| **V** | ****Materials Managements:**** Field and Scope of materials management material planning and Programme. ARC control policy inverter, control Economic lot size, lead time and recorder point, Inventory models (Deterministic only) ****Wages and incentives:**** Characteristics of a Good wage for incentive system. Methods of wage payment Concept of wage incentive schemes, financial and non financial Holsely premium plan. Merric's Multiple piece rate system. | 7 |

**Reference Books:**

1. Introduction to Study, ILO Publishers.
2. Statistical Quality Control, Grant EL& Leawethwarts R.S., McGraw Hill.
3. Facility Layout& Location, Francis R.C.& White J.A.Prentice Hall.
4. Production and Operations Management, Adam Everett E& Ebert Ronald J.PHI
5. Production and operations management; E.W.S. Buffa and S.Kapoor.

**ME 311 MECHATRONICS C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Introduction about Mechatronics, scope of Mechatronics, application, process control automation and N/c Machines.  **Hydraulic And Pneumatic Actuation Systems:** Overview: Pressure Control Valves, Cylinders, Direction Control Valves, Rotary Actuators, Accumulators, Amplifiers, and Pneumatic Sequencing Problems. | 7 |
| **II** | **Electrical Actuation Systems:** Switching Devices, Mechanical Switches **–** SPST, SPDT, DPDT, Debouncing keypads; Relays, Solid State Switches, Diodes, Thyristors, Transistors, Solenoid, Types Devices: Solenoid Operated Hydraulic and Pneumatic Vlaves, Electro-Pneumatic equencing Problems. Control of DC Motors, Permanent Magnet DC Motors, Control of DCMotors, Bush less Permanent Magnet DC Motors, AC Motors, Stepper Motors, Stepper Motor Controls, Servo Motors. | 7 |
| **III** | **Sensors and transducers and application:** Performance Terminology, Static and Dynamic Characteristics, Displacement, Position and Proximity Sensors, Potentiometer Sensors, Strain Gauge Element, LVDT, Optical Encoders, Pneumatic Sensors, Hall Effect Sensors,Tachogenerators, Strain Gauge Load Cell, Thermostats, Photo Darlington. Interfacing Sensors in Mechantronic System as – Temperature Switch Circuit, Float Systems |  |
| **IV** | **Interfacing controllers:** Interfacing, Buffers, Darlington Pair, I/O Ports, Interface Requirements, Handshaking, Serial and Parallel Port Interfacing, Peripheral Interface, Adapters.  **Data Acquisition and Control System -** Introduction, Quantitizing theory, Analog to Digital Conversion, Digital to Analog (D/A) conversation, transfer function, transient response & frequency response & frequency response, stability criteria. | 7 |
| **V** | **Design of Mechatronic systems -** Introduction, Automatic front and book and cutting in steel rolling mill, lift control system, CNC lathe, temperature control of a heat treatment furnace, EOT crane control panel, Grey grain separators, electrode arm control in electric arc furnace. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Mechatronics Engineering, Tomkinson, D. and Horne, J., McGraw Hill, 1996
2. Mechatronics, Bolton, W., Longman, 1995
3. Mechatronics, HMT Hand Book, 1998
4. Understanding Electro-Mechanical Engineering, Kamm, L.J., IEEE Press, New York, 2000
5. Nitaigour Premchand Mahalik, Mechatronics, Tata Mcgraw-Hill
6. J.P. Holman, Mechanical Measurements,McGraw-Hill
7. T.K.Kundra, P.N.Rao And N.K.Tewari,Numerical Control and Computer AidManufacturing,Tata McGraw-Hill,
8. J.P. Holman, Mechanical Measurements,McGraw-Hill
9. T.K.Kundra, P.N.Rao And N.K.Tewari,Numerical Control and Computer Aided Manufacturing,Tata McGraw-Hill,

**ME 312 COMPUTATIONAL FLUID FLOW & HEAT TRANSFER**   **C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Review of basic fluid mechanics and the governing (Navier-Stokes) equations. Types of partial differential equations- hyperbolic, parabolic and elliptic. Traditional solution methods- method of characteristics, separation of variables, Greens function method. | 7 |
| **II** | Preliminary computational techniques: Discretisation, converting derivatives to discrete algebraic expressions, spatial derivatives, time derivatives. Approximation of derivatives, Taylor series expansion, general techniques. Accuracy of discretisation process-higher order vs lower order formulae. | 7 |
| **III** | Finite difference method: conceptual implementation, application to transient heat conduction problem. Convergence, consistency and stability of FD equation. | 7 |
| **IV** | Weighted residual methods: General formulation, Introduction to Finite Volume method. Finite Volume method: Equations with first derivatives and second derivatives. FV method applied to Laplace’s equation. | 7 |
| **V** | Finite Element method: Linear interpolation, quadratic interpolation, two dimensional interpolations. Application to heat transfer problems. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Computational Fluid Dynamics: The Basics with [Applications](http://www.indiastudychannel.com/resources/37094-Syllabus-University-Pune-M-E-Chemical-Engg-Semester-I-Computational-Fluid-Dynamics.aspx), John D.Anderson, Mc Graw Hill, 1995.  
2. Computational Flow Moeling for Chemical Reactor Engineering, V. V. Ranade, Process Engineering Science, Volume 5, 2001.  
3. Fundamentals of Grid Generation, Patrick Knupp and Stanly Steinberg, CRC Press,1994.  
4. Turbulence Modelling for CFD, D.C. Wilcox 1993,

**ME 313 FACILITIES PLANNING & MATERIAL HANDLING C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Plant Location:** The ideal location. Proximity to market. Proximity to raw materials, Transportation costs. The labour supply. electric power. Water and land costs. Local Taxes. Security from attack. Specialised communities, Climate, Urban, Suburban, and small town locations, Plant location trends, Best location for small plants. Incentive offered by State Government for dispersal of industries. Planned Industrial centres Government industrial estate - public sector plants and their location, growing competition for industry amoung states to locate in their midst. centralisation v/s decentrlisation - decentralisation by horizontal and vertical methods. soures of information concern in location. Moving to a new location. Moving costs. To lease or buy or build an industrial plant. | 7 |
| **II** | **Plant Location techniques:** Euclidean distance, squared euclidean distance, rectilinear distance, linear distance methods, Prolems on multi-location. **Plant layout:** introduction to plant design, types of manufacturing processes. Plant location, influence of location on layout, Industrial Buildings. Influences of Buildingon Layout, Classical types of layout product layout and Process layout and practical layouts. | 7 |
| **III** | Planning the Layout: Various operational Research techniques for balancing of assembly lines, Fabrication line balancing. Safety Engineering; Safety in Machine shop, forging shop, carpentry shop, welding shop and foundary shop. safety in critical storage area. storing explosive materials, gases and inflammable liquids. | 7 |
| **IV** | **MATERIAL HANDLING:** Types of materials handled in an engineering plant, basic principles of material handling. Engineering and economic factors. Classifications of material handling equipment's according to operating principle, construction and nature of service. Gravity equipment's - Chutes, belt and rolling conveyers. Gravity roller spirit's Fixed systems of power driven conveyers, Belt, chain slot, apron, wire aush, Pellet, roller flight, cross bar and chain trolley type of conveyers, Arm, vertical Belt and suspended tray type of elevatos, reciprocation elevators industrial elevators, screw conveyers, ribbon conveyers, bucket elevators, etc. Skip hoists, drag scrapers, tramways and cableways, Pneumatics and hydraulic conveyers. | 7 |
| **V** | Cranes ; jib electric overhead travelling (E.O.T.), cantilever cranes. Track systems; Overhead track of onorail system. Industrialrailways,locomotivecranes.Portable conveyers; Hand trucks, Forkit trucks. Container system of transport; Unit loads, riteriaetion of unit load riteria Co-ordination of handling with production; copntinous, riteriae and intermittent type. Applicationof time and motion study. Organisational and selection of material handling system. Operation, maintenance, and safety precaution Selection of plant layout from material handling riteria. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Practical Plant Layout, Muther, McGraw Hill
2. Plant Layout & Design, Immer, McGraw Hill
3. Material Handling, Immer, McGraw Hill
4. Facilities Planning, Tomphins James A & White John Wiley & Sons.
5. Facility Layout & Location, Francis R.C. & White J.A.Prentice Hall.

**ME 314 Numerical Analysis & Programming  C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Errors and significant digits, Roots of algebraic equations Bisection method, secant method,Graff’s root- squaring method,  **Numerical Techniques:**The solution of linear and non-linear equations: Direct Iteration method, Regula-Falsi method, Newton – Raphson method.  Solution of system of simultaneous equations by Gauss elimination, Gauss-Jacobi and Gauss-Seidal methods.  **Finite differences**: Forward, backward and Central differences. | 7 |
| **II** | **Interpolation and Numerical Calculus:**Newton’s interpolation for equi-spaced  values. Divided differences and  interpolation formula in terms of divided differences.  Stirling’s central difference interpolation formula,  Lagrange’s  interpolation formula for unequi-spaced values. | 7 |
| **III** | Numerical differentiation, Numerical Integration:- Trapezoidal, Simpson’s rule and Gaussian integration (only formula applications) Differential equations and their solutions. Numerical methods for ordinary differential equations (Picard method, Taylor series method, Euler’s method, Ranga Kutta Method, Predictor- corrector method, Adams- Bashforth method). | 7 |
| **IV** | Sampling theory: Introduction: Moments, Moment generating functions, Skewness, Kurtosis, Correlation and Regression, Normal sampling distributions; Binomial distribution, Poisson distribution, Normal distribution; Sampling distribution of the means; sampling distribution of the differences of the means; sampling distributions of proportions. | 7 |
| **V** | **Computer Programming**:  Writing programmes in C++ for solving numerical problems.  For example, Programme for solving algebraic and transcendental equations by Newton-Rapson Method, solving simultaneous equations by Gauss-Seidal method.  Programme for Interpolation by Lagrange’s method.  Programme for estimating the value an  integral by Simpson’s rule.  Programme for solving differential equation by Runge-Kutta method, etc. | 7 |

**Reference Books:**

1. **B.V.RAMANA.,** McGraw Hill
2. **B.RAM, PEERSON PUBLICATION**
3. **E.KRIZING, WILLY PUBLICATION**

**ME – 318 Automobile and IC engine C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | FRAME & BODY: Layout of chassis, types of chassis frames and bodies, their constructional features and materials. TRANSMISSION SYSTEM**:** Clutch; single plate, multiplate, cone clutch, semi centrifugal, electromagnetic, vacuum and hydrautic clutches. Fluid coupling. | 7 |
| **II** | Gear boxes, Sliding mesh, constant mesh, synchromesh and epicyclic gear boxes, Automatic transmission sytem; Hydraulic torque converter; overdrive, propeller shaft, universal joints, front wheel drive, differential; Rear axle drives. Hotchkiss and torque tube drives; rear axle types; Two wheel and four wheel drive. BRAKES; Classification and function; Mechanical, hydraulic, vacuum air and self engineering brakes; Brake shoes and lining materials. RUNNING GEAR: Types or wheels and tyres. Tyre construction; tyre inflation pressure, tyre wear and their causes; re-treading of the tyre, Steering system, steering gear boxes, Steering linkages, steering mechanism, under and over steering. Steering Geometry, effect of camber, caster, king pin inclination, toe in and toe out; power steering; integral and linkage types suspension system; objects and requirements, suspension spring, front and rear suspension systems, Independent suspension system shock absorber. | 7 |
| **III** | AUTOMOTIVE ELECTRICAL SYSTEM: Battery construction, Charging and testing, battery types, Starting and Battery Charging System : Starter motor construction, types of drive, Alternator construction, regulation and rectification. Ignition System: magneto and coil ignition systems, System components and requirements, Automotive lighting : Wiring systems Electrical instruments; head lamp, electric horn, fuel level indicator. AUTOMOTIVE AIR CONDITIONING: Introduction, Loads, Air conditioning system Components, Refrigerants, Fault Diagnosis. AUTOMOTIVE SAFETY: Safety requirements, Safety Devices, Air bags, belts, radio ranging, NVS (Night Vision System) GPS (Global Positioning System) etc. | 7 |
| **IV** | Air Standard Cycles: Internal and external combustion engines; classification of I.C. Engines, Cycles of operation in four stroke and two stroke I.C. Engines, Wankel Engines, Assumptions made in air standard cycle; Otto cycle; diesel cycle, dual combustion cycle, comparison of Otto, diesel and dual combustion cycles; sterling and Ericsson cycles; air standard efficiency, specific work output, specific weight; work ratio; mean effective pressure; deviation of actual engine cycle from ideal cycle. Problems. Carburetion, fuel Injection and Ignition systems: Mixture requirements for various operating conditions in S.I. Engines; elementary carburetor, Requirements of a diesel injection system; types of inject systems; petrol injection, Requirements of ignition system; types of ignition systems ignition timing; spark plugs. Problems. | 7 |
| **V** | Combustion in I.C. Engines : S.I. engines; Ignition limits; stages of combustion in S.I. Engines; Ignition lag; velocity of flame propagation; detonation; effects of engine variables on detonation; theories of detonation; octane rating of fuels; pre-ignition; S.I. engine combustion chambers, Stages of combustion in C.I. Engines; delay period; variables affecting delay period; knock in C.I. engines, Cetane rating; C.I. engine combustion chambers. Lubrication and Cooling Systems: Functions of a lubricating system, Types of lubrication system; mist, wet sump and dry sump systems; properties of lubricating oil; SAE rating of lubricants, engine performance and lubrication, Necessity of engine cooling; disadvantages of overcooling; cooling systems; air-cooling, water cooling; radiators. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Automobile Engineering, R.K.Sharma
2. Automobile Engineering, Kirpal Singh, Vol. 1 & 2
3. Automotive Chassis and Body, P.L.Kohli, Vol.1 & 2
4. Vehicle Engine and Technology, Heisler, ELBS
5. Automotive Transmission, Mathias F., Brejcha, Prentice Hall.
6. Internal Combustion Engines –V. Ganesan, Pub.-Tata McGraw-Hill.
7. Internal Combustion Engines & Air pollution- Obert E.F, Pub.-Hopper & Row Pub., New York

**ME 351 PRODUCTION PROCESS LAB-II**   **C (L, T, P) = 2(0, 0, 3)**

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| **LIST OF EXPERIMENTS**   1. To study of single point cutting tool geometry & to grind the tool to the given tool geometry. Write importance of various angles and to prepare a capacity chart of the Tool & cutter grinder. 2. Prepare a hexagonal/octagonal nut using indexing head on milling m/c and to cut bsw/ metrix internal threads on lathe (to meet with job). 3. To prepare the capacity chart for a lathe machine. 4. To cut multi-start square/metric thread. 5. To cut external metric threads & to mesh it with the nut (drg). 6. Prepare the process chart for the job. 7. To perpare the job by eccetric turning on lathe machine drawing. 8. To study shaper machine & its mechanism and calculate its quick return ratio. 9. To prepare a job on shaper from given mild Steel rod drawing   10. To study the effect of rake angle on chip thickness ratio and the shear angle in orthogonal machining.  11. Using drill dynamometer measure the torque and thrust force in drilling and to plot the characteristics, torque, force & power v/s speed & feeds.  12. To measure effective diameter of a screw thread by three wire method.  13. To perform alignment test on a centre lathe  14. To calibrate pneumatic comparator and measure taper of a given work peice. |

**ME 352 DYNAMICS OF MACHINES LAB.-II C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENTS**   1. To plot. Force v/s radius and lift v/s. speed curves for governors 2. To plot pressure distribution curves on a journal bearing. 3. To Perform wheel balancing. 4. To perform static and dynamic balancing on balancing setup. 5. Study of a lathe gear box 6. Study of a sliding mesh automobile gear box. 7. Study of a planetary gear box |

**ME 353 FLUID MACHINES LAB. C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENTS**   1. To Draw operating characteristics of Pelton wheel 2. To Draw operating characteristics of Francis turbine at 40%, 60% and full gate opening 3. To Draw operating characteristics of Kaplan turbine at different loads 4. To Draw operating characteristics of Centrifugal pump at 3 to 4 speeds 5. To plot discharge v/s lift curve for different flow rates in hydro ram 6. To Draw operating characteristics of centrifugal pump and determine surging point. |

**ME 354 HEAT AND MASS TRANSFER LAB. C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENTS**  1. To find emissivity of a grey body relative to a given block body.  2. Perform parallel and counter flow heat exchanger.  3. To find out the Stefan Boltzmen constant.  4. To perform experiment on pin fin test rig in forced convection by neglecting radiation losses & to calculate. Convective heat transfer coefficient. (Experimentally & empirical correlation), Efficiency, Effectiveness, Comparison of experimental & theoretical temperature profile.  5. Repeat the same exercise by considering radiation losses  6. To find convectively heat transfer coefficient of a given cylinder in vertical position by neglecting radiation losses by assuring, constant surface temperature, constant heat flux & compare with experimental heat transfer coefficient by neglecting radiation losses & by considering radiation losses.  7.Perform the experiment No.5 by using cylinder in horizontal position |

**ME 355 DYNAMICS OF MACHINES LAB.** -**I C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENTS**  1. To study inversion of four bar chain  2. Coupling Rod  3. Beam Engine  4. Steering Mechanism  (a) Study of quick return mechanism.(Crank and Slotted lever mech.)  (b) To draw velocity and acceleration diagram for Crank and slotted lever mechanism.  5. Study of inversion of Double slider chain  Oldhan Coupling  Scotch Yoke  Elleptical Trammel  6. To plot displacement v/s θ curve for various cams.  7. Study of various cam- follower arrangements.  8. To determine co-efficient of friction.  9. Study of various types of dynamometers, Brakes and Clutches.  10. To determine moment of inertia of the given object using of Trifler suspension.  11. To Verify the relation T=I.W.Wp. for gyroscope. |

**ME 356 AUTOMOBILE ENGG. LAB. C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENTS**  1. Disassembling and assembling of multi-cylinder petrol and diesel engines and study of their parts.  2. To disassemble and assemble a 2-stroke petrol engine.  3. To disassemble and assemble a 4-stroke motor cycle engine and study of various engine parts.  4. Load test on a single cylinder 4-stroke diesel engine using a rope brake dynamometer and calculate volumetric and thermal efficiency and draw a heat balance-sheet.  5. Study of carburetors and MPFI system and disassembling and assembling of their parts.  6. To calculate valve timing of a multi-cylinder petrol engine and valve tappets  adjustment.  7. Disassemble all the parts of a fuel injection pump and its parts study.  8. To disassemble the governor and study its various parts. |

**ME 357 MECHANICAL VIBRATION LAB C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENTS**   1. To verify relation T=2 √L/g for a simple pendulum. 2. To determine radius of gyration of compound pendulum. 3. To determine the radius of gyration of given bar by using bifilar suspension. 4. To determine natural frequency of Spring mass System. 5. Equivalent spring mass system 6. To determine natural frequency of free torsional vibrations of single rotor system (a) Horizontal rotor (b) Vertical rotor. 7. To verify the Dunkerleys rule. 8. Study of free damped torsional vibration to performing the experiment to find out damping co-efficient. 9. To conduct experiment on trifilar suspension   10. Vibration of beams concept of more than one degree of freedom Excrtation using eccentric mass.  11. Critical speed of shafts.  12. Study of vibration measuring instruments. |

**ME 358 INDUSTRIAL LAB**   **C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENTS**  1. Determination of time standard for a given job using stopwatch time- study.  2. Preparation of flow process chart, operation process chart and man-machine charts for an existing setup and development of an improved process.  3. Study of existing layout of a workstation with respect to controls and displays and suggesting improved design from ergonomic viewpoint.  4. To carryout a work sampling study.  5. To conduct process capability study for a machine in the workshop.  6. To design a sampling scheme based on OC curve.  7. To conduct Shewart's experiments on known population  8. Generation of random numbers for system simulation such as facility planning, job shop scheduling etc. |

**ME 362 AUTOMOBILE And IC ENGG. LAB. C (L, T, P) = (0, 0, 3)**

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| **LIST OF EXPERIMENTS**  1. Disassembling and assembling of multi-cylinder petrol and diesel engines and study of their parts.  2. To disassemble and assemble a 2-stroke petrol engine.  3. To disassemble and assemble a 4-stroke motor cycle engine and study of various engine parts.  4. Load test on a single cylinder 4-stroke diesel engine using a rope brake dynamometer and calculate volumetric and thermal efficiency and draw a heat balance-sheet.  5. Study of carburetors and MPFI system and disassembling and assembling of their parts.  6. To calculate valve timing of a multi-cylinder petrol engine and valve tappets adjustment.  7. Disassemble all the parts of a fuel injection pump and its parts study.  8. To disassemble the governor and study its various parts. |

**ME 401 COMPUTER AIDED DESIGN C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Overview of Computer Graphics, Picture representation, Coordinate Systems, Output Graphcis Display devices. Raster Scan Graphics : DDA for line generation and Bresenham’s algorithm for line and circle generation. | 7 |
| **II** | Wire frame models, Parametric representation of curves, Plane curves : line, circle, ellipse, parabola and hyperbola. Space curves : Cubic spline curve, Bezier Curve and B Spline Curves. Blending of Curves. | 7 |
| **III** | Surface models and entities Parametric representation of Hermite Bicubic surfaces, Bezier surfaces and B-spline surfaces. Solid Models and entities, Solid Representation : B-rep. and CSG.Comparison between three types of models**.** | 7 |
| **IV** | Two and three dimensional transformation of Geometric models: Translation, Scaling Reflection, Rotation and Shearing. Homogeneous Representation, Combined Transformation. Projection of Geometric models: Parallel and Perspective Projection. | 7 |
| **V** | Clipping : Point clipping, Line clipping, Cohen- Sutherland algorithm etc. Viewing Transformation, Hidden Line and surface Removal : Techniques and Algorithms. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Mathematical Elements for Computer Graphics, Rogers and Admas.
2. CAD/CAM Theory and Practice, Zied Ibrahim, Tata McGraw Hill.
3. Computer Graphics (Schaum Series), Plastock and Kalley.

**ME 402 COMPUTER AIDED MANUFACTURING**   **C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Introduction: Overview of manufacturing processes, types of manufacturing systems, the product cycle, computer’s role in manufacturing, sources and types of data used in manufacturing. The Beginning of CAM: Historical Background, Basic components of NC systems, NC Procedure, NC coordinate system and machine motions, applications and economics of NC. | 7 |
| **II** | Part programming- manual and computer assisted such as APT Language. Computer Controls In NC Systems: Problems with conventional NC computer numerical control, Direct numerical control, combined CNC/ DNC systems, adaptive control machining system computer process interfacing, New development and latest trends. | 7 |
| **III** | Computer Aided Process Planning: Traditional Process Planning, Retrieval process planning system, Generative Process Planning, Machinability data system, computer generated time standards. Group Technology: Introduction, part families, part classification and coding, coding system and machining cells. | 7 |
| **IV** | Compuer Aided Production Management Systems: Introduction to computer aided PPC, Introduction to computer aided inventory management, manufacturing resource planning (MRPII), computer process monitoring and shop floor control, computer process control. Computer Aided Quality Control: Computer in quality control, contact inspection methods, Non contact inspection methods, optical and non optical computer aided testing. Computer Aided Material Handling: Computer control on material handling, conveying, picking. Ware house control, computerized material handling for automated inspection and assembly. | 7 |
| **V** | Computer Integrated Manufacturing Systems: Introduction, types special manufacturing systems, flexible manufacturing systems (FMS). Collaborative Engineering**:** Introduction, Faster Design throughput, Web based design, Changing design approaches, extended enterprises, concurrent engineering, Agile and lean manufacturing. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Automation, Production Systems and Computer Integrated Manufacturing by M.P.Grover, PHI
2. Principal of computer integrated manufacturing by S.Kant Vajpayee.
3. Numerical control and computer aided Manufacturing; Kundra, Rao & Tiwari, TMH.

**ME 403 REFRIGERATION AND AIR - CONDITIONING**   **C (L, T, P) = 4(3, 1, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Introduction -** Refrigeration and second law of Thermodynamics, Refrigeration effect and unit of Refrigeration, Heat pump, reversed Carnot cycle. **Vapour Compression Refrigeration System -** Analysis of simple vapour compression Refrigeration cycle by p-h and T-S diagram. Effect of operating conditions, liquid vapour heat exchangers, actual refrigeration cycle. **Multiple Evaporator and compressor system -** Application, air compressor system, Individual compressor, compound compression, cascade system. Application, air compressor systems, individual compressor, compound compression, cascade system. | 7 |
| **II** | **Gas cycle Refrigeration -** Limitation of Carnot cycle with gas, reversed Brayton cycle, Brayton cycle with regenerative heat exchanger. **Air cycle for air craft -** Necessity of cooling of air craft, Basic cycle, boot strap, regenerative type air craft refrigeration cycle. | 7 |
| **III** | **Vapour Absorption System -** Simple Vapour absorption system, Electrolux Refrigerator, Analysis of Ammonia absorption refrigeration system, Lithium Bromide Absorption Refrigeration System. **Refrigerants -** Classification, Nomenclature, selection of Refrigerants, global warming potential of CFC Refrigerants. **Refrigeration Equipments -** Compressor, condenser, evaporator, expansion devices – types & working. | 7 |
| **IV** | **Other Refrigeration System:** Principle and applications of steam jet refrigeration system, Performance; vortex tube refrigeration, thermoelectric refrigeration systems. **Psychrometry-** Psychrometric properties, psychometric relations, pyschrormetric charts, psychrometric processes, cooling coils, By-pass factor and air washers. **Human Comfort -** Mechanism of body heat losses, factors affecting human comfort, effective temperature, comfort chart. | 7 |
| **V** | **Cooling load calculations -** Internal heat gain, system heat gain, RSHF, ERSHF, GSHF, cooling load estimation, heating load estimation, psychometric calculation for cooling, selection of air conditioning, apparatus for cooling and dehumidification, Air conditioning system. **Distribution and Duct systems:** Distribution of air in conditioned space et location, return and exhaust grills. Duct materials and sizing, design of Supply and return air ducts. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Refrigeration and Air Conditioning, C.P.Gupta
2. Refrigeration and Air Conditioning, Ballarey
3. Refrigeration and Air Conditioning, C.P.Arora
4. Modern Air Conditioning-Practice, Narman E.Harris, Tata McGraw Hill.

**ME 404 POWER PLANT ENGINEERING C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Introduction:** Introduction to generation of electrical power, Sources of energy, comparative merits, types of power plants. Review of growth of power & development of different types of power plants in India, future possibilities. Review of Steam power plant and gas power plant. | 7 |
| **II** | Diesel Power Plants: General layout; elements of diesel power plants; field of use; systems of diesel power plant; comparison with steam power plants (advantages and disadvantages). combined gas and steam power plants; Advantage of combined cycle, Introduction to integrated coal gasification combined cycle power plants | 7 |
| **III** | Nuclear Power Plants: Elementary concept of physics of generation of nuclear energy, Nuclear materials and waste disposal; nuclear fuels, fuel cycles, coolants, moderating and reflecting materials; cladding materials, shielding materials; Disposal of nuclear waste; General components of nuclear reactor, different types of nuclear reactors, Their construction and working; Location of nuclear power plants; Comparison of nuclear plants with thermal plants. Enrichment; safety and control. Fast breeder reacors and power plants | 7 |
| **IV** | Hydro-elecrtic power PLant: Classification and applications of Hydro-electric plant; Measurement of stream flow; capacity calculation of hydro-power, The hydro plant and its auxiliaries; automatic and remove control of hydro-systems. MHD geothermal, tidal & wind power plants. | 7 |
| **V** | Power Plant Economics: Load curves; different terms and definitions; cost of electrical energy; Selection of type of generation; Performance and operating characteristics of power plants; load division combined operation of power plants; load division between stations. Different systems of tariff. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Power Plant Technology, M.M.El-Wakil, McGraw Hill Book Company
2. A Course in power Plant Engineering, Arora and Domkunwar Dhanpat Rai and Co.(P) Ltd.
3. Power Plant Engineering, Black and Veatch, CBS publication.

**ME 405 OPERATION RESEARCH C (L, T, P) = 4(3, 1, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Linear Programming-** Introduction & Scope, Problem formulation, Linear Programming: LP formulation, graphical method, simplex method, duality and Sensitivity analysis. | 7 |
| **II** | Transportation Model, Assignment Model, Sequencing problems, Network Flow, constrained optimisation and Lagrange multipliers. **Dynamic Programming-** Multistage decision problems & solution, Principle of optimality. | 7 |
| **III** | **Decision theory-**Decision under various conditions. **Game Theory-**Minimax & maximum strategies. Application of linear programming. **Integer Programming-** Cutting Plane method and Branch & Bound method | 7 |
| **IV** | **Deterministic and Stochastic inventory models-** Single & multi period models with continuous & discrete demands, Service level & reorder Policy. **Replacement Models:** Capital Equipment replacement with time, group replacement of tems subjected to total failure, Industrial staff problem, replacement problems under warranty condition. | 7 |
| **V** | **Simulations-** Need of simulation, advantages and disadvantages of simulation method of simulation. Generation of Random numbers, Generation of normal Random numbers, Generation of random numbers with any given distribution. Use of random numbers for system simulation, Application of simulation for solving queueing Inventory Maintenance, Scheduling and other industrial problems. Simulation V/S mathematical modeling, Monte Carlo simulation, simulation language ARENA, Example & cases. **Queing models-** Introduction Model types, M.M. 1 & M/M/S system cost consideration. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Introduction of Operations Research, Hiller F.S. & Liberman G.J.CBS Publishers
2. Operations Research,Taha H.A., McMillan Publishing Company
3. Foundation of Optimisdation, Heightler, C.S. & Philips D.T. Prentice Hall

**ME 406 PRODUCTION PROCESSES - III**   **C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Mechanics of Metal Cutting:** Elements of a cutting process: geometry of single point cutting tool; tool angles, chip formation; types of chips; chip breakers effects of cutting parameters; Typical cutting speeds and feeds for different tool and job materials; Orthogonal and obligue cutting; Theories of mechanics of metal cutting; cutting force measurement; various types of tool dynameter; thermal aspects of metal machining measurement of chip tool interface temperature; friction in metal cutting. | 7 |
| **II** | **Evaluation of machinability:** Tool life; types of tool failure; mechanism of tool wear, failure and their remedies; reconditioning of tools, relationship between cutting force and power required tool life and cutting speed, surface finish; nose radius, feed; economics of metal machining - cutting tool materials; cutting fluids and methods of their application | 7 |
| **III** | **Gear manufacturing process:-** Introduction: methods of forming gears, hot rolling stamping, powder metallurgy, extruding of coining etc. shear cutting of gear template process, gear generating process, gear hobbing, gear shaping ,bevel gear generating , lapping, shot blasting , phosphate coating, gear testing. | 7 |
| **IV** | . **New Machining Methods:** Types of machining methods; hot machining; electric discharge machining (E.D.M.) ultrasonic machining (U.S.M.) ; Electron beam machining (E.B.M.) laser beam Machining (L.B.M.); abrasive jet machining (A.J.M.) ; plasma arc machining (PAM); economics of machining | 7 |
| **V** | **Grinding:** Abrasives: manufacturing and selection of grinding wheels; theory of grinding; characteristic terms used in grinding; classification; constructional features; principle of working; applications and limitations of different grinding machines. Honing, lapping super finishing, buffing and polishing processes. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Production Engineering Sciences by P.C.Pandey & C.K.Singh Standard Publishers & Distributors Delhi
2. Production Engineering by P.C.Sharma, S.Chand & Company Ltd., N.Delhi
3. Production and Operations Management By S.N. Chary. T.M.H

**ME 407 RELIABILITY AND MAINTENANCE C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Introduction:** Maintenance Objectives and Functions; Maintenance Organization and Administration of Maintenance Systems. Need of planned maintenance. Maintenance policies; Breakdown, time based maintenance: Block replacement, age replacement and periodic replacement policy. Corrective and preventive maintenance. Maintenance planning, Scheduled maintenance. Cost of maintenance versus Cost of equipment and production delays. | 7 |
| **II** | **Predictive maintenance.** Equipment wear records, standards. Equipment used in predictive maintenance. Computerized maintenance, Total Productive Maintenance. Methods of condition monitoring, Non-destructive testing, Liquid Penetrate, Magnetic particles, Ultrasonic testing, and Vibration analysis. Oil analysis, Radiographic testing. | 7 |
| **III** | **Reliability**: Definition, failure data analysis, Mean failure rate, mean time to failure (MTTF),mean time between failures (MTBF) , hazard rate, Bathtub curve.  **Inspection**: Inspection intervals, Inspection reports, card history system,guarantee period etc. | 7 |
| **IV** | **System reliability**: Series, parallel and mixed configuration; Simple problems. Reliability improvement: Techniques, use of Pareto analysis-Design for reliability, redundancy unit and stand by redundancy, Optimization of reliability. | 7 |
| **V** | **Spare Parts Management:** Spare parts, features and categorization of spares, cost considerations, Techniques of cost reduction; Selective controls used in spare parts control; ABC analysis, FSN, XYZ, VED and other approaches. Inventory control of spares. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. **Reliability of Machines by D.Reshetov, A.Ivanov, V.Fadeev**
2. **Engineering Diagnostics by I.A.Birger**
3. Production Technology by R.K.Jain
4. Production and operation management by Adam and Evert ,Tata McGraw Hill.

**ME 408 PRODUCT DESIGN AND DEVELOPMENT C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Importance of new product-Definition-importance-Development Process -** Importance of new product for growth of enterprise. Definition of product and new product. Responsibility for new product development. Demands on product development team. Classification of products from new product development. Point of view- Need based/Market pull products, Tech. push, Platform based, Process based and customized products. New product development process and organization. Generic product development process for Market Pull Products. Modification of this process for other types of products. | 7 |
| **II** | **Need analysis- Problem Formulation -** Establishing economic existence of need, Need Identification and Analysis, Engineering Statement of Problem, Establishing Target Specification. | 7 |
| **III** | **Generation of Alternatives and Concept Selection -** Concept generation- a creative process, Creativity, Road Elects to creative thinking- Fear of criticism and Psychological set. Tools of creativity like brain storming, Analogy, Inversion etc., Creative thinking Process. Concept feasibility and Concept Selection, Establishing Engineering Specification of Products. | 7 |
| **IV** | **Preliminary & detailed design- Design Review -** Preliminary design- Identification of subsystems, Subsystem specifications, Compatibility. Detailed design of subsystems, component design, Preparation of assembly drawings. Review of product design from point of view of Manufacturing, Ergonomics and aesthetics. | 7 |
| **V** | **Management of New Product – development and Launch -** New Product Management’s Challenges – Maintaining focus, Promotion of Right Culture, Management of Creativity, Top Management attention. Design Team Staffing and Organization. Setting key mile stone, Identification of Risk Areas, Project Execution and Evaluation Product Launch Strategies.  Project Planning – Project Task matrix, estimation of time & resources, project scheduling. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Product Design and Manufacturing, Chital AK and Gupta RC,PHI
2. Product Design and Manufacturing, Ulrich Ktand Eppinger SD McGraw Hill
3. Product Design and Manufacturing, Lind beck JR, Prentice Hall.
4. Engineering Design Method, Cross, Nigel, John Wiley & Sons.
5. Design for Strength & Production; C.Ritz and F. Koenigsbenger.
6. Human Factors in Engineering and Design; Mark S. Sanders, Ernest J. M.Cormick.
7. Engineering Design, G.E.Deiter.

**ME 409 GAS TURBINE AND JET PROPULSION C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Gas Turbines:** Classification of Gas Turbines,Different parts Of Gas Turbines,**Gas Turbine Cycles**.Ideal Cycles; open and closed cycles; constant pressure and constant volume cycles; intercooling, reheat and reheat with heat exchange; Ericksson cycle. Compounding - different shaft arrangements, special Applications of gas turbines such as industrial aircraft, marine. Gas turbines in power generation; combined cycle power generation. | 7 |
| **II** | **Performance of Practical Gas Turbine Cycles:** Compressor and turbine efficiencies; pressure losses; heat exchanger thermal ratio; mechanical losses; variation of specific heat; design point performance calculation for simple cycle. Factors affecting the performance, calculation of practical gas turbine cycles; polytropic efficiency; general performance of simple cycle with losses | 7 |
| **III** | **Centrifugal Compressors:** Principal of operation; work done and pressure rise; slip diffuser. Design criterion; compressibility effects; non-dimensional quatities used for plotting compressor characteristics surging, choking and rotating stall gas Turbine **Axial Fow Compressors:** Basic constructional features; turbine v/s compressor blades; elementary theory; degree of reaction; vortex theory, simple design calculations; introduction to blade design; cascade test; compressibility effects; operating characteristics; | 7 |
| **IV** | **Jet Propulsion:** Aircraft propulsion- types of jet engines-energy flow through jet engines, study of turbojet engine components-diffuser, compressor, combustion chamber, turbine and exhaust systems, performance of turbo jet engines-thrust, thrust power, propulsive and overall efficiencies, thrust augmentation in turbo jet engines, ram jet and pulse jet engines. Expansion of steam through a Nozzle. Effect of friction. Critical pressure ratio. Areas at Throat & Exit for maximum discharge conditions. Performance at Off- design conditions. | 7 |
| **V** | **Rocket propulsion**– basics, solid and liquid propelled engines, parametric studies,construction features, single and multi-stage rockets. Thrust chamber and nozzle models. Studies of in-use engines. Environmental aspects**.**  **Nozzles:** Application of Nozzles. Types of Nozzles. Converging and converging-diverging nozzles and diffusers. | 7 |
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|  | **Total** | **35** |

**Reference Books:**

1. Gas Turbines Theory, H. Cohan, G.F.C. Roger and HIH Saravanama, Longman Scientific & Technical Pub., N.York
2. Gas Turbines and Jet and Rocket Propulsion, M.L.Mathur and R.P.Sharma, Standard Publisher & Distributor, New Delhi
3. Power Plant Technology, M.M.El-Wakil, McGraw Hill Book Company
4. A Course in power Plant Engineering, Arora and Domkunwar Dhanpat Rai and Co.(P) Ltd.

**ME 410 COMPUTATIONAL FLUID FLOW & HEAT TRANSFER**   **C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Review of basic fluid mechanics and the governing (Navier-Stokes) equations. Types of partial differential equations- hyperbolic, parabolic and elliptic. Traditional solution methods- method of characteristics, separation of variables, Greens function method. | 7 |
| **II** | Preliminary computational techniques: Discretisation, converting derivatives to discrete algebraic expressions, spatial derivatives, time derivatives. Approximation of derivatives, Taylor series expansion, general techniques. Accuracy of discretisation process-higher order vs lower order formulae. | 7 |
| **III** | Finite difference method: conceptual implementation, application to transient heat conduction problem. Convergence, consistency and stability of FD equation. | 7 |
| **IV** | Weighted residual methods: General formulation, Introduction to Finite Volume method. Finite Volume method: Equations with first derivatives and second derivatives. FV method applied to Laplace’s equation. | 7 |
| **V** | Finite Element method: Linear interpolation, quadratic interpolation, two dimensional interpolations. Application to heat transfer problems. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Computational Fluid Dynamics: The Basics with [Applications](http://www.indiastudychannel.com/resources/37094-Syllabus-University-Pune-M-E-Chemical-Engg-Semester-I-Computational-Fluid-Dynamics.aspx), John D.Anderson, Mc Graw Hill, 1995.  
2. Computational Flow Moeling for Chemical Reactor Engineering, V. V. Ranade, Process Engineering Science, Volume 5, 2001.  
3. Fundamentals of Grid Generation, Patrick Knupp and Stanly Steinberg, CRC Press,1994.  
4. Turbulence Modelling for CFD, D.C. Wilcox 1993,

**ME 411 FINITE ELEMENT ANALYSIS C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Stress strain and deformation relations, plane - stress, planes strain, Principles of minimum Potential Energy, principle of virtual work. | 7 |
| **II** | Stiffness method for steady state problems of discrete systems (Bar, trusses, one dimensional heat transfer system) Element stiffness matrix, Assembly of elements, global stiffness matrix and its properties, Node numbering, Displacement and force Boundary conditions, Transformations matrix, Gauss elimination method | 7 |
| **III** | Displacement - Based FEM for solid mechanics; Derivation of finite element equilibrium equations, Langrangian elements (I-D & 2-D elements); CST, rectangle, aspect ratio shape functions, lumping of loads, computability and convergence requirements. Stress calculations Isopohmetric Derivation of Stiffness matrices, bar and plane bilinear elements, Seredipity elements, natural coordinates, numerical integration, Co-continuity p and h refinement | 7 |
| **IV** | Variational Method: Variational Approach for known functional of field problems. Weighted Reidual Methods: Point collection, subdomain collocation, methods of least square, Galerkin. Application of these methods to one dimensional boundary value problems; Structures, fluid mechanics and heat transfer. | 7 |
| **V** | Finite Elements in Dynamics and Vibrations: Introduction, Dynamic Equations, Mass and Damping Matrics, Mass Matrics, Consistent and Diagonal, Damping, Natural frequencies and Mode Shapes. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Introduction to Finite Elements in Engineering, Tirupathi R. Chandrapatla and Ashok D. Belagundu, Prentice Hall of India. Ltd.
2. Comcept and Applications of Finite Element Analysis, Robert D. Cook. David S. Malkus. Michaiel E. Palesha, John Wiley & Sons.
3. Finite Element Procedures, Klaus Jurgan Bathe, Prentice Hall of India, New Delhi

**ME 412 OPERATIONS MANAGEMENT C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Operations Management:** An Overview - Systems concepts in Operations Management, Objectives in Operations Management, Operations management Decisions, Productivity concepts and measurement, Types of Production Systems. Aggregate planning and master scheduling Objectives of Aggregate planning Methods, Master Scheduling, Objectives, Master Scheduling Methods. | 7 |
| **II** | **Forecasting Demand:** Forecasting Objectives and uses, Qualities & Quantities methods of Forecasting, Opinion and Judgmental Methods Time Series Methods, Exponential Smoothing, Regression and Correlation Methods, Time Series Analysis, Application and Control of Forecasts. Capacity Planning: Capacity Strategy, aspects of Capacity Planning, Determination of Capacity Requirement, Types of capacity, Evaluation of Alternative plant size, Traditional Economic Analysis, Cost-Volume Profit Analysis. | 7 |
| **III** | Materials Management: Scope of Materials Management, Purchase system and procedure, purpose of Inventories, Classification of inventory, factors effecting inventory, inventory models, probabilistic models, inventory systems classification, selective inventory control, stores management, standardization codification and variety reduction. Material and Capacity Requirements Planning Overview, MRP and CRP, MRP Underlying concepts, system parameters, MRP Logic, CRP Activities. | 7 |
| **IV** | Scheduling and controlling Production Activities: Introduction, PAC Objectives and Date Requirements. Scheduling Strategy and Guidelines., Scheduling Methodology, Priority Control, Capacity Control | 7 |
| **V** | Just in Time (JIT) in manufacturing planning & control. Major-elements, Characteristics of Just in Time System pre-requisite for JIT manufacturing, Elements of Manufacturing, Eliminating Waste, Enforced, Problem Solving and Continuous Improvements, Benefits of JIT Purchasing, The Kanban System JIT implementation in Industries. Bottleneck scheduling and theory of constraints. Issues in choosing manufacturing technologies and strategies: product life cycle, standardization, simplification, diversification, value analysis. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Production and Operations Management, Adam Everett E.& Elbert Ronald J., PHI
2. production & Operation Management; S.N.Charry, TMH
3. Manufacturing planning and control systems; Berry W.L.Whybark D.C. Vollman T.E.galgotia Publication Pvt. Ltd.
4. Operations Management: Theory and Problems Monk J.G. McGraw Hill.

**ME – 415 FUNDAMENTAL OF ROBOTICS C (L, T, P) =3 (3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Introduction to Robotics -** Evolution of Robots and Robotics, Laws of Robotics, What is and What is not a Robot, Progressive Advancement in Robots, Robot Anatomy, Human Arm Characteristics, Design and Control Issues, Manipulation and Control, Sensors and Vision, Programming Robots, The Future Prospects, Notations. | 7 |
| **II** | **Coordinate Frames, Mapping and Transforms -** Coordinate Frames, Description of Objects in Space, Transformation of Vectors, Inverting a Homogeneous Transform, Fundamental Rotation Matrices | 7 |
| **III** | **Symbolic Modeling of Robots – Direct Kinematic Model -** Mechanical Structure and Notations, Description of Links and Joints, Kinematic Modeling of the Manipulator, Denavit – Hartenberg Notation, Kinematic Relationship between Adjacent Links, Manipulator Transformation Matrix. Introduction to Inverse Kinematic model | 7 |
| **IV** | **Robotic Sensors and Vision -** The Meaning of Sensing, Sensors in Robotics, Kinds of Sensors used in Robotics, Robotic vision, Industrial Applications of Vision-Controlled Robotic Systems, Process of Imaging, Architecture of Robotic Vision Systems, Image Acquisition. | 7 |
| **V** | **Robot Applications -** Industrial Applications, Material Handling, Processing Applications, Assembly Applications, Inspection Application, Principles for Robot Application and Application Planning, Justification of Robots, Robot Safety, Non-Industrial Applications. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Introduction to Robotics by John J. Craig,Pearson Education
2. Robotics by K.S.Fu,R.C.Gonzalez and C.S.G.Lee,McGraw-Hill
3. Robotic Engineering by Richard D.Klafter,Thomas A.Chmielewski and Michel Negin

**ME 451 CAD LAB. C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENTS**   1. Introduction & different features of the CAD Software 2. 2-D Drafting 3. 3-D Modeling 4. 3-D Advanced Modeling 5. Assembly modeling 6. Feature Modification and Manipulation 7. Detailing 8. Sheet Metal Operations   9. Surface Modeling  10. One Dimensional problems of Finite Element Method.  (These exercises may be performed by any of the following Advanced CAD Software such as Pro E /Unigraphics/ Aoto CAD Inventor) |

**ME 452 CAM LAB.**  **C (L, T, P) = 2(0, 0, 3)**

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| **LIST OF EXPERIMENTS**  1. To prepare part programming for plain turning and taper turning operation.  2. To prepare part programming for turning operation in absolute mode.  3. To prepare part program for threading operation.  4. To prepare part program for slot milling operation.  5. To prepare part program for drilling operation.  6. To prepare part program for multiple drilling operation in Z-axis.  7. To prepare part program for multiple drilling in X-axis.  8. To prepare part program for multiple drilling in X and Z axis using drilling cycle. |

**ME 453 REFRIGERATION AND AIR CONDITIONING LAB. C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENTS**   1. Study of a vapour absorbtion refrigeration system. (Electrolux refrigerator). 2. To determne the C.O.P. of vapour compression cycle. 3. To determine actual and theopritical C.O.P. of heat pump setup. 4. To study various refrigeration accessories. 5. Three Ton air-conditioner performance test. 6. Energy analysis of parallel and counter flow heat exchanger. |

**ME 454 PRODUCTION PROCESS LAB-III**   **C (L, T, P) = 2(0, 0, 3)**

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| **LIST OF EXPERIMENTS**  1. NC - Lathe machine, Tool holders and Practice on the manual control  2. To study the capstan lathe, tool holders and attachments.  3. To prepare the given job as drawing  4. To prepare a process chart and flow diagram for the above job  5. Design a Die & Punch set for Blanking & Punching equation for the given job in drawing and prepare the job.  6. To measure flatness and surface defects in the given test piece with the help of monochromatic check light and optical flat.  7. To plot the composite errors of the given set of the gears using composite gear tester. To measure and temperature at the tool point chip thermocouple technique.  8. To perform alignment test on a centre lathe.  9. To calibrate pneumatic comparator and measure taper of a given work peice.  10. To measure the taper of a given test piece with the help of a single bar and compare it. |

**ME – 460 PRODUCT DESIGN AND DEVELOPMENT LAB. C (L, T, P) = (0, 0, 3)**

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| **LIST OF EXPERIMENTS**  Stress Analysis - Analytical/Theoretical  Stress Analysis - Experimental/Analogies  Designing for Uniform Strength.  Design for regidity and material saving - Ribs etc.  Problems on optimum design.  Design for Production; Standardization, preferred numbers  Design of different fit joints: Clearance/Transition/Interface.  Human factors in engineering design. Design of work environment.  Computer/Software in Production Design and Development  Project on Product Design and Product Development; value analysis, economics of new product design. |

**ME 501 DESIGN OF THERMAL SYSTEMS C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total Contact Hrs. 30** |
| I | Mathematical Modeling of thermal Systems:Development of equations based on number-processing operation and physical laws for simulation and optimization of thermal systems | **6** |
| II | The art of equation fitting to performance data; Development of performance equations for heat exchangers, distillation separators and turbo machinery | **6** |
| III | Simulation of thermal Systems: Uses of system simulation, classes of simulation; Information-flow diagrams; sequential and simultaneous calculations | **6** |
| IV | simulation of continuous, deterministic steady-state systems, e.g. gas turbine system; simulation of dynamic behavior of thermal systems | **6** |
| V | Optimization of Thermal Systems:Optimization criteria; use of Lagrange Multipliers, search methods, dynamic programming and geometric programming for optimum design of thermal systems | **6** |

**Reference Books:**

1. W.F. Stocker; “Design of thermal Systems”, McGraw Hill International, 1989.
2. B.K. Hodge, “Analysis and Design of Energy Systems”, Prentice-Hall Inc., 1990.

**ME 502 DESIGN OF COMBUSTION SYSTEM C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total Contact Hrs. 30** |
| **I** | Types Of Fuels: Composition-physical, chemical and thermodynamic properties. Proportion of reactants and cooled products: Individual hydro carbons – volumetric fuel blends gravimetric fuel and mixture calculation from product analysis-physical characteristics of mixtures and products | **6** |
| **II** | Proportions Of Hot Products: Kinetic equilibrium – equilibrium product composition in hydrocarbon combustion – Fuel rich mixture dissociation – general mixture dissociation | **6** |
| **III** | Combustion Energies: Standard energy of formation-standard energy of reaction calorific value-maximum useful work.  Combustion Temperatures: Sensible energy – determination of maximum temperature in steady flow – Influence of fuel type and operating parameters.  Combustion Efficiencies: Work transfer applications in now-flow – heat transfer applications in steady flow- work transfer applications in steady flow.  Combustion Control Systems: Controlling fuel flow- controlling air flow- As pollution control flow | **6** |
| **IV** | Design Of Burners: Gas and oil burners- operations characteristics – calculation of gas flow rate; pressure drop efficiency | **6** |
| **V** | Design of furnaces and chimneys, steam generating devices – stokers, fluidized bed combustion – types – performance analysis | **6** |

**Reference Books:**

1. Samir Sarkar, Fuels and Combustion, Orient Longman, 1990.
2. E.M. Goodger, Combustion Calculations, The Macmillan Press Ltd.,1977.
3. Francis G. Shinskey, Energy Conservation through Control, Academic press, 1978.

**ME 503 ELECTRICAL POWER GENERATION, TRANSMISSION AND DISTRIBUTION C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total Contact Hrs. 30** |
| **I** | Basic Concept: Power in Single Phase, AC Circuits, Complex Power, Power Triangle, Power in Balanced Three- Phase Circuit. Phasor Diagram. Types of Conductors, Skin Effect, Corona Losses, Basics of Transmission & Distribution System, Layout of substation and component of substation | **6** |
| **II** | Inductance of Transmission Lines, Capacitance of Transmission Lines, Representation of Power Systems, Bundle conductors. Performance of Short, Medium and Long Transmission Lines, Transmission Line Losses, Underground Cables, Voltage Regulation. | **6** |
| **III** | Distribution: Radial and Ring Type Distribution Systems, Kelvin’s Economic Depreciation and Tariffs, economics of generation, power factor Improvement Law, Distribution Network, Distribution and feeder, Distribution losses. | **6** |
| **IV** | Generation: Various Method of Electrical Generation, Thermal Power Plants, Nuclear Power Plant | **6** |
| **V** | Major equipment of power plant, Hydroelectric Power Plants, Wind Power Plants | **6** |

**Reference Books:**

1.Gupta B.R., “Power System Analysis and Design”, S.Chand, New Delhi, 2003  
2.Singh S.N., “Electric Power Generation, Transmission and Distribution”, Prentice Hall of India, New Delhi, 2002  
3. Luces M. Fualkenberry, Walter Coffer, “Electrical Power Distribution and  
 Transmission”, Pearson Education, 1996  
4. Hadi Saadat, “Power System Analysis”, Tata McGraw Hill Publishing Company,2003  
5. Wadhwa C.L, “Electric Power Systems”, New Age International (P) Ltd., 2000.  
6. Turan Gonen “Electric Power Distribution Engineering”, CRC Press, 2nd Edition, 2007

**ME 504 WIND ENERGY UTILIZATION C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total Contact Hrs. 30** |
| **I** | Wind Characteristics: Sources of wind, wind hazards, sitting in flat terrain, sitting in non-flat terrain, ecological indicators of site suitability, site analysis methodology. Wind Energy System: Energy from the wind, work-energy and power, different types of rotors, over speed control, electric power generation and storage. Water pumping systems – major components – lift – transport – storage sitting and sizing | **6** |
| **II** | Applied Aerodynamics: Role of aerodynamics in wind power – cross wind axis machines – wind axis machines – general momentum theory – vortex strip theory, forces and moments due to vertical wind gradient | **6** |
| **III** | Towers And Systems Installation: Specific types of tower, Tower height, Tower and systems raising, wiring, lightning protection, Installation, maintenance of other equipments | **6** |
| **IV** | Energy Conversion And Storage: Synchronous inverters, dc/ac inverters, battery storage, battery characteristics, battery system installation, other types of storage systems. Wind Energy Conversion Systems: Specifications and characteristics of commercial water-pumping wind mills, electricity producing wind energy. Conversion systems, selection of systems-case study. Environmental aspects | **6** |
| **V** | Applications: Potential application of wind energy conversion systems, residential applications, wind power use in agriculture | **6** |

**Reference Books:**

1. V. Daniel Hunt, Wind Power, Van Nostrand Reinhold Company, 1981.
2. Wind Energy Basics: A Guide to Small and Micro Wind Systems; Paul Gipe, Chelsea Green Pub Co; April 1999.

**ME 505 SOLAR POWER ENGINEERING C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total Contact Hrs. 30** |
| **I** | Solar Radiation: Solar Radiation, instruments for measuring solar radiation, solar radiation geometry, empirical equations, solar radiation on tilted surfaces. Solar time and equation of time, pyranometer & pyrheliometer, solar spectrum ,selective surfaces. | **6** |
| **II** | Liquid Flat Plate Collectors: Basic elements, performance analysis, transmissivity - absorptive, heat transfer Coefficients and Correlations, Collector efficiency and heat removal factors, effects of various parameters, types of other liquid flat-plate Collectors, transient analysis |  |
| **III** | Solar Air Heaters: Type of air heaters, solar performance analysis of a Conventional air heater, other types of air heater, Concentrating Collectors: Type of Concentrating Collectors and their general characteristics. | **6** |
| **IV** | Thermal Energy Storage: Basic methods, Sensible heat storage – liquids- solids-analysis, latent heat storage, thermo chemical storage. solar cooker & performance, animal feed cooker. | **6** |
| **V** | Solar Refrigeration: absorption based solar refrigeration technologies .photovoltaics: fundamental of photovoltaic conversion, semiconductor materials, photon energy, solar cell, material used in solar cell, polycrystalline & amorphous silicon, current voltage characteristics. | **6** |

**Reference Books:**

1. Krith F. and Krelder J.F., Principles of Solar Engineering**,** McGraw hill book company, 1978.
2. John A, Duffie, William A. Beckman ; Solar Engineering of thermal processes, , John Wiley and Sons, 1991.
3. Garg H.P. and Prakash J., Solar energy fundamentals and application, TATA McGraw Hill Publishing company limited, New Delhi, 2000.
4. Sukhatme S.P., Solar Energy Principle of thermal collection and storage, TATA McGraw Hill Publishing company limited, New Delhi, 1996

**ME 506 POLLUTION CONTROL TECHNOLOGIES C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total Contact Hrs. 30** |
| **I** | Introduction: Introduction to air pollution, classification of pollutants, their effects, impact of environment on human | **6** |
| **II** | Air Pollution Sources: Mobile and stationary sources, types of plume dispersion mechanisms, air quality measurement concepts | **6** |
| **III** | Control devices for particulate contaminants: gravitational settlement, centrifugal and wet collectors, fabric filters, cyclon separators, electrostatic precipitators  Control devices for gaseous contaminants from stationary sources: adsorption, adsorption, condensation, combustion based pollution control systems | **6** |
| **IV** | Automotive Emission control: Types and construction of catalytic converters, emission control through operating parameters and engine design, alternative fuels for emission reduction | **6** |
| **V** | Laws and regulations: National and international standards for mobile and stationary sources of air pollution | **6** |

**Reference Book:**

1. Howard S. Peavy, Donald Rowe; Environmental Engineering; Tata Mc-Graw Hill, 1989.

**ME 507 MODELING & PLANNING OF ENERGY SYSTEM C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total Contact Hrs. 30** |
| **I** | Introduction: Energy policy analysis; need for energy modeling; classification of energy models; types of computer based tools for energy planning; national and rural energy planning; sect oral energy planning. | **6** |
| **II** | Input-Output Models: Types and Characteristics of I-O models; use of I-O models; I-O transaction tables; method of estimation and sources of data; mathematical expression on the methodology of construction of I-O tables; case studies. Econometric Models: Statistical estimation techniques; time series; regression analysis; advantages and limitations of econometric models; elastic ties of energy demand; case studies | **6** |
| **III** | Optimization Models: Linear and non-linear optimization models; advantage and limitation of optimization models; case studies of linear optimization models for national and rural energy planning | **6** |
| **IV** | Process Analysis Models: End-use models; process analysis models for industrial, domestic and transport energy conservation; advantage and limitations of process analysis models; case studies | **6** |
| **V** | System Dynamic and Other Simulation Models: Concept of closed system; causal loop diagram; flow diagram and system equations; dynamic behavior of energy systems; advantages and limitations of simulation models; case studies | **6** |

**Reference Books:**

1. Richard de Nenfville, “ Applied Systems Analysis” Mc Graw Hill International Eds. 1990.
2. J.P. Weyant & T. A. Kuczmowski “Engineering- Economy Modeling: Energy Systems” Energy-The International Issue (Special issue an energy modeling), Pergaman Press. Vol. 15, No. ¾ PP 145-715, 1990.
3. J. W. Forrester, “ Principle of Systems” MIT Press, 1982.
4. Rene Codoni, Hi- Chun Park, K.V. Ramani, “ Integrated Energy Planning: A Manual” Volume on policy planning, Asian & Pacific Development Center, Kuala Lumpur 1985.

**ME 508 ENERGY CONSERVATION (ELECTRICAL) C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total Contact Hrs. 30** |
| **I** | Electrical Systems: Basis of Energy and its various forms: Electrical Basis-DC & AC, currents active power, reactive power and apparent power, star, delta connection, electricity billing, electrical load management, maximum demand control. Power Factor: Power factor, Power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors and energy conservation opportunities | **6** |
| **II** | Electric Motors: Types, losses in induction motors, motor efficiency, factor affecting motor performance, rewinding and motor replacement issues, energy saving opportunities in motors, energy efficient motors, soft starter with energy savers | **6** |
| **III** | Transformers and Electric Distribution:Types of transformers, transformer losses, energy efficient transformers, factor affecting the performance of transformers and energy conservation opportunities, cables, switch gears, distribution losses, energy conservation opportunities in-house electrical distribution system. Compressed Air Systems:Types of air compressors, compressor efficiency, efficient compressor operation, compressed air systems components, capacity assessment, leakage test, factors affecting the performance and energy savings opportunities | **6** |
| **IV** | Pumps and Pumping System: types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities. Fans & Blowers: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities | **6** |
| **V** | Lighting System: Light source, choice of lighting, energy efficient lighting controls Luminance requirements and energy conservation avenues. Energy Conservation through: Variable Speed Drives, Occupancy Sensors, Energy Savers, Day Lighting | **6** |

**Reference Books:**

1.H. Partab, ‘Art and Science of Utilisation of Electrical Energy’, Dhanpat Rai and Co, New Delhi, 2004.  
2.Gopal.K.Dubey, ‘Fundamentals of Electrical Drives’, Narosa Publishing House, New Delhi, 2002.  
3.C.L. Wadhwa, ‘Generation, Distribution and Utilization of Electrical Energy’, New Age International Pvt.Ltd, 2003.

**ME 509 ALTER NATIVE FUELS IN I.C.ENGINES C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total Contact Hrs. 30** |
| **I** | Introduction: Need of alternative gaseous fuels, future automotive gaseous fuels, hydrogen, CNG, LNG, and Producer gas, biogas, LPG. Stochiometric air fuel ratio, Physical properties of different gaseous fuels, mode of engine operations, spark ignition and dual fuel mode, multi fuel mode, combustion and performance of engines, specific problems, safety and environmental aspects, economic aspects, production | **6** |
| **II** | Use of alcohol in four stroke spark ignition engines and diesel engines, use of alcohol in two stroke engines, use of bio diesels, combustion and performance of engines, stochiometric air fuel ratio, specific problems, safety and environmental aspects, economic aspects, production. | **6** |
| **III** | Impacts: Impact of alternative fuels on engine test and test procedures, guidelines for emission measurements, emission norms for engines using alternative fuels | **6** |
| **IV** | Legal Aspects: Legal aspects of blending alternative fuels into conventional liquid fuels, properties of blends, comparison of neat versus blended fuels, fuel testing | **6** |
| **V** | Computer simulation: Computer simulation of engines using alternative fuels | **6** |

**Reference Books:**

1. Future automotive fuels, Edited by Joseph M. Colucci and Nicoles C. Gallopoulos, Plenum press, New York
2. Dual fuel engines, edited by R.L.Evans, Plenum Press, 1987
3. SAE hand book, volume III, Engines, fuels, lubricants, emissions and noise
4. Automotive fuels and fuel systems, volume II, T.K.Garrett, Pantech Press, London
5. Gaseous fuels for transportation I, proceedings of the conference held at Vancouver, british Columbia, Canada, 1987
6. Pandel U, Poonia M.P.; Energy Technologies for Sustainable Development,.,Prime Publishing House Gajiabad, 2003.

**ME 510 ENERGY MANAGEMENT C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total Contact Hrs. 30** |
| **I** | Introduction to Energy Management: Aims and approaches of auditing, types of energy audit, energy indices in residential, commercial and industrial sector, data collection | **6** |
| **II** | Energy in Manufacturing: Energy and environmental analysis of products, energy consumption in manufacturing, laws of energy and materials flow.  Energy in Residential Sector: Supply of energy for rural and urban housing, fuel substitution, efficiency improvement of domestic appliances | **6** |
| **III** | Instrumentation for Energy Management: Measurement of heat flux, radiation, psychometric variables, fluid flow & velocities, data analysis | **6** |
| **IV** | Life Cycle Analysis: LCA of energy systems, concept of life cycle costing and its use | **6** |
| **V** | Demand Side Management: Principles of DSM, rules and tools of DSM, fundamentals of demand response, DSM tools and practices | **6** |

**Reference Books:**

1. C.B. Smith, Energy Management Principles, Pergamon Press, New York, 1981.
2. Hamies, Energy Auditing and Conservation: Methods, Measurements, Management & case study, hemishpere, Washington, 1980.
3. Diamant R.M.,Total Energy, Pergamon Press, Oxford, 1970.

**ME 511 Advance Manufacturing Processes C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total**  **Contact**  **Hrs. 40** |
| **I** | **Principles of Casting**  Principles of Casting – metals, alloys, eutectics and plastics; Mechanism of melting and solidification, grain growth and structure, shrinkage defects.  Mold filling – fluidity and turbulence, filling under gravity and pressure; filling defects; gating design, Injection Molding, Simulation of Mold filling and Solidification. | 8 |
| **II** | **Fundamentals of Fusion Welding**  Fundamentals of fusion welding processes – analysis of heat source, types of metal transfer, weld pool characteristics, solidification mechanisms in fusion zone, heat affected zone characteristics, types of weld joint, distortion and residual stresses, weld defects, destructive and non-destructive testing of welds. | 8 |
| **III** | **Non Conventional Machining Processes**  Introduction and need of Non-conventional machining processes, Principle, Theory of material removal, Process parameters, Advantages, limitations and applications of Ultrasonic machining, Electro discharge machining, Laser beam machining and Electrochemical machining.  **Special processes:** Micro machining, Nano-technology, molecular dynamic analysis, dry electro discharge machining, electro discharge chemical machining, vacuum coating, Ballistic machining, unit head machining, hot machining. | 8 |
| **IV** | **Advances in Material Forming**  Macroscopic plasticity and yield criteria, plastic instability, strain rate and temperature ,slab analysis, upper bound analysis, slip line field theory, plastic anisotropy, numerical analysis of material forming processes | 8 |
| **V** | **Unconventional forming processes**  High energy rate forming, electromagnetic forming, explosive forming, high speed hot forging, high velocity extrusion, high speed forming machines, peen forming, study of various process parameters. | 8 |

**Reference Books:**

1.B.H. Amsteal, Philip F. Ostwald and Myron L. Begeman, Manufacturing Processes",John Wiley & Sons, eighth edition.

2. G.F. Benidict "Advanced Manufacturing processes", Marcel Deker Publisher.

3. Lancaster,J. F., Metallurgy of welding, brazing and soldering, George Allen & Unwin, London, 1985

4. Degarmo, “Materials and Processes in Manufacturing”, 9th edition, Wiley Students Edition.

5. P. N. Rao, “Manufacturing Technology”, Tata McGraw Hill.

6. Regis Blondeau, “Metallurgy and Mechatronics of Welding”, ISTE.

7. American Soc. For Metals, Metals Handbook, 10th Edition, Vol 15, on Metal Forming,ASM, Metals Park, Ohio, 1989.

8. Eary, D. F., and Reed, E. A., Techniques of Press working Sheet metal and Engineering.

9. Willium F. Hosfford and Robert Caddell, Metal forming: Mechanics and Metallurgy.

10. Raj, Shankar, Bhandari, “Welding Technology for Engineers”, Narosa Publication House Pvt. Limited.

**ME 512 ENGINEERING ECONOMICS & ACCOUNTING C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total**  **Contact**  **Hrs. 40** |
| **I** | **Introduction:** Definition, nature and scope of Managerial Economics, Managerial Economics and Microeconomics – Managerial, Economics and Macro-economics - Applications of Economics.  **Demand Analysis:** Determinants of Market Demand – Law of Demand - Elasticity of Demand - Measurement and its use - Demand Forecasting – Techniques of Demand Forecasting. | 8 |
| **II** | **Pricing and output determination**  Pricing decisions under different market forms like perfect competition, monopoly, oligopoly -Pricing Methods - Pricing in Public Sector, Pricing Methods - Pricing in Public Sector undertakings and co-operative societies. | 8 |
| **III** | **Cost Benefit Analysis**  Steps in cost benefit analysis - Justification for the use of cost benefit analysis, Private Vs. Public Goods - Government investment, Overall resource allocation. | 8 |
| **IV** | **Cost management**  Classification of cost, type of costing, absorption and marginal costing, break even analysis, standard cost accounting, cost-volume profit analysis. | 8 |
| **V** | **Investment appraisal methods**  Types of investment proposals, project report, methods of appraisal, discounted cash flow, net present value method, internal rate of return, profitability index, depreciation, limitation of appraisal method, forecasting business changes, use of index number and growth analysis. | 8 |

**Reference Books:**

1. D.Salvatore , “Managerial Economics in a global economy” Tata McGraw Hill

2. Reckie and Crooke., “ Managerial Economics” Prentice Hall; 4 edition.

3. Khan M.Y., Jain P.K , “Management Accounting”, Tata Mc Graw Hill, 1995.

4. Horngren C.T., Datar S.M., Foster G.M., “Cost Accounting : a managerial emphasis”,Pearson Education, 2002.

**ME 513 METAL FORMING ANALYSIS & TECHNOLOGY C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total**  **Contact**  **Hrs. 40** |
| **I** | **Introduction:** Stress-strain relations in elastic and plastic deformations, yield criteria for ductile metals, work hardening and anisotropy in yielding. Flow curves, elements of theory of plasticity, application of theory of plasticity for solving metal forming problems using slab method, upper and lower bound methods, slip line field theory, extremism principles, and effect of temperature and strain rate in metal working. | 8 |
| **II** | **Tube making:** Tube making and deep drawing: introduction, plug drawing with a conical die, load determination, tandem drawing of tubes on a mandrel, tube sinking, concept of tube production by rolling and extrusion methods.  **Exclusion:** Extrusion: round bar extrusion through a conical die, flat strip extrusion through dies of constant angles, impact extrusion, and hot extrusion of steels. | 8 |
| **III** | **Rolling:** Rolling of flat slabs and strip: Cold rolling and hot rolling, roll-pressure determination, rolling with no external tensions, rolling with front and back tensions.  **Forging:** Forging: Introduction, determination of plain strain compression load, weight friction condition, inclined platen, thin strip, load evaluation for forging a flat circular disc. | 8 |
| **IV** | **Frictions lubrication:** Friction and lubrication in metal working, introduction, influences of friction in metalworking processes, lubricants used for different metalworking processes.  **Unconventional Forming:** Introduction to unconventional forming processes like hydrostatic extrusion, hydro-forming of sheets and tubes, powder forming. | 8 |
| **V** | **Drawing:** Drawing of a flat strip and round bar, determination of drawing load, drawing with wedge shaped dies, cylindrical dies, cylindrical rod drawing with a conical die analysis of the processes and maximum possible reduction. | 8 |

**Reference Books:**

1. Principles of Industrial Metal working Processes ,G. B. Rowe, CBS.
2. Manufacturing Science, Ghosh & Malik, East West.
3. Foundry, forming and welding, P.N. Rao, TMH.

**ME 514 TOOL AND CUTTER DESIGN C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total**  **Contact**  **Hrs. 40** |
| **I** | **Classification of cutting tools:** Various machining operations and the tools required to carry out these operations: principle elements of various cutting tools; single point cutting tool geometry in ASA, ORS & NRS systems.  **Tool Materials:** Properties of cutting tool materials, development of cutting tool materials, composition, production process and application of different cutting tool materials viz. High carbon steel, HSS, carbides, Ceramics, CBN, UCON, diamond, etc. | 8 |
| **II** | **Design of Single point cutting tools:** Cutting parameters of a lathe, different turning operations and cutting tools used for these operations. Classification of single point cutting tools: solid, carbide tipped tools, geometrical parameters of a single point cutting tool, design procedure of single point cutting tool, re-sharpening of single point cutting tools.  **Form Tools:** Purpose and types, design procedure and their sharpening. | 8 |
| **III** | **Drill design:** Drilling operations, Cutting parameters of drilling operations, different drilling operations and cutting tools used for these operations, Types of drills, solid, carbide tipped drills, geometrical parameters of a twist drill, design procedure of a twist drill, resharpening of the twist drill. | 8 |
| **IV** | **Milling Cutter Design:** Milling operations, milling cutting parameters, different milling operations and cutting tools for these operations, Types of milling cutters, solid, and carbide tipped cutter; geometrical parameters of a milling cutter, design procedure of a disc type milling cutter, re-sharpening of the cutters. | 8 |
| **V** | **Broach design:** Broaching operation and its advantages, broaching cutting parameters,types of broaches, solid, and carbide tipped broaches; design procedure of a broach, resharpening of the broach.  **Hob design:** Gear nomenclature, construction of involutes profile, hobbing operation and its advantages, geometrical parameters of a hob, design procedure of a hob. | 8 |

**Reference Books:**

1. Tool Design, Donaldson, McGraw Hill
2. Cutting tools, Prakash Joshi, Wheeler Publishing
3. Metal Cutting theory & practice, Arschinow & Alearoev, Mir publication.

**ME 515 QUALITY ENGINEERING AND MANAGEMENT C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total**  **Contact**  **Hrs. 40** |
| **I** | Statistical concepts in quality control, Graphical representation of ground data, Continuous & discrete probability distributions, central limit theorem, Chi-square test, Introduction to quality control, process control and product control, chance and assignable causes of quality variation, advantages of Shewart control charts. | 8 |
| **II** | Process control charts for variables, Fixation of control limits, Type I and Type II errors Theory of runs, interpretation of out of control points, Probability limits, initiation of control charts, trial control limits, determination of aimed-at value of process setting, rational Method of sub grouping, control chart parameters, control limits and specifications limits, natural tolerance limits, relationship of process in control to upper and lower specifications limits, process capability studies. | 8 |
| **III** | Control charts:Special control charts for variables, Group control charts, Arithmetic moving X ad R charts, Geometric Moving charts, X control charts with reject limits, Steady trend in process average with cost dispersion, trend chart with sloping limits, variable subgroup size CUSUM or cumulative sum control chart. | 8 |
| **IV** | Sampling plans:Probability theory, hyper-geometric, Binomial and Poisson distributions, Acceptance inspection 100% inspection, no Inspection and sampling inspection, Operating characteristic curve, effect of sample size and acceptance number. Type a and Type B ,O.C curves, single, Double and multiple sampling plans, Sequential sampling plans, Acceptance/rejection ad acceptance/rectification plans, procedure’s risk ad consumer’s risk, difference quality level, Average outgoing quality curve, average outgoing quality limit,  quality protection offered by a sampling plan. average sample number, Design of single, double and sequential plans. | 8 |
| **V** | Quality systems:Economics of product inspection. real point, selection of economic sampling plans, Product quality ad reliability, failure data analysis ad life testing, elements of total quality control quality assurance, ISO9000 quality system. | 8 |

**Reference Books:**

1. Statistical Quality Control, Grant & Leaveworth, McGraw Hill
2. Quality Control & Industrial Statistics, Duncan, Irwin Press
3. Quality Control Handbook, Juran, McGraw Hill
4. Quality Control, Hansen, Prentice Hall
5. An Introduction to reliability & control, Thomason, Machinery Publishing
6. Total Quality Control, A.V. Taylor, McGraw-Hill
7. Quality Control Systems, J.R. Taylor, McGraw-Hill

**ME 516 MANUFACTURING MANAGEMENT C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total**  **Contact**  **Hrs. 40** |
| **I** | **Scope of Manufacturing Management** History and development of Manufacturing Management - Contribution of various pioneers beginning from Division of Labor to Quality Revolution and Environmental Control. Manufacturing Management - Nature, Scope, Importance and Functions  **Production Planning & Control** Functions of Production Planning & Control (PPC), Scheduling techniques - Gantt Charts, analytical techniques, Documentation - Production Work Order. Introduction to PERT/CPM, Network Crashing. | 8 |
| **II** | **Advanced Topics in Production Management** Concept of world-class manufacturing, quality management system, manufacturing challenges of information age, lean and agile manufacturing, reconfigurable manufacturing, green production, computerized production management system. | 8 |
| **III** | **Organizational Behaviour**  Definition - Importance - Historical Backgrourud, Fundamental Concepts of OB - 21st Century corporate - Different models of OB i.e. autocratic, custodial, supportive, collegial and SOBC Personality & Attitudes - Meaning of personality - Development of personality Nature and dimensions of attitude - Job Satisfaction - Organizational Commitment. | 8 |
| **IV** | **Motivation and Leadership**  Motivation - Motives - Characteristics - Classification of motives - Primary Motive, Secondary motives - Morale - Definition and relationship with productivity – Morale Indicators; Theories of Work Motivation - Maslow's theory of need hierarchy Herzberg's theory of job loading Leadership - Definition -Importance - Leadership Styles - Models and Theories of Leadership Styles. | 8 |
| **V** | **Group Dynamics and Team Working**  Theories of Group Formation - Formal and Informal Groups, their interaction - Importance of teams - Formation of teams - Team Work. Conflict management - Traditional vis-à-vis Modern view of conflict - Stress management, Conflict Process - Strategies for encouraging constructive conflict - Strategies for resolving destructive conflict. | 8 |

**Reference Books:**

1. Fred Luthans, Organizational Behaviour

2. Saxena, Principles and Practices of Management

3. Krajewski, Operations Management, 5th Ed.

4. Panneerselvam, Production & Operations Management

5. Adam & Ebert, Production & Operations Management

**ME 517 RELIABILITY AND FAILURE ANALYSIS C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total**  **Contact**  **Hrs. 40** |
| **I** | **Introduction:** Basic Probability-concept and various distributions, Concept of Reliability and analysis of various configurations of assemblies and sub-assemblies. Series, Parallel and other grouping. System reliability, Set theory, optimal Cut Set and Tie Set, ‘stardelta’ method, matrix method etc. | 8 |
| **II** | **Product Failure Theory:** System reliability through ‘Even Tree’ analysis and Fault Tree Analysis (FTA),Failure Modes and Effects Analysis (FMEA), Failure Modes,Effect and Criticality Analysis (FMECA).R.P.N, Graph theory, etc. | 8 |
| **III** | **Reliability Prediction Models:** Series and parallel systems – RBD approach-Standy systems – m/n configuration – Application of Baye’s theorem – cut and tie set method – method – Markov analysis. Optimal allocation of component reliability to achieve maximum system reliability – various techniques and methods such as Proportional, Conditional, Agree, Arinc, etc. | 8 |
| **IV** | **Reliability evaluation:** Concept of loading roughness, probability in design including evaluation of safety margin. Reliability of Engineering Design; Mean, Median & K statistics for Reliability evaluation (non parametric,Short Sample). | 8 |
| **V** | **Reliability Management:** Reliability testing – Reliability growth monitoring - Non parametric methods – Reliability and life cycle costs – Reliability allocation - Replacement model.  **Case Studies:** CDiagnostic maintenance through ferrography, Vibration Signature, SOAP and other programme. Case studies done in Indian perspectives using Short Sample, nonparametric reliability. | 8 |

**Reference Books:**

1. Gupta AK, Reliability engineering and tero-technology, Macmillan India Ltd, Delhi
2. Srinath LS, Reliability Engineering, Affiliated East-West Press Pvt Ltd.Delhi
3. O’Connor PDT,Practical Reliability Engineering, John Wiley & Sons Ltd, Singapore
4. Modarres, “Reliability and Risk analysis”, Mara Dekker Inc., 1993.
5. John Davidson, The Reliability of Mechanical system, The Institution of Mechanical Engineering, London, 1998.
6. Smith C.O.” Introduction to Reliability in Design” McGraw Hill, London.”Reliability Engineering and Risk Analysis”,2nd edition Taylor & Francis.

**ME 518 INDUSTRIAL AUTOMATION C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total**  **Contact**  **Hrs. 40** |
| **I** | **Automation of assembly lines**  Concept of automation, mechanization and automation, Concept of automation in industry, mechanization and automation, classification, balancing of assembly line using available algorithms. Transfer line-monitoring system (TLMS) using Line Status, Line efficiency. Buffer stock Simulation in assembly line. | 8 |
| **II** | **Automation using hydraulic systems**  Design aspects of various elements of hydraulic systems such as pumps, valves, filters, reservoirs, accumulators, actuators, intensifiers etc. Selection of hydraulic fluid, practical case studied on hydraulic circuit design and performance analysis. Servo valves, electro hydraulic valves, proportional valves and their applications. | 8 |
| **III** | **Automation using pneumatic systems**  Pneumatic fundamentals - control elements, position and pressure sensing -logic circuits -switching circuits - fringe conditions modules and these integration - sequential circuits -cascade methods - mapping methods – step counter method - compound circuit design -combination circuit design. Pneumatic equipments - selection of components – design calculations -application - fault finding – hydro pneumatic circuits - use of microprocessors  for sequencing - PLC, Low cost automation - Robotic circuits. | 8 |
| **IV** | **Automation using electronic systems**  Introduction, various sensors, transducers, signal processing, servo systems, programming of microprocessors using 8085 instruction, programmable logic controllers.  **Automated work piece handling**  Working principles and techniques, job orienting and feeding devices. Transfer mechanisms-automated feed cut of components, performance analysis. Uses of various types of handling systems including AGV and its various guiding technologies. | 8 |
| **V** | **Introduction to robot technology**  Robot physical configuration and basic robot motions, Types of manipulators- constructional features, servo and non servo manipulators. Feedback systems and sensors- encoders and other feed back systems, vision, ranging systems, tactile sensors. Programming languages- description of VAL and other languages. Artificial intelligence- legged locomotion and expert systems. | 8 |

**Reference Books:**

1. Groover, M.P., CAD/CAM- Prentice Hall

2. Yoram Koren, Robotics for Engineers- McGraw Hill 1992

3. Paul, R.P., Robot Manipulators- MIT Press 1993

4. Pressman R.S, Numerical Control and CAM-. John Wiley 1993 Williams

5. Shearer P., Fluid Power Control John Wiley

6. Antony Espossito, " Fluid power with Applications ", Prentice Hall, 1980.

7. Dudleyt, A.Pease and John J.Pippenger, " Basic Fluid Power ", Prentice Hall, 1987.

8. Andrew Parr, " Hydraulic and Pneumatics ", (HB), Jaico Publishing House, 1999.

9. Bolton. W. " Pneumatic and Hydraulic Systems ", Butterworth - Heineman, 1997.

**ME 519 CAD/CAM/CIM C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total**  **Contact**  **Hrs. 40** |
| **I** | **Computer aided design:** Geometric modeling, model structure organization, database creation, wire frame modeling, solid modeling, surface modeling, parametric modeling, variational modeling, hybrid modeling. Types and mathematical representation of curves, surfaces and solids.  Geometric transformations, visual realism, computer animation, mechanical assembly, mass property calculations. | 8 |
| **II** | **Computer aided manufacturing:** Revision to NC/CNC/DNC and its role in flexible manufacturing systems and CIMS, Elements of CNC systems, CNC part programming, computer assisted part programming, NC program generation from CAD models, tool path generation and verification, recent  developments in CNC machine tools. | 8 |
| **III** | **Computer aided engineering analysis:** Introduction to finite element analysis, need for finite element analysis in CAD/CAM system, Steps in finite element analysis, second order differential equation in onedimension  applications such as discrete systems, heat transfer, fluid mechanics, plane  trusses. Introduction to advance topic in finite element analysis such as three-dimensional problems and non-linear problems. Use of engineering analysis software. | 8 |
| **IV** | **Computer aided process planning:**Advantages of CAPP, variant type CAPP system, generative approach, hybrid approach, geometric modeling for process planning, computer programming languages for CAPP.  **Computer aided shop floor control:** Computer aided production planning and control, computer aided material requirement planning, factory data collection system, computer process monitoring, computer aided  quality control. | 8 |
| **V** | **Computer Integrated manufacturing**  **Cellular manufacturing system:** Introduction to GT, benefits, part families, part classification and coding, product flow analysis, cellular manufacturing systems, virtual cell system, quantitative analysis in cellular manufacturing.  **Flexible manufacturing system:** Building blocks of FMS, applications, benefits, FMS layout, FMS planning and implementation issues, quantitative analysis of FMS. Computer aided material handling system, computer control system. | 8 |

**Reference Books:**

1. Mikell P. Grover, “Automation, Production Systems and Computer-Integrated Manufacturing”, Pearson Education, New Delhi.
2. P. Radhakrishnan and S. Subramanyan “CAD/CAM/CIM” Willey Eastern Limited, New Delhi.
3. Michael Fitzpatrick, “Machining and CNC Technology”, Tata McGraw Hill.
4. Mikell P. Grover and Enory W. Zimmers Jr. “CAD/CAM”, Pearson Education, New Delhi.
5. Steve Krar, Arthar Gill “CNC Technology and Programming”, McGraw Hill Pub. Company, New Delhi.
6. P.N. Rao N.K. Tewari et al “CAM” Tata Mc Graw Hill Pub. New Delhi.
7. David Bedworth, "Computer Integrated Design and Manufacturing", TMH, New Delhi
8. Zeid Ibrahim, “CAD/CAM Theory and Practices”, McGraw Hill International Edition.

**ME 520 SUPPLY CHAIN MANAGEMENT C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total**  **Contact**  **Hrs. 40** |
| **I** | **Introduction**  Objectives of Supply Chain Management (SCM), 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 SCM.  **Supply chain strategies**  Evaluation of supply chain strategies, supply chain performance measures, vendor management, JIT, Link to supply chain, evaluation of SCM strategies, customer focus in SCM, inventory and logistic management, vendor management, Just-in- Time (JIT). Supply chain design considerations. | 8 |
| **II** | **Logistic Management**  Logistical operation, integration, network design, logistical performance cycle, customer service global logistic, logistical resources, logistic planning. | 8 |
| **III** | **Warehouse and transport management**  Concept of strategic storage, warehouse functionality, warehouse operating principles, developing warehouse resources, material handling and packaging in warehouse, transportation management, transport functionality and principles, transport infrastructure, transport economics and pricing, transport decision making. | 8 |
| **IV** | **Inventory management**  Cost associated with inventory decisions, selective control, economic order quantity, safety stock and service level, P and Q system, probabilistic models. Recent Trends in SCM: | 8 |
| **V** | **Recent Trends in SCM**  Tierisation of supplies, Reverse logistics, JIT II, Milk Round System (MRS), bar coding, Hub and Spoke Concept and other latest concepts. IT – enabled supply chain: Electronic data interchange, enterprise resource planning (ERP), Application of IT, Scope of emerging distributed cooperative tele-manufacturing over internet. | 8 |

**Reference Books:**

1. Chopra, “Supply Chain Management”, Pearson Education Asia, New Delhi
2. Christopher, “Logistics and Supply Chain Management”, Pearson Education Asia, New Delhi
3. Taylor and Brunt, “Manufacturing Operations and Supply Chain Management (The Lean Approach)”, Business Press Thomson Learning, NY.

4. Arjan J. Van Weele, “Purchasing and Supply Chain Management (Analysis Planning and Practice)”, Engineering, Business Press, Thomson Learning NY.

5. Donald B., “Logistic Management - The Integrated Supply Chain process”, McGraw Hill.

**ME 601 ENERGY CONSERVATION TECHNOLOGIES C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total Contact Hrs. 30** |
| **I** | Radiant Heating Equipment: Panel of heaters - steam - water, electrical radiant heaters, tubular radiant heaters, reflectors, heat transfer, comfort conditions, reduction of heat loss, installation.  Prime Movers And Generators: Energy conversion and efficiency, steam turbines, gas turbines, diesel and gas engines, electrical motors and DG-sets. Selection, factors affecting performance, load matching, PF improvement, maintenance practice | **6** |
| **II** | Heat Pumps: General principles, appropriate conditions for using heat pumps, theoretical and practical COP, refrigerants, absorption heat pump, applications of heat pumps; gas driven heat pumps.  Heat Recuperators: Basic concepts, liquid/liquid heat exchangers, liquid/gas and gas/liquid heat exchangers, gas/gas exchangers, heat transfer calculations and area determination | **6** |
| **III** | Heat Regenerators: Thermal wheel - basic principle- construction - flue gas as energy source - preheating combustion air - installation, regenerative heat recovery, double-effect operation and coupling of columns | **6** |
| **IV** | Heat Pipes: Basic concepts, design of heat pipes - heat transfer rate - thermodynamic efficiency - influencing factors- wick design - heat recovery from exhaust air, classification of heat pipes, practical applications.  Heating Ventilation And Air Conditioning: Comfortable environment, effective temperature, heating and cooling systems, reheat systems, variable air volume, dual duct system, air water system, design considerations | **6** |
| **V** | Cogeneration: Application for cogeneration, types of cogeneraiton processes- topping cycle plant- bottoming cycle plant. Choice of configuration, effect of legislation-case studies | **6** |

**Reference Books:**

1. R.M.E. Diamant, Energy Conservation Equipment, The Architectural Press, 1984.

2.S. David Hu, Hand Book of Industrial Energy Conservation; Van Nostrand,Reinhold Pub., 1983.

**ME 603 DIRECT** **ENERGY CONVERSION C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total Contact Hrs. 30** |
| **I** | Fuel Cells: Thermodynamics of fuel cells; free energy change and cell potentials; effects of temperature and pressure on cell potential; energy conversion efficiency; factors affecting conversion efficiency; polarization losses; important types of fuel cells (hydrogen-oxygen, organic compounds-oxygen, carbon or carbon monoxide-air, nitrogen compounds-air); electrode types; electrolytes for fuel cells; applications | **6** |
| **II** | Thermo-Electric Sysems: Thermo-electric phenomena; Thomson, Peltier and Seeback effects; Kelvin’s relations; basic thermo-electric engine materials; typical layout of engines; design of thermo-electric generators; thermo-electric cooling | **6** |
| **III** | Thermionic Systems: Thermionic emission; work function and energy distribution of electrons in metals; Richardson-Dushman equation; types of thermionic energy converters and their performance | **6** |
| **IV** | Photovoltic Systems: Photovoltaic effects; photo energy; general theory of junction-type cells; solar cells; operating characteristics of photovoltaic cells; conversion efficiency. | **6** |
| **V** | Magnetohydrodynamic Systems: Conversion process; ionization process; gaseous conduction and Hall effect; formulation of M.H.D. performance; analysis of constant area and verifying area M.H.D. engines | **6** |

**Reference Books:**

1. Energy Conversion, Chang, Prentice Hall
2. Direct Energy Conversion, Soo ,Prentice Hall
3. Direct Conversion of Heat to Electricy, Kay & Welsh (Eds.), Wiley
4. Fuel Cells, Bockris & Srinivasan, McGraw Hill
5. Magnetohydrodynamics, Kulikovsky & Lyubimov Addiso

**ME 605 MACHINE TOOL DESIGN C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total**  **Contact**  **Hrs. 40** |
| **I** | **Design approach:** Design requirements of machine tools, A design approach for machine tools. Identification and quantification of objectives and constraints in machine tool design  **Power requirements:** Estimation of power requirements and selection of motor for metal cutting machine tool spindles. | 8 |
| **II** | **Gearbox design:** Design of gearbox, spindle and guide-ways. | 8 |
| **III** | **Structural design:** Principles of design of structural components, namely, head stock, tail stock, carriage, table, knee, column and overarms to achieve desired static & fatigue strength, stiffness, dynamic characteristics and other requirements, Exercises on the design of machine tools using existing CAD software packages. | 8 |
| **IV** | **CNC machine design:** Introduction to computer integrated manufacturing systems and CNC machine tools. | 8 |
| **V** | **Design of CNC systems:** Design/selection of linear motion systems, ball, screws, CNC feedback devices, controllers, feed drives and servomotors for CNC machine tools. Recent developments in CNC and other machine tools. | 8 |

**Reference Books:**

1. Design of Devices and Systems, William H. Middendorf and Richard H. Engelmann,CRC Press
2. Computer numerical control of machine tools,G. E. Thyer Heinemann Prof.,Publishing
3. Machine Design Fundamentals:A Mechanical Designers'Workbook,Joseph Edward Shigley and Charles R. Mischke,McGraw Hill.
4. Numerical Control and Computer aided manufacture Kundra, Rao, Tiwari Tata McGraw Hill.

**ME 607 RESEARCH METHODOLOGIES C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total**  **Contact**  **Hrs. 40** |
| **I** | **Introduction**  Nature and objectives of research. Methods of Research: historical, descriptive and experimental, research process, research approaches, criteria for good research.  **Research Design**  Meaning of research design, need of research design, features of good design, different research designs, and basic principles of experimental designs, design of experiments. | 8 |
| **II** | **Data collection**  Types of data, methods and techniques of data collection, primary and secondary data, meta analysis, historical methods, content analysis, devices used in data collection, pilot study and pretest of tools, choice of data collection methods. | 8 |
| **III** | **Processing and analysis of data**  Use of statistics for data analysis, measures of central tendency, dispersion, skewness and relationship. Sampling distributions, sampling theory, determination of sample size, chisquare test, analysis of variance, multiple regression analysis. | 8 |
| **IV** | **Decision making techniques**  Application of various decision making techniques such as Analytical Hierarchy Process (AHP), TOPSIS, neural networks, graph theory, simulated annealing, genetic algorithms, data envelope analysis (DEA). | 8 |
| **V** | **Interpretation and report writing:**  Techniques of interpretation, precautions in interpretation, significance of report writing, different steps in report writing, layout of research report, mechanics of writing research report. | 8 |

**Reference Books:**

1. C.R Kothari, Research Methodology, Wishwa Prakashan

2. P.G Triphati, Research Methodology, Sultan Chand & Sons, N.Delhi

3. Fisher, Design of Experiments, Hafner

4. Stoufferetal, Measurement and Prediction, Wiley, N.York

5. J.W Bames, Statistical Analysis for Engineers and Scientists, McGraw Hill, N.York

6. Donald Cooper, Business Research Methods, Tata McGraw Hill, N.Delhi

7. Bhanwar Lal Garg, Renu Kavdia, Sulochana Agrawal and Umesh Kumar Agrawal, An

Introduction to Research Methodology. RBSA Publications,

8. Rao S. S., “Optimization”, Wiley Eastern, New Delhi, 1995.

9. Montgomery D.C., “Design and analysis of experiments”, Wiley publications.

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**MA 205 ADVANCE ENGG.MATHEMATICS- III C (L, T, P) = 4(3, 1, 0)**

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| **Units** | **Course Contents** | **Total Contact Hrs. 34** |
| **I** | **Boundary value problems:** Method of separation of variables - in the solution of wave equation in one dimension, Laplace’s equation in two dimensions, Diffusion equation in one dimension. | 7 |
| **II** | **Transform calculus :** Laplace transform with its simple properties, applications to the solutions of ordinary and partial differential equations having constant co-efficient with special reference to wave and diffusion equation. | 7 |
| **III** | **Transform calculus :** Laplace transform with its simple properties, applications to the solutions of ordinary and partial differential equations having constant co-efficient with special reference to wave and diffusion equation. | 7 |
| **IV** | **Complex variable:** Taylor’s series, Laurent’s series, poles, residues. Evaluations of simple definite real integrals using the theorem of residues. Simple contour integration. | 6 |
| **V** | **Numerical Methods:** Finite differences and interpolation Numerical Differentiation and Integration. Solution of Algebraic and transcendental equations by graphical method, trisection method, regula – falsi method and Newton raphson method | 7 |

**Reference Books:**

1. Advanced Mathematics for Engineers by Chandrika Prasad.

2 Higher Engineering Mathematics by B.S.Grewal

3. Higher Engineering Mathematics by Y.N.Gaur and C.L.Koul.

4. Higher Engineeringh Mathematics by K.C.Jain and M.L.Rawat

**MA 303 OPTIMIZATION METHOD C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Total Contact Hrs. 35** |
| **I** | Historical development, Engineering application of optimization, Formulation of design problems as mathematical programming problems, Classification of optimization problems. | 7 |
| **II** | Simplex methods, Revised simplex method, Duality in linear programming, post optimality analysis | 7 |
| **III** | Transportation and assignment problems. , Constrained optimization, Direct and indirect methods. . | 7 |
| **IV** | Unconstrained optimization techniques, Direct search methods, Descent methods. | 7 |
| **V** | **Dynamic Programming:** Introduction, multi-decision processes, computational procedure. | 7 |

**Reference Books:**

1. Linear Programming". G. Haddley
2. "Optimization methods for engineering Design:. RL.Fox, Addision Wesley, USA.
3. "Mathematical Programming Technique", N.S.Kambo
4. "Optimization Theory and Application", S.S.Rao, Wiley Eastern, New Delhi.

**ME 518 INDUSTRIAL AUTOMATION C (L, T, P) = 3(3, 0, 0)**

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| --- | --- | --- |
| **Unit** | **Course Contents** | **Hours** |
| **I** | **Automation of assembly lines -** Concept of automation, mechanization and automation, Concept of automation in industry, mechanization and automation, classification, balancing of assembly line using available algorithms. Transfer line-monitoring system (TLMS) using Line Status, Line efficiency. Buffer stock Simulation in assembly line. | 8 |
| **II** | **Automation using hydraulic systems -**  Design aspects of various elements of hydraulic systems such as pumps, valves, filters, reservoirs, accumulators, actuators, intensifiers etc. Selection of hydraulic fluid, practical case studied on hydraulic circuit design and performance analysis. Servo valves, electro hydraulic valves, proportional valves and their applications. | 8 |
| **III** | **Automation using pneumatic systems -** Pneumatic fundamentals - control elements, position and pressure sensing -logic circuits -switching circuits - fringe conditions modules and these integration - sequential circuits -cascade methods - mapping methods – step counter method - compound circuit design -combination circuit design. Pneumatic equipments - selection of components – design calculations -application - fault finding – hydro pneumatic circuits - use of microprocessors for sequencing - PLC, Low cost automation - Robotic circuits. | 8 |
| **IV** | **Automation using electronic systems -** Introduction, various sensors, transducers, signal processing, servo systems, programming of microprocessors using 8085 instruction, programmable logic controllers. **Automated work piece handling** Working principles and techniques, job orienting and feeding devices. Transfer mechanisms-automated feed cut of components, performance analysis. Uses of various types of handling systems including AGV and its various guiding technologies. | 8 |
| **V** | **Introduction to robot technology -** Robot physical configuration and basic robot motions, Types of manipulators- constructional features, servo and non servo manipulators. Feedback systems and sensors- encoders and other feedback systems, vision, ranging systems, tactile sensors. Programming languages- description of VAL and other languages. Artificial intelligence- legged locomotion and expert systems. | 8 |
|  | **Total** | **40** |

**Reference Books:**

1. Groover, M.P., CAD/CAM- Prentice Hall

2. Yoram Koren, Robotics for Engineers- McGraw Hill 1992

3. Paul, R.P., Robot Manipulators- MIT Press 1993

4. Pressman R.S, Numerical Control and CAM-. John Wiley 1993 Williams

5. Shearer P., Fluid Power Control John Wiley

6. Antony Espossito, " Fluid power with Applications ", Prentice Hall, 1980.

7. Dudleyt, A.Pease and John J.Pippenger, " Basic Fluid Power ", Prentice Hall, 1987.

8. Andrew Parr, " Hydraulic and Pneumatics ", (HB), Jaico Publishing House, 1999.

9. Bolton. W. " Pneumatic and Hydraulic Systems ", Butterworth - Heineman, 1997.

**ME 520 SUPPLY CHAIN MANAGEMENT C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Hours** |
| **I** | **Introduction -** Objectives of Supply Chain Management (SCM), 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 SCM.  **Supply chain strategies -** Evaluation of supply chain strategies, supply chain performance measures, vendor management, JIT, Link to supply chain, evaluation of SCM strategies, customer focus in SCM, inventory and logistics management, vendor management, Just-in- Time (JIT). Supply chain design considerations. | 8 |
| **II** | **Logistic Management -** Logistical operation, integration, network design, logistical performance cycle, customer service global logistics, logistical resources, logistic planning. | 8 |
| **III** | **Warehouse and transport management -** Concept of strategic storage, warehouse functionality, warehouse operating principles, developing warehouse resources, material handling and packaging in warehouse, transportation management, transport functionality and principles, transport infrastructure, transport economics and pricing, transport decision making. | 8 |
| **IV** | **Inventory management -** Cost associated with inventory decisions, selective control, economic order quantity, safety stock and service level, P and Q system, probabilistic models. Recent Trends in SCM: | 8 |
| **V** | **Recent Trends in SCM -** Tierisation of supplies, Reverse logistics, JIT II, Milk Round System (MRS), bar coding, Hub and Spoke Concept and other latest concepts. IT – enabled supply chain: Electronic data interchange, enterprise resource planning (ERP), Application of IT, Scope of emerging distributed cooperative tele-manufacturing over internet. | 8 |
|  | **Total** | **40** |

**Reference Books:**

1. Chopra, “Supply Chain Management”, Pearson Education Asia, New Delhi
2. Christopher, “Logistics and Supply Chain Management”, Pearson Education Asia, New Delhi
3. Taylor and Brunt, “Manufacturing Operations and Supply Chain Management (The Lean Approach)”, Business Press Thomson Learning, NY.
4. Arjan J. Van Weele, “Purchasing and Supply Chain Management (Analysis Planning and Practice)”, Engineering, Business Press, Thomson Learning NY.
5. Donald B., “Logistic Management - The Integrated Supply Chain process”, McGraw Hill,

**CP 101 COMPUTER SYSTEMS AND PROGRAMMING C (L, T, P) = 3 (3, 0, 0)**

|  |  |  |
| --- | --- | --- |
| **Unit** | **Contents of the Course** | **Hours** |
| I | **Introduction**  Types of computers and generations  Basic architecture of computers and its building blocks  Input-Output devices, Memories | 6 |
| II | **Number Systems**  Binary, octal, decimal and hexadecimal representation of numbers  Integers and floating point numbers  Representation of characters, ASCII and EBCDIC codes  Binary Arithmetic: addition, subtraction, complements  **Classification of Computer Languages**  Machine, assembly and high level languages  Brief idea of operating system  Assembler, compiler and interpreter | 7 |
| III | **Programming in ‘C’**  Need of programming languages, Defining problems  Flowcharts and algorithm development  Data types, constants, variables, operators and expressions  Input and output statements, Conditional and control statements | 8 |
| IV | Loops (While do while for), break, goto, continue, Arrays, 2D array, user defined functions | 8 |
| V | Structures and unions ; Pointers; File handling | 8 |
|  | **Total** | **37** |

**Reference books**

1. Let Us c : Yaswant Kanetaker
2. Programming in c: Balaguruswami
3. Computer fundamental: P.K. Sinha
4. Programming in C: Lipschutz
5. Programming in C: Kernighan Ritchie
6. Computer System Programming : Naveen Hemrajani

**CP 102 C++ C (L, T, P) = 3 (3, 0, 0)**

|  |  |  |
| --- | --- | --- |
| Unit | Contents of the Course | Hours |
| I | Overview of C++ : Object oriented programming, Concepts, Advantages, Usage. C++ Environment: Program development environment, the language and the C++ language standards. Prototype of main() function, Data types. Array, Pointers References & The Dynamic Allocation operators : Array of objects, Pointers to object, Type checking C++ pointers, The This pointer, Pointer to derived types, Pointer to class members, References: Reference parameter, Passing references to objects, Returning reference, Independent reference, C++ ’s dynamic allocation operators, Initializing allocated memory, Allocating Array, Allocating objects. | 6 |
| II | Classes & Objects : Classes, Structure & classes, Union & Classes, Friend function, Friend classes, Inline function, Scope resolution operator, Static class members, Static data member, Static member function, Passing objects to function, Returning objects, Object assignment. Constructor & Destructor: Introduction, Constructor, Parameterized constructor, Multiple constructor in a class, Constructor with default argument, Copy constructor, Default Argument, Destructor. | 7 |
| III | Inheritance : Base class Access control, Protected members, Protected base class inheritance, Inheriting multiple base classes, Constructors, destructors & Inheritance, When constructor & destructor function are executed, Passing parameters to base class constructors, Granting access, Virtual base classes . | 7 |
| IV | Function & operator overloading : Function overloading, Overloading constructor function finding the address of an overloaded function, Operator Overloading: Creating a member operator function, Creating Prefix & Postfix forms of the increment & decrement operation, Overloading the shorthand operation (i.e. +=,-= etc), Operator overloading restrictions, Operator overloading using friend function. | 7 |
| V | Virtual functions & Polymorphism: Virtual function, Pure Virtual functions, Early Vs. late binding The C++ I/O system basics : C++ streams, The basic stream classes: C++ predefined streams, Formatted I/O. | 8 |
|  | Total | 35 |

**Text & Reference Books :**

1. Herbert Schildt, “C++ The Complete Reference ” - TMH Publication ISBN 0-07-463880-7
2. R. Subburaj, “Object Oriented Programming With C++ ”, Vikas Publishing House, New Delhi.isbn 81-259-1450-1
3. E. Balguruswamy, “C++ ”, TMH Publication ISBN 0-07-462038-x
4. M Kumar “Programming In C++”, TMH Publications
5. R. Lafore, “Object Oriented Programming C++ ”
6. Ashok . N. Kamthane, “Object Oriented Programming with ANSI & Turbo C++”, Pearson Education Publication, ISBN 81-7808-772-3

**CP 151/152 COMPUTER PROGRAMMING LAB C (L, T, P) = 1 (0, 0, 2)**

|  |  |
| --- | --- |
| **S.No.** | **List of Experiments** |
| I | Simple input program integer, real character and string. (Formatted & Unformatted) |
| II | Conditional statement programs (if, if-else-if, switch-case) |
| III | Looping Program (for, while, do-white) |
| IV | Program based on array (one, two, and three dimensions) |
| V | Program using structure and unions. |
| VI | Program using Function (With and without recursion) |
| VII | Simple programs using pointers |
| VIII | File handling |

**CP 154 OBJECT ORIENTED PROGRAMMING LAB C (L, T, P) = 1 (0, 0, 2)**

|  |
| --- |
| Write a program to find the greatest between four numbers. |
| Write a program to prepare mark sheet of student using structures. |
| Write a C program to read several different names and addresses, re-arrange the names in alphabetical order and print name in alphabetical order using structures. |
| Write a program to implement concatenation of two strings using pointers. |
| Write a program to search a pattern in a given string. |
| Write a program to read add, subtract and multiply integer matrices. |
| Write a program to calculate the power function (mn) using the function overloading technique, implement it for power of integer and double. |
| Implement file creation and operate it in different modes: seek, tell, read, write and close operations. |
| Using multilevel inheritance, prepare students’ mark sheet. Three classes containing marks for every student in three subjects. The inherited class generate mark sheet. |
| Write a program to print the following output using FOR loop.  1 1  2 2 2 2  3 3 3 3 3 3  4 4 4 4 4 4 4 4  5 5 5 5 5 5 5 5 5 5 |

**CP 216 OBJECT ORIENTED PROGRAMMING C(L,T,P) =3(3,0,0)**

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| --- | --- | --- |
| **Unit** | **Course Contents** | **Hours** |
| 1 | **OOP FUNDAMENTALS:** Concept of class and object, attributes, public, private and protected members, derived classes, single & multiple inheritance, | 7 |
| II | **PROGRAMMING IN C++:** Enhancements in C++ over C, Data types, operators and functions. Inline functions, constructors and destructors. Friend function, function and operator overloading. Working with class and derived classes. Single, multiple and multilevel inheritances and their combinations, virtual functions, pointers to objects. Input output flags and formatting operations. Working with text files. | 7 |
| III | **JAVA:** Variation from C++ to JAVA. Introduction to Java byte code, virtual machine, application & applets of Java, integer, floating point, characters, Boolean, literals, and array declarations. | 7 |
| IV | **OPERATORS AND CONTROL STATEMENTS:** Arithmetic operators, bit wise operators, relational operators, Boolean logic operators, the assignment operators, ?: operators, operator precedence. Switch and loop statements. | 7 |
| V | **PACKAGE AND INTERFACES:** Packages, access protection, importing & defining packages. Defining and implementing interfaces. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Folk-File Structre: An Object Oriented Approach to C++, Pearson Education.
2. Patric Naughton: Java 2, Tat Mc-Graw Hill.
3. C Gottfried: Programming in C, Schaum Series, Tata Mc-Grtaw Hill.
4. Balaguruswamy: Object Oriented Programming in C++, Tata Mc-Graw Hill.
5. Booch G: Object Oriented Analysis & Design, Benamin-Commings.
6. Rumbaugh J.Et. al.: Object Oriented Modelling & Design, Prentice Hall of India.
7. Deitel: Java: Haw to Programme, Pearson Education.

**CP 260 ADVANCED COMPUTER PROGRAMMING LAB C(L,T,P) =2(0,0,3)**

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| --- | --- |
| **S. N.** | **List of Experiments** |
|  | **PART I: Programs in C++** |
| 1. | Write a program to perform the complex arithmetic. |
| 2. | Write a program to perform the rational number arithmetic. |
| 3. | Write a program to perform the matrix operations. (Transpose, addition, subtraction, multiplication, test if a matrix is symmetric/ lower triangular/ upper triangular) |
| 4. | Implement Morse code to text conversion and vice-versa. |
| 5. | To calculate Greatest Common Divisor of given numbers. |
| 6. | To implement tower of Hanoi problem. |
|  | **PARET II: Program in Java** |
| 7. | To implement spell checker using dictionary. |
| 8. | To implement a color selector from a given set of colors. |
| 9. | To implement a shape selector from a given set of shapes. |
| 10. | By mapping keys to pens of different colors, implement turtle graphics. |
| 11. | To implement a calculator with its functionality. |
| 12. | To implement a graph and display BFS/DFS order of nodes. |

**CP 301 DATA BASE MANAGEMENT SYSTEM C(L,T,P) =3(3,0,0)**

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| --- | --- | --- |
| **Unit** | **Course Contents** | **Hours** |
| 1 | Introduction Need, purpose and goals of DBMS. DBMS Architecture, Concept of keys, Generalization and specialization, Introduction to Relational data model, ER Modeling, Relational algebra. | 7 |
| II | **DATABASE DESIGN:** Conceptual Data Base design. Theory of normalization, Primitive and composite data types, concept of physical and logical databases, data abstraction and data independence,. Relational calculus. | 7 |
| III | SQL: DDL and DML. Constraints assertions, views, data base security. Application Development using SQL: Host language interface, embedded SQL programming. GL's, Forms management and report writers. Stored procedures and triggers. | 7 |
| IV | **INTERNAL OF RDBMS -** Physical data organization in sequential, indexed, random and hashed files. Inverted and multilist structures. | 7 |
| V | Transaction processing, concurrency control, Transaction model properties and state serialisability. Lock base protocols, two phase locking, Log based recovery Management. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Korath H., Silberschatz A. : Database system Concepts, Second Edn., McGraw-Hili, 1991. .
2. 2. R.Elmasri and S.B. Navathe: Fundamentals of Data base Systems, Benjamin Cummins.

**CP – 307 COMPUTER GRAPHICS C(L,T,P) =3(3,0,0)**

|  |  |  |
| --- | --- | --- |
| **Unit** | **CONTENTS OF THE SUBJECT** | **Hours** |
| I | Introduction to interactive computer graphics, picture analysis, overview of programmer's model of interactive graphics. Fundamental problems in geometry, Hardware for Computer Graphics. | 7 |
| II | **BASIC RASTER GRAPHICS -** Scan conversion algorithms for line, Circle, Ellipse, Filling algorithms, Line Clipping and Polygon clipping. | 7 |
| III | **GEOMETRIC MANIPULATION:** 2 D and 3 D Transformation, Composite Transformations, Concept of Homogenous Coordinates Viewpoints. | 7 |
| IV | **ELEMENTRY 3 D GRAPHICS** – Types of Projections, Vanishing Points, specification of 3 D View, Matrices for Parallel and Perspective Projections. Visibility ; Image and object precision, z-buffer algorithms, area based algorithms, floating horizon. | 7 |
| V | **RENDERING -** Ray tracing, ant aliasing, Gourard and Phong Shading. Curves and Surfaces: Parametric Representation, Bezier and B-Spline curves. Interactive Computer Graphics | 7 |
|  | **Total** | 35 |

**Reference Books:**

1. D.Rogers and Adams: Mathematical Elements of Computer Graphics, Mc-Graw Hill.
2. J.Foley, A Van dam, S.Feiner, J.Hughes: Computer Graphics-Princxiples and Practice. Addison Weslev.
3. D.Hearn and Baker: Computer Graphics. Prentice Hall of India.
4. Krihsnamurthy N: Introduction to computer Graphics, Tata Mc Graw Hill Edition.
5. Zhigang X. & Plastock R.a.: Theory and problems of Computer Graphics (Schaum's Outline), Tata Mc Graw Hill.
6. Giloi, W.K.: Interactive Computer Graphics, Prentice-Hall.

**CP 415 NEURAL NETWORKS C(L,T,P) =3(3,0,0)**

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| --- | --- | --- |
| **Unit** | **Course Contents** | **Hours** |
| 1 | INTRODUCTION: Introduction to Neural Networks, Biological basis for NN, Human brain, Models of a Neuron, Directed Graphs, Feedback, Network architectures, Knowledge representation, Artificial intelligence & Neural Networks. | 7 |
| II | LEARNING PROCESSES: Introduction, Error –Correction learning, Memory –based learning, Hebbian learning, Competitive learning, Boltzmann learning, Learning with a Teacher & without a teacher, learning tasks, Memory, Adaptation. | 7 |
| III | SINGLE LAYER PERCEPTRONS: Introduction, Least-mean-square algorithm, Learning Curves, Learning rate Annealing Techniques, Perception, and Perception Convergence Theorem. | 7 |
| IV | MULTI LAYER PERCEPTRONS: Introduction, Back-Propagation Algorithm, XOR Problem, Output representation and Decision rule, Feature Detection, Back-Propagation and Differentiation, Hessian Matrix, Generalization. | 7 |
| V | RADIAL-BASIS FUNCTION NETWORKS & SELF-ORGANISING MAPS: Introduction to Radial basis function networks, Cover’s Theorem on the Separability of Patterns, Interpolation Problem, Generalized Radial-Basis function networks, XOR Problem. Self-Organizing map, Summary of SOM, Algorithm, Properties of the feature map. | 7 |
|  | **Total** | **35** |

**Reference Book:**

Freeman / Skapura - Networks, Pearson Education.

**CP – 605 INFORMATION SECURITY SYSTEM C(L,T,P) =3(3**

|  |  |  |
| --- | --- | --- |
| **Unit** | **Course Contents** | **Hours** |
| 1 | Introduction to security attacks, services and mechanism, introduction to cryptography. Conventional Encryption: Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers. Modern Block Ciphers: Block ciphers principals, Shannon’s theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, IDEA encryption and decryption, strength of IDEA, confidentiality using conventional encryption, traffic confidentiality, key distribution, random number generation. | 7 |
| II | Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat’s and Euler’s theorem, primality testing, Euclid’s Algorithm, Chinese Remainder theorem, discrete logarithms. Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffle-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elganel encryption. | 7 |
| III | Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA). Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm. | 7 |
| IV | Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME. | 7 |
| V | IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Web Security: Secure socket layer and transport layer security, Secure Electronic Transaction (SET). System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems. | 7 |
|  | **Total** | **35** |

**Reference Books:**

INFORMATION SECURITY SYSTEM-Atul Kahate-TMH

Cryptography & Network Security-William Stallings-TMH

**IT 101/102 INFORMATION TECHNOLOGY C (L, T, P) = 3 (3, 0, 0)**

|  |  |  |
| --- | --- | --- |
| **Unit** | **Contents of the Course** | **Hours** |
| I | * An overview of information technology, difference between data and information, quality, of information, Information system. * Important data types: text, image, graphics & animation, audio, video. * Data compression and its techniques | 6 |
| II | * Introduction to internet: www, web browser, search engine, email * Introduction to e-commerce and its advantage, security threats to e-commerce, Electronic payment system, * E-governance, EDI and its benefits * Introduction to cryptography, digital signature and smart card technology | 7 |
| III | * Introduction to LAN, WAN, MAN: Transmission media * Data transmission type: Introduction to OSI reference model * Analog and digital signals, modulation * Network topologies, client-server architecture, ISDN | 7 |
| IV | * Overview, definition and function of operating system, need of operating system * Batch processing, spooling, multi-programming, multi-processing * Time sharing, online processing, real time system | 7 |
| V | * Application software and their categories, system software * User interface GUI, spread sheet * Data base software, its features and benefits | 8 |
|  | **Total** | **35** |

**Recommended Books:**

1. [Information Technology and the Networked Economy, Second Edition](http://www.infibeam.com/Books/info/Patrick-G-McKeown/Information-Technology-and-the-Networked-Economy-Second/003034851X.html) **By** [McKeown, Patrick G.](http://www.infibeam.com/Books/search?author=McKeown,%20Patrick%20G.)
2. Internet & Intranet Engineering, Tata McGraw Hill company.
3. Information Technology by Ajit Poonia.
4. Information Technology by D.P. Sharma

**EC 201 ELECTRONIC CIRCUITS & DEVICES. C(L,T,P) =4(3,1,0)**

|  |  |  |
| --- | --- | --- |
| **Unit** | **Course Contents** | **Hours** |
| 1 | **SEMICONDUCTOR PHYSICS:** Mobility and conductivity, charge densities in a semiconductor, Fermi Dirac distribution, carrier concentrations and fermi levels in semiconductor, Generation and recombination of charges, diffusion and continuity equation, Mass action Law, Hall effect. | 7 |
| II | Junction diodes, Diode as a ckt. element, load line concept, clipping and clamping circuits, Voltage multipliers. Construction, characteristics and working principles of UJT | 7 |
| III | Transistor characteristics, Current components, Current gains: alpha and beta. Operating point. Hybrid model, h-parameter equivalent circuits. CE, CB and CC configuration. DC and AC analysis of CE,CC and CB amplifiers. Ebers-Moll model. Biasing & stabilization techniques. Thermal runaway, Thermal stability. | 7 |
| IV | JFET, MOSFET, Equivalent circuits and biasing of JFET's & MOSFET’s. Low frequency CS and CD JFET amplifiers. FET as a voltage variable resistor. | 7 |
| V | **SMALL SIGNAL AMPLIFIERS AT LOW FREQUENCY:** Analysis of BJT and FET, DC and RC coupled amplifiers. Frequency response, midband gain, gains at low and high frequency. Analysis of DC and differential amplifiers, Miller's Theorem. Cascading Transistor amplifiers, Darlington pair. Emitter follower, source follower. | 7 |
|  | **Total** | **35** |

**Reference Books**

1. J Millman & C.C. Halkias - Integrated Electornics; Tata Mc-Graw Hill. Pearson Education.
2. Rebert Boylestad & L. Nashelsky - Electronic Devices and Circuit Theory.
3. Sedra Smith-Micro Electronic Circuits. Oxford Press, India.
4. Floyd-Electronic Devices, Pearson Education.
5. .Shur - Physics of Semiconductor Devices. Prentice Hall of India

**EC 204 DIGITAL HARDWARE DESIGN C(L,T,P) =4(3,1,0)**

|  |  |  |
| --- | --- | --- |
| **Unit** | **Course Contents** | **Hours** |
| 1 | **NUMBER SYSTEMS, BASIC LOGIC GATES & BOOLEAN ALGEBRA:** Binary Arithmetic & Radix representation of different numbers. Sign & magnitude representation, Fixed point representation, complement notation, various codes & arithmetic in different codes & their inter conversion. Features of logic algebra, postulates of Boolean algebra. Theorems of Boolean algebra. Boolean function. Derived logic gates: Exclusive-OR, NAND, NOR gates, their block diagrams and truth tables. Logic diagrams from Boolean expressions and vica-versa. Converting logic diagrams to universal logic. Positive, negative and mixed logic. Logic gate conversion. | 7 |
| II | **DIGITAL LOGIC GATE CHARACTERISTICS:** TTL logic gate characteristics. Theory & operation of TTL NAND gate circuitry. Open collector TTL. Three state output logic. TTL subfamilies. MOS & CMOS logic families. Realization of logic gates in RTL, DTL, ECL, C-MOS & MOSFET. Interfacing logic families to one another. | 7 |
| III | **MINIMIZATION TECHNIQUES:** Minterm, Maxterm, Karnaugh Map, K map upto 4 variables.Simplification of logic functions with K-map, conversion of truth tables in POS and SOP form. Incomplete specified functions. Variable mapping. Quinn-Mc Klusky minimization techniques. | 7 |
| IV | **COMBINATIONAL SYSTEMS:** Combinational logic circuit design, half and full adder, subtractor. Binary serial and parallel adders. BCD adder. Binary multiplier. Decoder: Binary to Gray decoder, BCD to decimal, BCD to 7-segment decoder. Multiplexer, demultiplexer, encoder. Octal to binary, BCD to excess-3 encoder. Diode switching matrix. Design of logic circuits by multiplexers, encoders, decoders and demultiplexers. | 7 |
| V | **SEQUENTIAL SYSTEMS:** Latches, flip-flops, R-S, D, J-K, Master Slave flip flops. Conversions of flip-flops. Counters: Asynchronous (ripple), synchronous and synchronous decade counter, Modulus counter, skipping state counter, counter design. Ring counter. Counter applications. Registers: buffer register, shift register. | 7 |
|  | **Total** | **35** |

**Reference Books:**

A.P. Malvino & D.P. Leach-Digital Principles & Applications, Tat aMc-graw Hill, Delhi.

Morris Mano-Digital Circuit & Logic Design; Prentice Hll of India.

Tocci-Digital Systems, Pearson Education

**EC 208 TELECOMMUNICATION ENGINEERING C(L,T,P) =3(3,0,0)**

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| --- | --- | --- |
| **Unit** | **Course Contents** | **Hours** |
| 1 | **TRANSMISSION LINE:** Types of transmission lines, general transmission line equation, line constant, equivalent circuits, infinite line, and reflection on a line, SWR of line with different type of terminations. Distortion less and dissipation less lines, Coaxial cables, Transmission lines at audio and radio frequencies, Losses in transmission line,. Characteristics of quarter wave, half wave and lines of other lengths, | 7 |
| II | **TRANSMISSION LINE APPLICATIONS:** Smith chart and its application. Transmission line applications, Impedance matching Network. Single & double Stub matching. Measurement of parameters of transmission line, measurement of attenuation, insertion loss, reflection coefficient and standing wave ratio. | 7 |
| III | **ATTENUATORS & FILTERS:** Elements of telephone transmission networks, symmetrical and Asymmetrical two port networks. Different Attenuators, ð-section & T-section attenuators, stub matching, Transmission equalizers Filters, constant K-section, Ladder type, ð-section, T-section filter, m-derived filter sections, Lattics filter section. | 7 |
| IV | **TELEPHONE TRANSMISSION:** Telephone set, Touch tone dial types, two wire/ four wire transmission, Echo suppressors & cancellors, cross talk. Multi-channel systems: Frequency division & time division multiplexing. | 7 |
| V | **AUTOMATIC TELEPHONY & TELEGRAPHY:** Trunking concepts, Grade of service, Traffic definitions, Introduction to switching networks, classification of switching systems. Principle of Electronic Exchange, EPABX and SPC Digital telephone Exchange, Numbering Plan, Facsimile services. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. W. Fraser-Telecommunications (BPB Publication)
2. Vishvanathan- Telecommunication switching systems & Networks. Prentice Hall of India.
3. Cole- Introduction to Telecommunication. Pearson Educatino

**EC 253 ELECTRONIC DEVICES & CIRCUITS LAB C (L,T,P) =2(0,0,3)**

|  |  |
| --- | --- |
| **S. No.** | **List of Experiments** |
| 1. | Study the following devices: |
|  | (a) Analog & digital multimeters |
|  | (b) Function/ Signal generators |
|  | (c) Regulated d. c. power supplies (constant voltage and constant current operations) |
|  | (d) Study of analog CRO, measurement of time period, amplitude, frequency & phase angle using Lissajous figures. |
| 2. | Plot V-I characteristic of P-N junction diode & calculate cut-in voltage, reverse saturation current and static & dynamic resistances. |
| 3. | Plot V-I characteristic of zener diode and study of zener diode as voltage regulator. Observe the effect of load changes and determine load limits of the voltage regulator. |
| 4. | Plot frequency response curve for single stage amplifier and to determine gain bandwidth product. |
| 5. | Plot drain current - drain voltage and drain current – gate bias characteristics of field effect transistor and measure of Idss & Vp |
| 6. | Application of Diode as clipper & clamper |
| 7. | Plot gain- frequency characteristic of two stage RC coupled amplifier & calculate its bandwidth and compare it with theoretical value. |
| 8. | Plot gain- frequency characteristic of emitter follower & find out its input and output resistances. |
| 9. | Plot input and output characteristics of BJT in CB, CC and CE configurations. Find their hparameters. |
| 10. | Study half wave rectifier and effect of filters on wave. Also calculate theoretical & practical ripple factor. |
| 11. | Study bridge rectifier and measure the effect of filter network on D.C. voltage output & ripple factor. |

**EC 254 DIGITAL HARDWARE DESIGN LAB C(L,T,P) = 2(0,0,2)**

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| --- | --- |
| **S. No.** | **List of Experiments** |
| 1. | To study and perform the following experiments.  (a) Operation of digital multiplexer and de-multiplexer.  (b) Binary to decimal encoder.  (c) Characteristics of CMOS integrated circuits. |
| 2. | To study and perform experiment- Compound logic functions and various combinational circuits based on AND/NAND and OR/NOR Logic blocks. |
| 3. | To study and perform experiment -Digital to analog and analog to digital converters. |
| 4. | To study and perform experiment- Various types of counters and shift registers. |
| 5. | To study and perform experiment - Interfacing of CMOS to TTL and TTL to CMOS ICs. |
| 6. | To study and perform experiment- BCD to binary conversion on digital IC trainer. |
| 7. | To study and perform experiment –  (a) Astable  (b) Monostable  (c) Bistable Multivibrators  and the frequency variation with different parameters, observe voltage waveforms at different points of transistor. |
| 8. | To study and perform experiment -Voltage comparator circuit using IC-710. |
| 9. | To study and perform experiment- Schmitt transistor binary circuit. |
| 10. | Design 2 bit binary up/down binary counter on bread board. |

**EC 302 A MICROPROCESSOR C(L,T,P) =4(3,1,0)**

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| --- | --- | --- |
| **Unit** | **Course Contents** | **Hours** |
| 1 | **INTRODUCTION**: CPU, address bus, data bus and control bus. Input/ Output devices, buffers, encoders, latches and memories. | 7 |
| II | **8085 MICROPROCESSOR ARCHITECTURE**: Internal data operations and registers, pins and signals, peripheral devices and memory organization, interrupts. CISC and RISC architecture overview. | 7 |
| III | **8085 MICROPROCESSOR INSTRUCTIONS**: Classification, format and timing. Instruction set.Programming and debugging, 8 bit and 16 bit instructions. | 7 |
| IV | **8085 MICROPROCESSOR INTERFACING**: 8259, 8257, 8255, 8253, 8155 chips and their applications. A/D conversion, memory, keyboard and display interface (8279). | 7 |
| V | **8086/8088 MICROPROCESSOR:** Hardware specifications, architecture, address spaces, clock generator, bus controller and arbiter, Minimum and maximum mode. System Bus Timing. Assembly language programming, addressing mode and instructions of 8086/8088, linking and execution of programs. MACRO programming, assembler directives and operators. | 7 |
|  | **Total** | **35** |

**Reference Books:**

R. Gaonkar- Microprocessor Architecture, Programming and Applications, Wiely Eastern Ltd.

Dougtas V.Hall- Microprocessors & Interfacing: Programming and Hardware, Tata Mc-Graw Hill.

Barry B. Brey- The Intel Microprocessors: Architecture, Programming & Interfacing, Pearson Education Asia.

**EC 305 LINEAR INTEGRATED CIRCUITS C(L,T,P) =4(3,1,0)**

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| --- | --- | --- |
| **Unit** | **Course Contents** | **Hours** |
| 1 | **OPERATIONAL AMPLIFIERS**: Basic differential amplifier analysis, Single ended and double ended configurations, Op-amp configurations with feedback, Op-amp parameters, Inverting and Non- Inverting configuration, Comparators, Adder**.** | 7 |
| II | **OPERATIONAL AMPLIFIER APPLICATIONS:** Integrator, Differentiator, Voltage to frequency & Frequency to voltage converters. Oscillators: Phase shift, Wein bridge, Quadrature, square wave, triangular wave, saw tooth oscillators. Voltage controlled oscillators. | 7 |
| III | **ACTIVE FILTERS:** Low pass, high pass, band pass and band reject filters, All pass filter, Switched capacitor filter, Butterworth filter design, and Chebyshev Filter design. | 7 |
| IV | **PHASE-LOCKED LOOPS**: Operating Principles of PLL, Linear Model of PLL, Lock range, Capture range, Applications of PLL as FM detector, FSK demodulator, AM detector, frequency translator, phase shifter, tracking filter, signal synchronizer and frequency synthesizer, Building blocks of PLL, LM 565 PLL. | 7 |
| V | **LINEAR IC’s**: Four quadrant multiplier & its applications, Basic blocks of linear IC voltage regulators, Three terminal voltage regulators, Positive and negative voltage regulators. The 555 timer as astable and monostable multivibrators. Zero crossing detector, Schmitt trigger. | 7 |
|  | **Total** | **35** |

**Reference Books:**

R.A. Gayakwad-Op-amplifiers & Linear ICs, Prentice Hall of India.

Taubay-Operational Amplifiers.

K.R. Botkar-Integrated Circuits. Pearson Education.

**EC - 311 Signal & Networking C(L,T,P) =3(3,0,0)**

|  |  |  |
| --- | --- | --- |
| **Unit** | **Course Contents** | **Hours** |
| 1 | **INTRODUCTION** **OF SIGNALS:** Continuous time and discrete time systems, Properties of systems. Linear time invariant systems - continuous time and discrete time. Properties of LTI systems and their block diagrams. Convolution, Discrete time systems described by difference equationsFOURIER SERIESREPRESENTATION OF SIGNALS: Fourier series representation of continuous periodic signal & its properties, Fourier series representation of Discrete periodic signal & its properties, Continuous time filters & Discrete time filters described by Diff. equation. | 8 |
| II | **FOURIER TRANSFORM:** The continuous time Fourier transform for periodic and aperiodic signals, Properties of CTFT. Discrete time Fourier transform for periodic and aperiodic signals. Properties of DTFT. The convolution and modulation property. | 7 |
| III | **NETWORK THEOREMS AND ELEMENTS:** Thevenin’s, Norton’s, Reciprocity, Superposition, Compensation, Miller’s, Tellegen’s and maximum power transfer theorems. Networks with dependent sources. Inductively coupled circuits – mutual inductance, coefficient of coupling and mutual inductance between portions of same circuits and between parallel branches. Transformer equivalent, inductively and conductively coupled circuits. | 6 |
| IV | **TRANSIENTS ANALYSIS:** Impulse, step, ramp and sinusoidal response Analysis of first order and second order circuits. Time domain & transform domain (frequency, Laplace) analysis. Initial and final value theorems. Complex periodic waves and their analysis by Fourier analysis. Different kind of symmetry. Power in a circuit. | 7 |
| V | **NETWORK FUNCTIONS:** Terminals and terminal pairs, driving point impedance transfer functions, poles and zeros. Procedure of finding network functions for general two terminal pair networks. Stability & causality. Hurwitz polynomial, positive real function. | 7 |
|  | **Total** | **35** |

**Reference Books:**

Kuo, Franklin F - Netwrok analysis and sysnthesis, II Ed, 1999, Jhon Wiley & sons.

Desoer, C. And Duh, E.S-E.s. Basic circuit theory, Mc Graw Hill.

Van Valkenburg, M.E. - Network Analysi, Prentice Hall, India.

Schaum's Outling series on circuit analysis.

Hayt; W, and Kinmmerly - Engineering circuit analysis, Mc Graw Hill, Inc.

Sudhakar, A and Chyam Mohan S.P. - Circuits and Networks, Tata Mc Graw Hill. India.

.V. Oppenheim, A.S. Willsky and I.J. Young-"Signals & Systems", Prentice Hall of India Ltd.

Tabub & Schilling-"Principles of Communication System", Tata Mc-graw Hill.

Prokins & Manolakis-Digital Signal Processing: Principles algorithms \*Applications, Prentice Hall Pvt. Ltd.

**EC – 318 COMMUNICATION SYSTEMS C(L,T,P) =4(3,1,0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Contents of the Subject** | **Hours** |
| 1 | **INTRODUCTION:** Introduction to communication systems, signals and spectra, electromagnetic spectrum and its usage, communication channels and propagation characteristics | 8 |
| 2 | **Modulation Techniques & Noise:** amplitude modulation and demodulation - spectra, circuits and systems, frequency modulation/demodulation, frequency division multiplexing, radio transmitters and receivers, sampling theory, pulse modulation and demodulation, **types of noise** spectra, circuits & systems, circuit noise, performance of analogue communication systems in AWGN and fading channels | 7 |
| 3 | **Introduction to Satellite Systems**; Orbiting satellites, satellite frequency bands, communication satellite systems, satellite modulation and multiple access formats; Satellite uplink and downlink analyses in C, Ku and Ka bands; multiple beam, frequency reuse; Satellite transponder; Satellite front end. | 7 |
| 4 | **Digital Transmission**: Introduction, pulse modulation, PCM – PCM sampling, signal to quantization noise rate, commanding – analog and digital – percentage error, delta modulation, adaptive delta modulation, differential pulse code modulation, pulse transmission , data modems, - Asynchronous modem, Synchronous modem, low-speed modem, medium and high speed modem, modem control. | 8 |
| 5 | **Digital Modulation techniques:** Introduction to ASK, FSK, PSK, QPSK and DPSK.QAM and PAM modulation techniques. | 7 |
|  | **Total** | **37** |

**Recommended Books:**

1. Analog and digital communication by Lathi, Oxford Publication.

2. Analog and digital communication by Symons Hykins

**EC 353 ELECTRONIC ENGINEERING DESIGN LAB C(L,T,P) =3(0,0,3)**

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| **S. N.** | **List of Experiments** |
|  | To design the following circuits, assemble these on bread board and test them. Simulation of these circuits with the help of appropriate software. |
| 1. | Op-Amp characteristics and get data for input bias current, measure the output-offset voltage and reduce it to zero and calculate slew rate. |
| 2. | Op-Amp in inverting and non-inverting modes. |
| 3. | Op-Amp as scalar, summer and voltage follower. |
| 4. | Op-Amp as differentiator and integrator. |
| 5. | Design LPF and HPF using Op-Amp 741 |
| 6. | Design Band Pass and Band reject Active filters using Op-Amp 741. |
| 7. | Design Oscillators using Op-Amp (i) RC phase shift (ii) Hartley (iii) Colpitts |
| 8. | Design (i) Astable (ii) Monostable multivibrators using IC-555 timer |
| 9. | Design Triangular & square wave generator using 555 timer. |
| 10. | Design Amplifier (for given gain) using Bipolar Junction Transistor. |

**EC 355 MICROPROCESOR LAB C(L,T,P) =3(0,0,3)**

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| **S. No.** | **List of Experiments** |
| 1. | Study the hardware, functions, memory structure and operation of 7085 microprocessor kit. |
| 2. | Program to perform integer division: (i) 8-bit by 8-bit (ii) 16-bit by 8-bit. |
| 3. | Transfer of a block of data in memory to another place in memory in the direct and reverse order. |
| 4. | Searching a number in an array and finding its parity. |
| 5. | Sorting of array in: (i) Ascending (ii) Descending order |
| 6. | Programme to perform following conversion: (i) BCD to ASCII (ii) BCD to Hexadecimal |
| 7. | Programme to multiply two 8-bit numbers. |
| 8. | Programme to generate and sum 15 fibanocci numbers. |
| 9. | Programme for rolling display of message “INDIAN”. |
| 10. | To insert a number at correct place in a sorted array. |
| 11. | Serial and Parallel data transfer on output port 8155 & 8255 & designing of disco light, running light, and sequential lights on off by above hardware. |
| 12. | Generation of different waveform on 8253/ 8254 programmable timer. |

**EC 401 ANTENNA & WAVE PROPAGATION C(L,T,P) =3(3,0,0)**

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| --- | --- | --- |
| **Unit** | **Course Contents** | **Hours** |
| 1 | **ANTENNA FUNDAMENTALS** - Antenna parameters, Radiation from a current element in free space. Quarter & half wave antenna. Reciprocity theorem. Resonant and non-resonant antenna. Effective length and aperture, gain, beam width, directivity, radiation resistance, efficiency, polarization, impedance and directional characteristics of antenna, antenna temperature. | 7 |
| II | **ANTENNAS -** V and Rhombic antennas, Folded dipole, Yagi-Uda antenna, Frequency independent antennas, Log-periodic antennas, UHF and Microwave antennas- Antenna with parabolic reflectors, Horn and Lens antennas, Helical antennas, Square and Circular loop antennas, Fundamentals of Slot and Micro strip antennas. | 7 |
| III | **ANTENNA ARRAYS -** Two element array, N-element linear arrays, Broadside, End fire, collinear and combination arrays, Multiplication of patterns, Binomial arrays. Effect of ground on antennas, Antenna loading. **Antenna Measurements** - Antenna impedance, radiation pattern, gain, directivity, polarization and phase measurements | 7 |
| IV | **RADIO WAVE PROPAGATION** - Mechanism of radio wave propagation, Reflection, Refraction interference and diffraction of radio waves. Theory of ground wave, space wave and sky wave propagation. Plane earth reflection, Reflection factors for horizontal and vertical polarizations. Duct propagation and troposphere scattering. | 7 |
| V | Various Ionospheric layers. Characteristics of ionosphere and its effects on wave propagation. Critical frequency, Virtual height, skips zone & maximum usable frequency. Multiple hop transmission. Oblique & vertical incidence transmission. Effect of earth's magnetic field, solar activity and meteorological conditions on wave propagation. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. J.D. Kraus, 'Antennas', Mc-Graw Hill.
2. C.A. Balanis, 'Antenna Theory', Harper & Row.
3. K.D. Prasad, 'Antenna and Wave Propagation', SATYA Prakashan, New Delhi.
4. E.C. Jordan and K.g. Balmain, 'Electromagnetic waves and Radiating Systems', Prentice hall of India.
5. R.e. Collin, 'Antennas & Radio Wave Propagation', Mc-Graw Hill.

**EC 403 WIRELESS COMMUNICATION C(L,T,P) =3(3,0,0)**

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| **Unit** | **Course Contents** | **Hours** |
| 1 | PROPAGATION PHENOMENA - Fundamentals of fading, Multipath channels, Spread Spectrum signals: Direct-sequence spread spectrum signals, p-n sequences, Frequency-hopped spread spectrum signals, Code-division multiplexing. | 7 |
| II | LINE OF SIGHT MICOWAVE COMMUNICATION- Link Engineering, Frequency planning, Free space loss, Fresnel zone clearance bending of radio beam, Effective earth radius, Building blocks of Transmitter & Receiver. | 7 |
| III | MULTIPLE ACCESS TECHNIQUES - FDMA, TDMA and CDMA with reference to mobile radio and satellite systems. TDMA based networks. CDMA based networks, | 7 |
| IV | CELLULAR WIRELESS NETWORKS-, GSM: Introduction, overview of the GSM systems, GSM codec, channel coding and interleaving, radio like control. Cordless systems and WLL, Mobile IP, Wireless access protocol. Wireless LAN’s: Technology, IEEE 702.11 standards and Blue tooth., Broadband Wireless 702.16 | 7 |
| V | SATELLITE COMMUNICATION - Elements of satellite communication: Frequency bands, Transmission and multiplexing. Modulation, Multiple access. Satellite orbit and description- orbital period and velocity, effects of orbital inclination, Azimuth and elevation, Coverage angle and slant range, Geostationary orbit, Satellite description. Earth Station antenna, high-power amplifier, low-noise amplifier, up converter, down converter, monitoring and control, reliability. Satellite Link: basic link analysis, | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Reppaport-Wireless Communication, Pearson Education.
2. William Stallings- Wireless communication & Networks, LPE, Pearson Education, Asia.
3. Tri. T. Ha.- Digital Satellite Communications, Mc-Graw Hill International.
4. Dr.Kamilo Feher-Digital Wireless Communication, Prentice Hall of India.
5. William C.Y. Le-Mobile Cellular Telecommunications, Mc-Graw Hill Interational Edition.
6. Richharia M-Satellite Communication System, Mac Millan.

**EC 405 MICROCONTROLLER C(L,T,P) =4(3,1,0)**

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| **Unit** | **Course Contents** | **Hours** |
| 1 | **THE 8051 MICROCONTROLLER:** Introduction, The 8051 microcontroller hardware. I/O pins, Port, External memory. Counters and Timers, Serial data. Interputs. | 7 |
| II | **8051 ASSEMBLY LANGUAGE PROGRAMMING:** Addressing modes, External data moves, push and pop opcides, Logical operations, Byte level and bit level logival operations. Arithmetic operations, Jump and call instructions, Interrupts & returns. | 7 |
| III | **REAL WORLD INTERFACING:** Interfacing of LCD, ADC to 8051. | 7 |
| IV | **INTRODUCTION TO REAL TIME OPERATING SYSTEMS:** Round robin with interrupts, RTOS Architecture, Task and task states, Semphores and shared data. | 7 |
| V | **BASIC DESIGN USING RTOS:** Encapsulating Semaphores and Queues, Saving Memory Space, Saving power. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. K.N. Ayala-The 8051 Microcontroller. Penram International.
2. M.A. Mazidi and J.G. Mazidi-The 8051 Microcontroller and Embedded Systems, Pearson Education Asia.
3. David simon-An Embedded software Primer. Pearson Education Asia.
4. J.W. Valvano Brooks/Cole-Embedded Microcomputer Systems Thomson Learning T M

**EC 407 VLSI DESIGN C(L,T,P) =4(3,1,0)**

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| **Unit** | **Course Contents** | **Hours** |
| 1 | INTRODUCTION TO MOS TECHNOLOGY- Basic MOS transistors, Enhancement Mode transistor action, Depletion Mode transistor action, NMOS and CMOS fabrication. | 7 |
| II | BASIC ELECTRICAL PROPERTIES OF MOS CIRCUITS- Ids versus Vds relationship, Aspects of threshold voltage, Transistor Transconductance gm. The nMOS inverter, Pull up to Pull-down ratio for a NMOS Inverter and CMOS Inverter (Bn/Bp), MOS transistor circuit Model, Noise Margin. | 7 |
| III | CMOS LOGIC CIRCUITS- The inverter, Combinational Logic, NAND Gate NOR gate, Compound Gates, 2 input CMOS Multiplexer, Memory latches and registers, Transmission Gate, Gate delays, CMOS-Gate Transistor sizing, Power dissipation. | 7 |
| IV | Basic physical design of simple Gates and Layout issues. Layout issues for inverter, Layout for NAND and NOR Gates, Complex Logic gates Layout, Layout optimization for performance. | 7 |
| V | Introduction to VHDL, Prolog & other design tools. VHDL Code for simple Logic gates, flip-flops, shift registers. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Stephen Brown and Zvonlo Veranesic-Fundamentals of Digital Logic with VHDL Design, Tata Mc-Graw Hill.
2. Neil H.E. Weste, Kamran Eshraghian-Principles of CMOS VLSI Design.
3. Douglas A. Pucknell, Kamran Eshraghian-Basic VLSI Design.
4. Michael John, Sebastian Smith-Application specific Integrated Circuit.
5. Behzad Razavi-Design of Analog CMOS Integrated Circuits, Mc-Graw Hill.

**EC 410 IMAGE PROCESSING C (L,T,P) =3(3,0,0)**

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| **Unit** | **Course Contents** | **Hours** |
| 1 | INTRODUCTION: Imaging in ultraviolet and visible band. Fundamental steps in image processing. Components in image processing. Image perception in eye, light and electromagnetic spectrum, Image sensing and acquisition using sensor array. | 7 |
| II | DIGITAL IMAGE FUNDAMENTALS: Image sampling and quantization, Representing digital images, Spatial and gray-level resolution, Aliasing and Moiré patterns, Zooming and Shrinking digital images. | 7 |
| III | IMAGE RESTORATION: Image restoration model, Noise Models, Spatial and frequency properties of noise, noise probability density functions, Noise - only spatial filter, Mean filter Statistic filter and adaptive filter, Frequency domain filters - Band reject filter, Band pass filter and Notch filter. | 7 |
| IV | IMAGE COMPRESSION: Compression Fundamentals - Coding Redundancy, Interpixel redundancy, Psycho visual redundancy and Fidelity criteria. Image Compression models, Source encoder and decoder, Channel encoder and decoder, Lossy compression and compression standards. color space formats, scaling methodologies (like horizontal, vertical up/down scaling). Display format (VGA, NTSC, PAL). | 7 |
| V | EXPERT SYSTEM AND PATTERN RECOGNITION: Use of computers in problem solving, information representation, searching, theorem proving, and pattern matching with substitution. Methods for knowledge representation, searching, spatial, temporal and common sense reasoning, and logic and probabilistic inferencing. Applications in expert systems and robotics | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Rafael C. Gonzalez-Digital Image Processing, Pearson Edcation Asia.
2. Kenneth R. Castleman-Digital Image Processing, Pearson Education Asia.
3. Nick Effard-Digital Image Processing, Pearson Education Asia.
4. Jain A.K.-Digital Image Processing, Prentice hall of India.
5. Sonka, Hlavac & Boyle-Image Processing. analysis and machine Vision, Thomas Learning.

**EC 453 MICROCONTROLLER LAB C(L,T,P) =3(0,0,3**)

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| **S. No.** | **List of Experiments** |
| 1. | Write a program to add two 2-byte numbers with a 3-byte sum. |
| 2. | Write a program to add an array of 8 numbers using loop. |
| 3. | Write a program to convert temperature from Fahrenheit to Centigrade. |
| 4. | Implement a sequencer traffic light controller. |
| 5-6. | Implement real time interrupt. |
| 7-8. | Interface microcontroller with stepper motor and move motor by given steps. |
| 9-10. | Interface, test and control LED display with Microcontroller. |
| 11-12. | Implement a watchdog timer and test the same to check infinite loop. |

**EC 456 SIGNAL PROCESSING LAB C(L,T,P) =2(0,0,3)**

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| **S. No.** | **List of Experiments** |
|  | **Simulation in MATLAB Environment:** |
| 1. | Generation of continuous and discrete elementary signals (periodic and non-periodic) using mathematical expression. |
| 2. | Generation of Continuous and Discrete Unit Step Signal. |
| 3. | Generation of Exponential and Ramp signals in Continuous & Discrete domain. |
| 4. | Continuous and discrete time Convolution (using basic definition). |
| 5. | Adding and subtracting two given signals. (Continuous as well as Discrete signals) |
| 6. | To generate uniform random numbers between (0, 1). |
| 7. | To generate a random binary wave. |
| 8. | To generate random sequences with arbitrary distributions, means and variances for following:  (a) Rayleigh distribution  (b) Normal distributions: N (0, 1).  (c) Gaussian distributions: N (mx, óx2) |
| 9. | To plot the probability density functions. Find mean and variance for the above distributions |

**EC 601 EMBEDDED SYSTEM DESIGN C(L,T,P) =3(3,0,0)**

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| **Unit** | **Course Contents** | **Hours** |
| 1 | **EMBEDDED COMPUTING-** Microprocessors, embedded design process, system description formalisms. Instruction sets- CISC and RISC; CPU fundamentals- programming I/Os, co-processors, supervisor mode, exceptions, memory management units and address translation, pipelining, super scalar execution, caching, CPU power consumption. | 7 |
| II | **EMBEDDED COMPUTING PLATFORM-** CPU bus, memory devices, I/O devices, interfacing, designing with microprocessors, debugging techniques., Program design and analysis- models of program, assembly and linking, compilation techniques, analysis and optimization of execution time, energy, power and size. | 7 |
| III | **PROCESSES AND OPERATING SYSTEMS-** multiple tasks and multiple processes, context switching, scheduling policies, inter-process communication mechanisms. | 7 |
| IV | **HARDWARE ACCELERATORS-** CPUs and accelerators, accelerator system design. Networks- distributed embedded architectures, networks for embedded systems, network-based design, Internet-enabled systems. | 7 |
| V | **SYSTEM DESIGN TECHNIQUES-** design methodologies, requirements analysis, system analysis and architecture design, quality assurance. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Wolf, W. Computers as components- Principles of embedded computing system design. Academic Press (Indian edition available from Harcourt India Pvt. Ltd., 27M Block market, Greater Kailash II, New Delhi-110 048.)

**EC 615**  **MICRO-ELECTRO-MECHANICAL-SYSTEMS (MEMS) C(L,T,P) =4 (3,1,0)**

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| **UNIT** | **Contents of the Subject** | **Hours** |
| 1 | Micro electro mechanical system (MEMS) origins. MEMS impetus/ motivation. | 7 |
| II | Material for MEMS. The toolbox: processes for micro machining. | 7 |
| III | MEMS fabrication technologies. Fundamentals MEMS device physics: Actuation. Fundamental | 7 |
| IV | MEMS devices: The cantilever beam. Microwave MEMS applications: | 7 |
| V | MEM switch design considerations. The micro-machined transmission line. MEMS-based microwave circuit and system. | 7 |
|  | **Total** | 35 |

**Reference Books:**

1. Microelectromechanical (MEM) Microwave Systems by Hector J.De Los Santos, Artechhouse

2. An Introduction to Microelectromechanical System by Nadim Maluf, Artechhouse

**EC 619** **WIRELESS SENSOR NETWORKS C(L,T,P) =4(3,1,0**

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| **UNIT** | **Contents of the Subject** | **Hours** |
| 1 | **WIRELESS SENSOR NETWORKS**: Introduction, Smart environments, the physical layer in WSN, WSN medium access control and link layer protocols | 7 |
| II | **COMMUNICATION NETWORKS:** Network architecture, Network Topology, Communication Protocols and Routing, Power Management, Network Structure and Hierarchical Networks, Historical Development and Standards | 7 |
| III | **SMART SENSORS:** IEEE 1451 and Smart Sensors, Transducers and Physical Transduction Principles, Sensors for Smart Environments,Commercially Available Wireless Sensor Systems, | 7 |
| IV | **WSN SERVICES:** Self-Organization and Localization, topology control and routing, data-centric and content-based routing, Quality of Service and transport protocols, in-network aggregation and WSN security. | 7 |
| V | **SIGNAL PROCESSING AND DECISION-MAKING:** signal processing and decision-making, Signal Conditioning, Digital Signal Processing, Decision-Making and User Interface, Building and Home Automation, | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. R. Frank, Understanding Smart Sensors, 2nd Ed., Artech House, Norwood, MA, 2000.

2. Ivan Stojmenovic Wireless Sensor Networks: Challenges and Opportunities

3. C.W. de Silva, Control Sensors and Actuators, Prentice-Hall, New Jersey, 1989.

4. F.L. Lewis, Optimal Estimation, Wiley, New York, 1986.

5. F.L. Lewis, Applied Optimal Control and Estimation, Prentice-Hell, New Jersey, 1992.

6. F.L. Lewis, C.T. Abdallah, and D.M Dawson, Control of Robot Manipulators, Macmillan, New York, Mar. 1993.

7. Murthy & Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols," ISBN 0-13-147023-X, Pearson 2004

8. William Stallings, “Wireless Communications & Networks”, ISBN: 0131918354, Prentice Hall; 2nd edition, November 12, 2004.

**EE 101/102 ELECTRICAL AND ELECTRONICS ENGINEERING C (L, T, P) = 4 (3, 1, 0)**

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| **UNIT** | **CONTENTS OF THE COURSE** | **Hours** |
| **1** | DC Networks: Kirchoff’s Laws, Node Voltage and Mesh Current Analysis;Delta-Star and Star-Delta Transformation, Source Conversion. Classification of Network Elements, Superposition Theorem, Thevenin’s Theorem. | **7** |
| **II** | Single Phase AC Circuits: Generation of Single Phase AC Voltage, EMF Equation, Average, RMS and Effective Values. RLC Series, Parallel and Series-Parallel Circuits, Complex Representation of Impedances. Phasor Diagram, Power and Power Factor.  • Three Phase A.C. Circuits: Generation of Three-Phase AC Voltage, Delta and Star-Connection, Line & Phase Quantities, 3-Phase Balanced Circuits, Phasor Diagram, Measurement of Power in Three Phase Balanced Circuits. | **7** |
| **III** | • Transformer: Faraday’s Law of Electromagnetic Induction, Construction and Operation of Single Phase Transformer, EMF Equation, Voltage & Current Relationship and Phasor Diagram of Ideal Transformer.  • Electrical DC Machine: Principle of DC Machines, Types, Different Parts of DC Machines. | **7** |
| **IV** | • Diode: PN junction diode, formation of depletion layer and diode characterstics. Transistor: Bipolar Junction Transistor, Transistor Current Components, Characteristics of CE, CB and CC Transistor Amplifiers.  • Thyristors: The four layer diode, Bi-directional thyristors, the uni-junction transistor and its application in thyristor circuits. | **7** |
| **V** | • Communication System: Introduction to modulation (AM, FM & PM) demodulation, multiplexing. Superhetrodyne radio receiver, television. Elementary concepts of optical, satellite & mobile communication. | **7** |
|  | **Total** | **35** |

**Recommended Books**

1. BL Theraja, Electrical Engineering

2. Niazi, Electrical and Electronics Engineering

3. Network Synthesis by Heytt Kamerly

4. Network Theory by Van Valkenburg

**EE 151/152 ELECTRICAL AND ELECTRONICS ENGG. LAB C (L, T, P) = 1 (0, 0, 2)**

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| **S. N.** | **List of Experiments** |
|  | **A. ELECTRICAL LAB** |
| 1. | To verify: Kirchhoff’s Current and Voltage Laws, Superposition Theorem and Thevenin Theorem. |
| 2. | Make house wiring including earthing for 1-phase energy meter, MCB, ceiling fan, tube light, three pin socket and a lamp operated from two different positions. Basic functional study of components used in house wiring. |
| 3. | Study the construction and basic working of single phase induction motor and ceiling fan along with regulator. |
| 4. | Basic functional study and connection of moving coil & moving iron ammeters and voltmeters, dynamometer, wattmeter and energy meter. |
| 5. | Study the construction, circuit, working and application of the following lamps: (i) Fluorescent lamp, (ii) Sodium vapour lamp and (iii) Mercury vapour lamp |
| 6. | Study the construction and connection of single phase transformer and auto-transformer.  Measure input and output voltage and find turn ratio. |
|  | **ELECTRONICS LAB** |
| 7. | Identification, testing and applications of resistors, inductors, capacitors, PN-diode, Zener diode, LED, LCD, BJT, SCR, Photo diode and Photo transistor. |
| 8. | Functional study of CRO, analog & digital multi-meters and function / signal generator. |
| 9. | Study the BJT amplifier in common emitter configuration and measure voltage gain. |
| 10. | Measurement of power in 3Phase circuit using Two Wattmeters and finding Power Factor. |

**EE 204 ELECTRO MECHANICAL ENERGY CONVERSION – II C(L,T,P) = 3(3,0,0)**

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| **UNIT** | **COURSE CONTENTS** | **Hours** |
| **I** | **Introduction:** General equation of inducted emf, AC armature windings: concentric and distributed winding, chording, skewing, effect on induced emf. Armature and field mmf, effect of power factor and current on armature mmf, harmonics. Rotating fields. | **6** |
| **II** | **Induction Motors:** Construction of squirrel cage and slip ring induction motor, basic principles, flux and mmf waves, induction motor as a transformer. Equivalent circuits, torque equation, torque-slip curves, no load and block rotor tests, circle diagram, performance calculation. Effect of rotor resistance. Cogging, Crawling. Double cage squirrel cage induction motor, induction generator, induction regulator. | **6** |
| **III** | **Starting and Speed Control of Induction Motors:** Various methods of starting and speed control of squirrel cage and slip ring motor, cascade connection, braking. **Single-Phase Induction Motor:** Revolving field theory, starting methods, equivalent circuits. | **8** |
| **IV** | **Synchronous Generator:** Construction, types, excitation systems, principles. Equation of induced emf, flux and emf waves, theory of cylindrical rotor and salient pole machines, tworeactance theory, phasor diagrams, power developed, voltage regulation, OC and SC tests, zero power factor characteristics, potier triangle and ASA method of finding voltage regulation, synchronization, parallel operation, hunting and its prevention. | **8** |
| **V** | **Synchronous Motors:** types, construction, principle, phasor diagrams, speed torque characteristics, power factor control, V-curves, starting methods, performance calculations, applications, synchronous condenser, synchronous induction motor. | **8** |
|  | **Total** | **36** |

**References:**

1) P.S.Bimbhra, Electrical Machinery, 2000, Khanna publishers New Delhi.

2) J.Nagrath and D.P.Kothari, Electrical Machines 2000, TATA MCGRAW HILL Publication New Delhi.

3) P.S.Bimbhra, Generalized theory of Electrical Machine, 1996, Khanna publishers, New Delhi.

4) Gopal K.Dubey, Fundamental of Electrical Drives, 2001 Narosa Publishing House, New Delhi

5) Fitzrald,Kingsley and umans Electrical Machines 2000, TATA MCGRAW HILL Publication New Delhi.

**EE-205 ELECTRO MECHANICAL ENERGY CONVERSION- I C(L.T.P) = 3(3,0,0)**

|  |  |  |
| --- | --- | --- |
| **Unit** | **COURSE CONTENTS** | **Hours** |
| **I** | **Electromechanical Energy Conversion:** Basic principles of electromechanical energy conversion. Basic aspects and physical phenomena involved in energy conversion. Energy balance. | **6** |
| **II** | **DC generators**: Construction, Types of DC generators, emf equation, lap and wave windings, equalizing connections, armature reaction, commutation, methods of improving commutations, demagnetizing and cross magnetizing mmf, interpoles, characteristics, parallel operation. Rosenberg generator. | **6** |
| **III** | **DC Motors:** Principle, back emf, types, production of torque, armature reaction and interpoles, characteristics of shunt, series and compound motor, DC motor starting. Speed Control of DC Motor: Armature voltage and field current control methods, Ward Leonard method. Braking, losses and efficiency, direct and indirect test, Swinburne’s test, Hopkinsion test, field and retardation test, single-phase series motor. | **8** |
| **IV** | **Transformers:** Construction, types, emf equation. No load and load conditions. Equivalent circuits, Vector diagrams, OC and SC tests, Sumpner’s back-to-back test, efficiency. Voltage regulation, effect of frequency, parallel operation, autotransformers, switching currents in transformers, separation of losses. | **8** |
| **V** | **Polyphase Transformers:** Single unit or bank of single-phase units, polyphase connections, Open delta and V connections, Phase conversion: 3 to 6 phase and 3 to 2 phase conversions, Effect of 3-phase winding connections on harmonics, 3-phase winding transformers, tertiary winding. | **8** |
|  | **Total** | **36** |

**References:**

1.) P.S.Bimbhra, Electrical Machinery, 2000, Khanna publishers New Delhi.

2. ) J.Nagrath and D.P.Kothari, Electrical Machines 2000, TATA MCGRAW HILL Publication New Delhi.

3. ) P.S.Bimbhra, Generalized theory of Electrical Machine, 1996, Khanna publishers, New Delhi.

4. ) Gopal K.Dubey, Fundamental of Electrical Drives, 2001 Narosa Publishing House, New Delhi

5. ) Fitzrald,Kingsley and umans Electrical Machines 2000, TATA MCGRAW HILL Publication New Delhi.

6. ) Advance Electrical Technologies by H.Cotton

# EE – 253 Electro-Mechanical Energy Conversion ­­–I Lab C (L, T, P) = (0, 0, 3)

1 Speed control of D.C. shunt motor by (a) Field current control method and plot the curve for speed vs field current. (b) Armature voltage control method and plot the curve for speed vs armature voltage.

2 Speed control of a D.C. Motor by Ward Leonard method and to plot the curve for speed vs applied armature voltage.

3 To determine the efficiency of D.C. Shunt motor by loss summation (Swinburne’s) method.

4 To determine the efficiency of two identical D.C. Machine by Hopkinson’s regenerative test.

5 To perform O.C. and S.C. test on a 1-phase transformer and to determine the parameters of its equivalent circuit its voltage regulation and efficiency.

6 To perform back-to-back test on two identical 1-phase transformers and find their efficiency and parameters of the equivalent circuit.

7 To perform parallel operation of two 1-phase transformers and determine their load sharing.

8 To determine the efficiency and voltage regulation of a single-phase transformer by direct loading.

9 To perform OC and SC test on a 3-phase transformer and find its efficiency and parameters of its equivalent circuit.

10 To perform parallel operation of two 3-phase transformers and determine their load sharing.

# 11 To study the performance of 3-phase transformer for its various connections, i.e. star/star star/delta delta/star and delta/delta and find the magnitude of 3rd harmonic current.

**EE 402 ELECTRICAL DRIVES C(L,T,P) = 4(3,1,0)**

|  |  |  |
| --- | --- | --- |
| **Unit** | **COURSE CONTENTS** | **Hours** |
| **I** | **Dynamics of Electric Drives:** Fundamental torque equations, speed-torque conventions and multi-quardant operation, equivalent values of drive parameters, nature and classification of load torques, steady state stability, load equalization, close loop configurations of drives. | **6** |
| **II** | **DC Drives:** Speed torque curves, torque and power limitation in armature voltage and field control, Starting. **Braking-**Regenerative Braking, dynamic braking and plugging. **Speed Control-**Controlled Rectifier fed DC drives, Chopper Controlled DC drives. | **6** |
| **III** | **Induction Motor Drives-I: Starting. Braking-**Regenerative braking, plugging and dynamic braking. **Speed Control-**Stator voltage control, variable frequency control from voltage source, Voltage Source Inverter (VSI) Control. | **8** |
| **IV** | **Induction Motor Drives-II:** Variable frequency control from current source, Current Source Inverter (CSI) Control, Cycloconverter Control, Static rotor resistance control, Slip Power Recovery- Stator Scherbius drive, Static Kramer drive. | **8** |
| **V** | **Synchronous Motor Drive**: Control of Synchronous Motor-Separately Controlled and VSI fed Self-Controlled Synchronous Motor Drives. Dynamic and Regenerative Braking of Synchronous Motor with VSI. Control of Synchronous Motor Using Current Source Inverter (CSI) | **8** |
|  | **Total** | 37 |

**References Books.:**

1. G K Dubey Fundamentals of Electrical Drives,Narosa Publishing House, New Delhi,1995.
2. V Subrahmanyam:Thyristor control of electric Drives,Tata McGraw Hill, New Delhi, 1988.
3. V Subrahmanyam:Electric Drives-Concepts and Applications,Tata McGraw Hill,New Delhi.
4. S K Pillai:A first course on electrical Drives,Wiley Eastern limited,India.
5. B K Bose:Power electronics and A. C. Drives, Prentice Hall.

**PY 101/102 ENGINEERING PHYSICS C (L, T, P) = 4 (3, 1, 0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Contents of Course** | **Hours** |
| **I** | **Interference of light**   * Newton’s Rings: Theory and determination of diameters of dark and bright rings. * Michelson’s interferometer: Construction and working, Determination of wavelength of light and wavelength separation of two nearby wavelengths.   **Polarization of Light**   * Production of Plane, circular and elliptically polarized, Phase retardation plates, * Specific rotation and its measurement using the half shade and Bi-Quartz polarimeters. | **8 hrs,** |
| **II** | **Diffraction of Light :**   * Fraunhofer’s diffraction due to single Slit, * Theory of plane transmission grating and determination of wavelength of light * Resolving power: Reyliegh criterion, Resolving power of diffraction grating. | **6 hrs.** |
| **III** | **Lasers , Holography and Optical fiber**   * Theory , design and application of Ruby, He- Ne and semiconductor lasers * Construction and Reconstruction of Hologram * Introduction of optical fiber as wave guide * Numerical Apeture of an optical fiber | **6 hrs.** |
| **IV** | **Special Theory of Relativity**   * Postulates of special theory of relativity, Lorentz Transformations * Relativity of length , mass, and time. * Relativistic velocity addition , Mass- Energy relation | **6 hrs.** |
| **V** | **Electricity & Magnetism**   * Scalar and Vector Fields, Concepts of Gradient, Divergence and Curl, Maxwell’s electromagnetic Equations.   **Nuclear Radiation Detectors**   * Nuclear Binding Energy, Construction , working and properties of proportional , G.eiger M.uller and Scintillation counter | **7 hrs.** |
|  | **Total** | **33** |

**References Books.:**

1. Optics by A.K. Ghatak (Tata McGraw-Hill)
2. Introductory Quantum Mechanics by Liboff (Pearson’s Publication)
3. Quantum Mech. by A.Ghatak & S. Lokhathan (Tata McGraw-Hill
4. A textbook of Optics: Brijlal and Subramanium. S. Chand Co. Ltd.
5. Introduction to Modern Optics by G.R. Fowels
6. An introduction to Fiber Optics by R. Allen Shotwell, PHI
7. Elements of Electromagnetic Fields: S P Seth, Dhanpat Rai & Company.
8. Lasers Theory and Applications by Thyagarajan and Ghatak, Macmillan India Ltd.
9. Elements of Electromagnetic by Mathew N.O. Sadiku, Oxford University Press.
10. Introductory University optics: Beynon, Prentice Hall of India Pvt. Ltd.
11. An introduction to Fiber Optics by John M. Senior, PHI
12. Nuclear Physics by Burchem (Addision Weisly)

**PY 151/152 ENGINEERING PHYSICS LAB C (L, T, P) = 1 (0, 0, 2)**

|  |  |
| --- | --- |
| **S. N.** | **LIST OF PRACTICALS** |
| 1 | To determine the dispersive power of material of prism |
| 2 | To determine the wavelength of sodium light by Newton’s rings experiment |
| 3 | To determine the specific rotation of glucose / cane sugar solution using polarimeter |
| 4 | To determine the wavelength of prominent lines of white light by plane diffraction grating |
| 5 | To determine the wavelength of sodium light with the help of Michelson interferometer |
| 6 | To study the profile of He-Ne Laser |
| 7 | To determine the Numerical Aperture of optical fiber |
| 8 | To determine the fringe width and distance between coherent sources by Fresnel’s bi-prism experiment |
| 9 | To determine the band gap in a semiconductor using a P.N. junction diode |
| 10 | To convert a galvanometer into an ammeter. |
| 11 | To convert a galvanometer into a voltmeter |
| 12 | To draw the plateau characteristic of a Geiger Muller Counter using a radioactive source. |
| 13 | To determine the height of an object with the help of sextant |
| 14 | To determine high resistance by method of leakage with the help of ballistic galvanometer |
| 15 | To determine the specific resistance of a given of a wire with the help of Carry Foster’s Bridge |

**CY 101/102 ENGINEERING CHEMISTRY C (L, T, P) = 4 (3, 1, 0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Contents of the Subject** | **Hours** |
| **I** | **Water:** Common impurities, Hardness, Determination of hardness by Clark’s and Complex metric (EDTA) method, Degree of Hardness. **Municipal Water Supply**: Requisites of drinking water, Purification of water. Sedimentation, coagulation, filtration, sterilization. Break point chlorination. **Water for Steam Preparation:** Boiler Trouble, Carryover, Corrosion, Scale & Sludge and caustic embrittlement. **Methods of Boiler Water Treatment:** Preliminary treatments, Preheating. Lime-Soda Process, Permutite or Zeolite process, Deionization or demineralization. Feed water Conditioning, Internal treatment, Blow down. Problems based on water treatment (Lime-Soda Process). | **7 hrs.** |
| **II** | **Corrosion:** Definition and its significance, Theories of corrosion. Galvanic Cell and concentration Cell, Pitting and Stress Corrosion. Protection against Corrosion, Protective Metallic Coating. **Lubricants:** Classification, Types, Properties: Viscosity, Viscosity Index, Flash and Fire point, Cloud and Pour point and Emulsification. **Pollution:** Elementary idea of air and water pollution, Effect of air pollution. Depletion of ozone layer and its environmental impact. Greenhouse effect. **Phase Rule:** Statement, Definitions. Application to one component system: Water and Sulphur. Study of two components: Lead-Silver. | **9 hrs.** |
| **III** | **New & Advanced Engineering Materials:** Materials and Chemistry of Engineering materials **Software & Hardware** industry: chip and integrated circuit manufacturing. Chemistry of **Electrical** Engineering materials. Metals Alloys, polymers. **Electronics and Communication** industries: Semiconductor Materials for**, Mechanical** industries Materials for **Civil and building constructions**. | **7 hrs.** |
| **IV** | **Plastics:** Classification and constituents of plastics and their uses, preparation, properties and uses of Polyethylene. Bakelite, Terylene and Nylon. **Rubber :** Natural rubber, vulcanization, synthetic rubbers. **Cement:** Manufacture of Portland cement, vertical shaft kiln technology, Chemistry of setting and hardening. **Refractories:** Definition, properties, classification, Manufacturing and Properties of Silica and Fireclay Refractories. **Glass:** Preparation, varieties and uses, **Explosive:** Introduction, classification, requisites of explosives. Plastic explosives, blasting fuses, application. | **7 hrs.** |
| **V** | **Chemicals Fuels:** Origin and classification fuels. **Solid Fuels:** Coal**,** Calorific value ,Proximate and Ultimate analysis Determination of calorific value by Bomb Calorimeter. **Liquid Fuel: Advantages**, petroleum and refining of petroleum, synthetic petrol, Cracking and Reforming, Knocking –Ant knocking Octane number, Cetane number. **Gaseous Fuels:** Advantages, Manufacture, composition and calorific value of coal gas and oil gas, Determination of calorific value by Junker’s Calorimeter. **Advanced fuel systems:** Elementary Non-conventional Energy Materials. | **7 hrs.** |
| **Books:**  1.A Text book of engineering chemistry:Dr. Sunita Rattan ,S.K. Kataria  2.A Text book of Engineering chemistry:P.C. Jain & Monika Jain,Dhanpat Rai Publication  3.VLSI Technology :S.M. Sze Tata Mc Graw Hill Publication company Ltd.  4.VLSI fabrication Principles ,Sorab K. Gandhi,John Wilay & Sons Inc.  5 .Semiconductor Devices,Basic Principles :Jasprit Singh.  6.Materials sciences:MS Vijaya & G Rangarajan,Tata Mc Graw Hill pub.. House  7.Materials Sciences and Engineering:Willams D Callister Jr. Wiley India(p)Ltd.  8.Materials Sciences:G.K. Narula ,K.S. Narula  9.Engineering Chemistry:R. Gopalan ,D. Venkappaya,Vikas Publication  10.Air Pollution :MN Rao,HVN Rao,Tata Mc Graw Hill Publication Company. | | |

**CY 151/152 CHEMISTRY LAB C (L, T, P) = 1 (0, 0, 2)**

|  |  |  |
| --- | --- | --- |
| **S. No.** | **Name of Experiment** | **No. of Practical Turns** |
| **I** | **Physical Methods of Analysis** |  |
| 1.  a.  b.  c. | Conduct metric Analysis  Determination of strength Acid and Bases  Determination of Solubility of Barium sulphate  Determination of equivalent conductivity | 01  01  01 |
| 2.  a.  b. | pH Analysis  Determination of strength of Acids and Bases  Determination of PH of various Water Sample and its Analysis | 01  01 |
| 3. | Determination of Viscosity of a given sample of oil at various temperature by Redwood Viscometer No.1 | 01 |
| 4. | Determination of Flash and Fire point of a given sample using Pensky Marten apparatus | 01 |
| 5. | Determination of Cloud and Pour point of a sample | 01 |
| **II** | **Volumetric Analysis** |  |
| 1. | To study kinetics of acetone iodine reactions | 02 |
| 2. | Determination of available chorine in Bleaching Powder | 01 |
| 3. | Determination of free chlorine in a Water sample | 01 |
| 4. | To study hydrolysis of ester | 01 |
| 5. | Determination of B.O.D Value of Water sample | 01 |
| 6. | Determination of C.O.D Value of Water sample | 01 |
| 7. | Determination of hardness of water | 01 |
| 8. | Determination of Dissolved Oxygen or Ammonia or Carbon Dioxide | 02 |
| 9. | Determination of total suspended dissolved and fixed solids in Sewage and Water sample | 01 |
| **III** | **REDOX Titrations** |  |
| 1. | Determination of Copper sulphate Idometrically | 01 |
| 2. | Determine Potassium dichromate idometrically | 01 |
| 3. | Determination Potassium dichromate by retreating it against ferrous ammonium sulphate ( Using internal indictor) | 02 |
| 4. | Estimation of Iron in plain Carbon steel | 01 |
| 5. | Estimation of Copper in brass | 01 |
| **IV** | **Gravimetric Analysis** |  |
| 1. | Barium as Barium sulphate gravimetrically | 02 |
| 2. | Silver as Silver Nitrate gravimetrically | 02 |
| 3. | Copper as Copper thiocynate gravimetrically | 02 |

* As per availability of experiment

**EN 101 ENGINEERING ENGLISH C (L, T, P) = 3 (3, 0, 0)**

|  |  |
| --- | --- |
| **Units** | **Contents of the Subject** |
| **I** | **Poems**   * Poetry Appreciation * Ode on Solitude- A Pope * Preludes- T S Eliot * On His Blindness- John Milton |
| **II** | **Poems**   * Solitary Reaper-W Wordsworth * The Sun Rising – John Donne * Death the Leveler- James Shirley * Voice of the Unwanted Girl-Sujata Bhatt |
| **III** | **Short stories**   * The Coffee House – Leo Tolstoy * Three Questions – Leo Tolstoy * Monal Hunt – Manohar Malgonkar * The Marriage is a Private Affair – Chinua Achebe |
| **IV** | **Essays**   * Of truth- Francis Bacon * Toasted English- R K Narayan * The Influence of Science – EN Dac Andrade and Julian Huxley * Our Civilization – C E M Joad. |
| **V** | **Novella**   * The Old Man and the sea – E Hemingway |

**References Books.:**

*Popular Short stories* Oxford University Press

Penguin Book of Verse Penguin

Complete works of Chinua Achebe – AITBS publication

The Old Man and the sea – E Hemingway

The Complete works of Leo Tolstoy.

Prose for pleasure and Comprehension – H G S Rao Oxford Publication.

*Oxford Companion to English Literature* O U P

*A glossary of literary terms* -M H Abrams

**EN 102 COMMUNICATION TECHNIQUES C (L, T, P) = 4 (3, 1, 0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Contents of the Course** | **Hours** |
| I | **Grammar**   * Words and Sentences * Verbs / Tenses * Questions / Questions Tags * Modal Verbs * The Passive | **10** |
| II | **Grammar**   * The Infinitive and The ING form * Nouns and Articles * Determiners * Reported Speech * Adjectives and Adverbs | **08** |
| III | **Grammar**   * Prepositions * Verbs with Prepositions and Adverbs * Pronouns * Relative Clauses * Conditionals * Linking Words | **08** |
| IV | **Compositions**   * Essay and Report Writing * Review Writing | **03** |
| V | **Compositions**   * Applications, Letter and Précis Writing * Technical Proposal Writing | **03** |
|  | **Total** | **32** |

**Recommended books:-**

1 Communicative Grammar & Composition by R K Lidiya, Oxford University Press

2 A Textbook of General English by R P Bhatnagar, Popular Book Depot

**Reference books:-**

1 The Pocket Guide to English Language- John O’ Connor, Cambridge University Press

2 Modern English –N. Krishnaswamy, Macmillan publication

3 Oxford Guide to Writing and Speaking – John Selly Oxford University press

4 English Grammar for Today – Geoffrey Leech, Pearson Longman

5 University Grammar of English – Quirk & Greenbaum, Pearson Longman

**EN 151 ENGLISH COMMUNICATION LAB C (L, T, P) = 1 (0, 0, 2)**

**One is required to study any 10 topics from the topics mentioned below.**

|  |  |
| --- | --- |
| **S No.** | **Contents of the Subject** |
| **1**  **2** | Phonetics  Phonetic symbols and transcription |
| **3**  **4**  **5**  **6**  **7**  **8**  **9** | Synonyms and Antonyms  Word forms  Affixes  Words commonly misspell  Homonyms  Homophones  One word substitution |
| **10**  **11**  **12** | Proverbs  Idioms and phrases  Reading comprehension |

**Reference books:-**

1 Better English Pronunciation- J D O’ Connor Cambridge University press

2 A Textbook of English Phonetics for Indian Students- T Balasubranian Macmillan Publication

3 Spoken English – J B Harrison & R K Bansal Macmillan Publication

4 English prəˈnaʊntsɪŋ Dictionary – Daniel Jones Cambridge University Press

5 Oxford Advanced Learner’s Dictionary

**EN 152 LANGUAGE LAB C (L, T, P) = 1 (0, 0, 2)**

**One is required to study any 10 topics from the topics mentioned below**

|  |  |
| --- | --- |
| **S No** | **Contents of the Subject** |
| **1**  **2**  **3**  **4** | Introducing communication  Communication:- Objectives & media  Communication:- Types, barriers and Principles  Modern Communication devices. Principles of emphatic communication |
| **5**  **6**  **7** | Personality development (Types & essentials )  Body language (Kinesics, proxemics, paralanguage, physical context)  Principles of personal vision, personal leadership & personal management |
| **8**  **9**  **10**  **11** | Leadership & Team building  Principles of Interpersonal leadership & Creative Corporation  Group discussion & seminars  Interview techniques |
| **12** | Practical lessons on personality development. |

***Reference books:-***

*1 Working with Emotional Intelligence-Daniel Goldman*

*2 Emotional Intelligence- Daniel Goldman*

*3 Stress Management-Vera Pfeiffer*

*4 Self hypnosis- Valerie Austin*

*5 Memory Boosters- Hamlyn*

*6 The 7 Habits of highly Effective People- Stephen R. Covey*

*7 First Things First- Stephen R. Covey*

**MA 101 ENGINEERING MATHEMATICS – I C (L, T, P) = 4 (3, 1, 0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Contents of the Course** | **Hours** |
| I | **Differential Calculus**   * Curvature, Concavity and Convexity and Point of inflexion (Cartesian Coordinates only) * Partial Differentiation, Euler’s Theorem on Homogeneous Functions. | 6 |
| II | **Differential Calculus**   * Maxima and Minima of Two and more Independent Variables, Lagrange’s method of undetermined multipliers. * Asymptotes (Cartesian coordinates only), Intersection of the curve and its asymptotes. * Multiple points, Curve tracing of simple curves (Cartesian and Polar) including cardioids, Lemniscates of Bernoulli, Limacon, Equiangular Spiral, Folium of Descartes. | 7 |
| III | **Integral Calculus**   * Double integral, Change of order of integration, Beta function and Gamma function. | 7 |
| IV | **Differential Equations**   * Differential Equations of first order and first degree. * Linear Differential Equations of Higher Order with Constant Coefficients. * Homogeneous Linear Differential Equations. | 7 |
| V | **Differential Equations**   * Linear Differential Equations of Second Order with Variable Coefficients: Method of Change of Dependent and Independent Variables. * Method of Variation of Parameters. | 7 |
|  | **Total** | **34** |

**Books Recommended:**

1. Advanced Mathematics for Engineers by Erwin Kreszig.
2. Advanced Mathematics for Engineers by B.S. Griwal.
3. Advanced Mathematics for Engineers by Chandrika Prasad.
4. Engg. Mathematics I by Y.N. Gaur & C.L. Koul
5. Engg. Mathematics I by K.C. Jain & M.L. Rawat
6. Engg. Mathematics I by D.N. Vyas

**MA 102 ENGINEERING MATHEMATICS – II C (L, T, P) = 4 (3, 1, 0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Contents of the Course** | **Hours** |
| I | **Algebra**   Convergence and Divergence of infinite series: Comparison test, Cauchy’s nth root test, D’alemberts ratio test,  logarithmic ratio test, Raabi’s test, De’Morgan and Bertrand’s test, Gauss test (without proof)   Fourier Series: Expansion of simple function’s in Fourier Series, Fourier Series of even and odd functions. Half range series, change of intervals, Harmonic Analysis. | 6 |
| II | **Matrices**   1.  Rank of a matrix, inverse of a matrix by elementary transformations. 2.  Solution of simultaneous linear equations by matrix method. 3.  Eigen values and Eigen vectors, Cayley- Hamilton theorem (without proof). 4.  Diagonalization of matrix. | 6 |
| III | **Coordinate Geometry of Three Dimensions**   1.  Equation of a sphere. 2.  Intersection of a sphere and a plane, tangent plane, normal lines. 3.  Right circular cone. 4.  Right circular cylinder. | 6 |
| IV | **Vector Calculus**   1.  Scalar and vector point functions, differentiation & integration of vector functions. 2.  Gradient, Divergence, Curl and Differential Operator. 3.  Line, Surface and volume integrals. . | 7 |
| V | **Partial Differential Equations**   1.  Partial Differential Equations of the First Order. 2.  Non-linear Partial Differential Equations of order one: Standard forms. 3.  Charpit’s Method. | 7 |
| **Total** | | **32** |

**Books Recommended:**

1. 1. Advanced Mathematics for Engineers by Erwin Kreszig.
2. 2. Advanced Mathematics for Engineers by B.S. Griwal
3. 3. Advanced Mathematics for Engineers by Chandrika Prasad
4. 4. Engg. Mathematics Book 2 by Y.N. Gaur & C.L. Koul
5. 5. Engg. Mathematics II by K.C. Jain & M.L. Rawat

**MA 201 Integral Transforms & Complex Analysis C(L,T,P) =4(3,1,0)**

|  |  |  |
| --- | --- | --- |
| **Unit** | **Course Contents** | **Hours** |
| 1 | **BOUNDARY VALUE PROBLEMS: –** Method of separation of variables in the solution of Boundary VALUE Problems (Wave equation, Diffusion and Laplace equation) | 7 |
| II | **LAPLACE TRANSFORM -** Laplace transform with its simple properties, applications to the solution of ordinary and partial differential equations having constant co-efficient with special reference to the wave and diffusion equations. | 7 |
| III | **FOURIER TRANSFORM -** Complex form of Fourier Transform and its inverse, Fourier sine and cosine transform and their inversion. Applications of Fourier Transform to solution of partial differential equations having constant co-efficient with special reference to heat equation and wave equation. | 7 |
| IV | **COMPLEX VARIABLES -** Analytic functions, Cauchy-Riemann equations, Elementary conformal mapping with simple applications, Line integral in complex domain, Cauchy;s theorem. Cauchy’s integral formula | 7 |
| V | **COMPLEX VARIABLES -**Taylor’s series Laurent’s series poles, Residues, Evaluation of simple definite real integrals using the theorem of residues. Simple contour integration | 7 |
|  | **Total** | **35** |

**Reference Books**

Advanced Mathematics for Engineers by Chandrika Prasad

Higher Engineering Mathematics by BS Grewal

Higher Engineering Mathematics by YN Gaur

Higher Engineering Mathematics by KC Jain

**MA 205 ADVANCE ENGG.MATHEMATICS- III C (L, T, P) = 4(3, 1, 0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| **I** | **Boundary value problems:** Method of separation of variables - in the solution of wave equation in one dimension, Laplace’s equation in two dimensions, Diffusion equation in one dimension. | 7 |
| **II** | **Transform calculus :** Laplace transform with its simple properties, applications to the solutions of ordinary and partial differential equations having constant co-efficient with special reference to wave and diffusion equation. | 7 |
| **III** | **Complex Variable:** Analytic functions, Cauchy Riemann equations, Elementary conformal mapping with simple applications line integral in complex domain, Cauchy’s Theorem, Cauchy’s integral formulae. | 7 |
| **IV** | **Complex variable:** Taylor’s series, Laurent’s series, poles, residues. Evaluations of simple definite real integrals using the theorem of residues. Simple contour integration. | 6 |
| **V** | **Numerical Methods:** Finite differences and interpolation Numerical Differentiation and Integration. Solution of Algebraic and transcendental equations by graphical method, trisection method, regula – falsi method and Newton raphson method | 7 |
|  | **Total** | 34 |

**Reference Books:**

1. Advanced Mathematics for Engineers by Chandrika Prasad.

2 Higher Engineering Mathematics by B.S.Grewal

3. Higher Engineering Mathematics by Y.N.Gaur and C.L.Koul.

4. Higher Engineering Mathematics by K.C.Jain and M.L.Rawat.

**ES101/102 ENVIRONMENTAL STUDIES C (L, T, P) = 2 (2,01, 0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Contents of the Course** | **Hours** |
| I | **Man & Environment:** Definition of Environment & its various components. Ecosystem concepts. Dependence of Man on nature for its various needs. Human population growth & its impacts on environment. Environment & human health. Environmental concerns including climate change, Global warming, Acid Rain, Ozone layer Depletion etc. Environmental ethics. Traditional ways of utilizing various components of environment. Sustainable developments. | 6 |
| II | **Natural Resources:** Forest resources, Mining , Dams & their effects on forests & tribal people. Water resources-over utilization of water, floods, droughts and conflicts over water resources. Mineral Resources- Use of various minerals for Human welfare & environmental effects of mining. Food resources -World food problem. Impacts of changing Agriculture practices on Environment. Energy Resources-Renewable and non renewable energy Resources & exploration of alternative energy sources. Land Resources- land degradation, soil erosion desertification and soil contamination. | 6 |
| III | **Ecosystems:** Structure & function, energy flow, food chains, food webs, Ecological pyramids. Basics of forest grasslands, desert & aquatic ecosystem (Ponds, Streams, Lakes, Rivers, Oceans & Estuaries) | 6 |
| IV | **Biological Diversity:** Genetic, species & ecosystem diversity, Values of Biodiversity, Global, National & Local Biodiversity. Hot-spots of Biodiversity, threat to biodiversity. Endangered & endemic species of India. Conservation of biodiversity in situ & ex-situ | 6 |
| V | **Environment pollution:** Causes, effects & control of- Air pollution, Water pollution, Soil pollution, Noise Pollution, Thermal pollution & Nuclear Hazards. Solid wastes & their Management. Disaster Management-Flood, Drought, Earthquake, Land slides etc. | 6 |
|  | **Total** | **30** |

**References**

1. Agarwal KC, 2001. Environmental Biology, Nidi Publishers Ltd. Bikaner.

2. Bharucha Erach, 2003. The Biodiversity of India, Mapin Publishing Pvt. Ltd, Ahmedabad – 380013, India. Email: mapin@icenet.net

3. Brunner RC, 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480pgs.

4. Clark RS, Marine Pollution, Clanderson Press, Oxofrd (TB).

5. Cunningham WP, Cooper TH, Gorhani E & Hepworth MT, 2001. Environmental Encyclopaedia, Jaico Publishing House, Mumbai, 1196pgs.

6. De AK, Environmental Chemistry, Wiley Eastern Ltd.

7. Down to Earth, Center for Science and Environment (R)

8. Gleick HP, 1993. Water in Crisis, Pacific Institute for Studies in Development, Environment and Security. Stockholm Environmental Institute, Oxford University Press, 473pgs.

9. Hawkins RE, Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)

10. Heywood VH, and Watson RT, 1995. global Biodiversity Assessment. Cambridge University Press 1140pgs.

11. Jadhav H and Bhosale VM, 1995. Environmental Protection and Laws. Himalaya Publishing House, Delhi 284pgs.

12. Mckinney ML and Schoch RM, 1996. Environmental Science Systems and Solutions. Web enhanced edition, 639pgs.

13. Mhaskar AK, Matter Hazardous, Techno-Science Publications (TB)

14. Miller TG, Jr. Environmental Science, Wadsworth Publishing CO. (TB)

15. Odum EP, 1971. Fundamentals of Ecology. WB Saunders Co. USA, 574pgs.

16. Rao MN and Datta AK, 1987. Waste Water Treatment. Oxford and IBH Publishing Co. Pvt. Ltd. 345pgs.

**BM 449 ENTREPRENEURSHIP DEVELOPMENT C (L, T, P) =3 (3, 0, 0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| **I** | Need scope and characteristics nature of entrepreneurship ventures in India economic and industrial heritage and entrepreneurship development; current economic and industrial environment with special reference to enterpreneurial ventures and economic growth. Understanding Human Behaviour time management, group dynamics, conflict and stress management | 7 |
| **II** | Small, medium and large industrial sectors, Industrial potential and identification of opportunities, demand and resource based industries, service sector, corporate entrepreneurship, entrepreneurship and technocrat entrepreneurship. **SSI:** definition and legal frame planning for small enterprise; major policies, organization of SSI units, reservation of items for SSI units, role of SIDO, NSIC and SSI corporate. | 7 |
| **III** | Marketing and Price distribution Methods of sales promotion state and central government purchase procedures: promotional and advertising methods, marketing research policies & Strategies, price determinate expert policies Financing of small scale industries, tax concession to SSI units. Machinery on Hire Purchases, Controlled & Scarce Raw Materials. | 7 |
| **IV** | **Production Planning:** Elements of production process managing production life cycle, PERT, CPM; managing production support services, product licensing, patenting; certification agencies, ISO 9000, and 14000, CS 8000 series; Testing facilities, Quality Control. | 7 |
| **V** | Project identification, decision making area money, market, machinery and material; Project planning and executing; working capital management sources and uses of funds; ration analysis; break even analysis, cost control; time control; Evaluation and preparation of project report | 7 |
|  | **Total** | 35 |

**Reference Books:**

1. Organization & Management of Small Scale Industries: Desai, J.V. Himalaya, Bombay, 1985
2. Management of Small Scale Industries: 3rd Himalaya, Bombay, 1986
3. The Story of an Entrepreneur: M.Nath, IMT Monographs
4. Small Industry Entrepreneurs Handbook: Mohan, K.K. Bombay Productivity Services International
5. Handbook of Entrepreneurship: Rao & Pareek. New Delhi: Learning System, 1978

**HS 201 COMMUNICATION SKILLS C(L,T,P)=3(3,0,0)**

|  |  |  |
| --- | --- | --- |
| **Unit** | **Course Contents** | **Hours** |
| 1 | Foundation and background of organizational behaviour, contemporary challenges-workforce diversity, cross – cultural dynamics, changing nature of managerial work, ethical issues at work, emotional intelligence in contemporary business. Perception, Personality, Learning, Motivation – Concepts and applications, individual decision making. | 7 |
| 2 | Understanding and managing group processes-interpersonal & group dynamics, Group cohesiveness, Group decision making Emotional Intelligence-concept and applications, Understanding work teams, power & politics, Empowerment, Conflict & Negotiation. | 8 |
| 3 | Purpose and process of communication; myths and realities of communication; paths of communication; oral communication; noise, barriers to communication; listening process, types of listening, deterrents to listening process, essentials of good listening; telephonic communication. | 6 |
| 4 | Non verbal communication; gestures, handshakes, gazes, smiles, hand movements, styles of working, voice modulations, body sport for interviews; business etiquettes; business dining, business manners of people of different cultures, managing customer care. | 7 |
| 5 | Written communication; mechanics of writing, report writing, circulars, notices, memos, agenda and minutes; business correspondence-business letter format, style of letter arrangement, types of letters, telex managers, facsimiles, electronic mail; diary writing; development resume. | 7 |
|  | Total | 35 |

**Reference Books:**

1. Enrich your English – by CIEFL (Academic Skills book)
2. Contemporary English Grammar – Raymond Murphy
3. Organizational Behavior, - Fred Luthans9thEdition, McGraw-Hill Irwin, 2002.
4. Organizational Behavior, Tenth Edition, TMG, 1998.John W. Newstorm and Keith Davis
5. . Business Communication Today – By Bovee, Thill, Schazman
6. G. Business Communication – by Pal and Korlahalli

**HS 202 CONGNITIVE SKILLS C (L,T,P)=3(3,0,0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Contents of the Subject** | **Hours** |
| 1 | Introduction to Mindfulness, Mindfulness Exercise, DBT Life Skills – Distress Tolerance | 8 |
| 2 | Mindfulness Exercise, DBT Life Skills – Emotion Regulation | 8 |
| 3 | Mindfulness Exercise, DBT Life Skills – Interpersonal Effectiveness | 7 |
| 4 | Mindfulness Exercise, Anxiety Disorders, Depression, and Personality Disorders, Acceptance: Living in the Here-and-Now as a Way of Life | 7 |
| 5 | Mindfulness Exercise, Introduction to Dialectical Behavior Therapy (DBT), Dialectic Philosophy, Wise Mind | 7 |
|  | **Total** | **37** |

**Reference Books:**

1. Shivani D.R. (1998): NGO Development Initiative & Policy – Vikas Publications

**HS 301 VERBAL & NON-VERBAL REASONING C(L,T,P)=3(3,0,0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| 1 | [Logical Sequence of Words](http://www.indiabix.com/verbal-reasoning/logical-sequence-of-words/), [Blood Relation Test](http://www.indiabix.com/verbal-reasoning/blood-relation-test/), [Syllogism](http://www.indiabix.com/verbal-reasoning/syllogism/) | 7 |
| 2 | [Series Completion](http://www.indiabix.com/verbal-reasoning/series-completion/), [Cause and Effect](http://www.indiabix.com/verbal-reasoning/cause-and-effect/), [Dice](http://www.indiabix.com/verbal-reasoning/dice/) | 7 |
| 3 | [Venn Diagrams](http://www.indiabix.com/verbal-reasoning/venn-diagrams/), [Cube and Cuboids](http://www.indiabix.com/verbal-reasoning/cube-and-cuboid/) [Analogy](http://www.indiabix.com/verbal-reasoning/analogy/) | 7 |
| 4 | [Seating Arrangement](http://www.indiabix.com/verbal-reasoning/seating-arrangement/), [Character Puzzles](http://www.indiabix.com/verbal-reasoning/character-puzzles/), [Direction Sense Test](http://www.indiabix.com/verbal-reasoning/direction-sense-test/) | 7 |
| 5 | [Classification](http://www.indiabix.com/verbal-reasoning/classification/), [Data Sufficiency](http://www.indiabix.com/verbal-reasoning/data-sufficiency/), [Arithmetic Reasoning](http://www.indiabix.com/verbal-reasoning/arithmetic-reasoning/), [Verification of Truth](http://www.indiabix.com/verbal-reasoning/verification-of-truth/) | 7 |
|  | Total | 35 |

**Reference Book:**

‘Reasoning’ by R.S. Aggarwal

**HS 302** **EMPLOYABILITY SKILLS–IV: TECHNICAL WRITING C(L,T,P) = 3(3,0,0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| 1 | Writing Process- Intro of various types of writings, Gathering, Writing, Reviewing, Editing, Indexing, Testing | 7 |
| 2 | Review Writing- Internal, Friendly and Anonymous reviews, Quantity review, Quality review, Precis Wring, Paragraph Writing, Report Writing- Science and research reports, business Reports, Business Report, Business overview | 7 |
| 3 | Letter Writing- Letter of Inquiry, Letter of adjustment, Claim Letter and follow of Letter, Letter of acceptance, Letter of refusal | 7 |
| 4 | Job search correspondence- cover letter, CV and resume | 7 |
| 5 | Writing Mails- User Guides, Reference Guide, Online helps, Website, Technical Proposal Writing. | 7 |
|  | Total | 35 |

**HS 401 TECHNICAL APTITUDE C(LTP)=3(3,0,0)**

|  |  |  |
| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| 1 | PPL (Principal of Programming Language, C, C++, Java, Asp.net, DSA | 7 |
| 2 | DBMS, RDBMS | 7 |



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**SYLLABUS**

**B. TECH.**

Mechatronics Engineering 4 Year Program

**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**GYAN VIHAR SCHOOL OF ENGINEERING & TECHNOLOGY**

**B.TECH. MECHATRONICS – 4 YEARS PROGRAM**

Bachelor of Technology in Mechatronics is 4 years (8 semesters) graduation degree program. The program has been designed to meet the growing demand for qualified professionals in the field of Mechatronics. This program can be taken up after obtaining secondary education up to 12th standard.

The curricula and syllabi of this program offered by Gyan Vihar University is designed considering the need of different applications of the courses related to Mechatronics.

**NEED, OBJECTIVES & MAIN FEATURES OF THE PROGRAM**

**NEED –**

* To develop a platform for higher studies in the field of Mechatronics and its applications
* To develop the ability in students for understanding the basic concepts and their applications in the industries.
* To develop the capability in students for relevant research work.
* To obtain and generate an employment in computing field.

**OBJECTIVES**

* The main objective of this program is to provide a basic platform for higher studies in the field of Mechatronics. This will only be achieved by an approach involving rigorous and comprehensive academic course work covering practical hands on experience with real world applications.

**FEATURES OF B. TECH. CURRICULUM**

* 1st year of the program is common to all B. Tech. programs covering courses related to Basic Sciences, Humanities, Communication skills etc.
* 2nd year covers the theory subjects related to computer programming viz integral transforms & complex analysis, thermodynamics, Material science, production processes, instrumentation and control, operation research, digital hardware design apart from labs of production processes, material science, machine drawing, thermal engineering lab digital hardware lab.
* 3rd year covers the subjects – machine design, CAD, fluid mechanics, production process – II, mechanical energy conversion, signals and networking, telecommunication, automobile & IC Engines, microcontroller and embedded system, communication system, neutral network, computer graphics, industrial electronics.
* B.Tech course contains the job oriented and advanced practical labs which help students understand the practical applications of the areas of mechanical engineering with the theoretical knowledge as well.

**ROLE OF BTECH CURRICULUM IN NATIONAL DEVELOPMENT**

Mechatronics plays a major role in the employment as well as in the economy of the country, the curriculum plays an important role in the development of graduates who can suffer world class services and take the nation forward.

**GLOBAL TRENDS REFLECTED IN B.TECH CURRICULUM**

There is always a demand of Mechatronics engineers globally. The department of Mechatronics aims to produce high quality engineers in technology with a sound theoretical and practical knowledge and responsibility who can contribute effectively to the progress of the country and society.

**POSSIBILITY OF MOTIVATION & SELF DEVELOPMENT**

There are various possibilities of motivation and self development of the students through curriculum. The curriculum has been so designed that a student can

* Understand the professional/industry environment
* Understand team work and group dynamism.
* Develop a sense of effective problem solving and decision making.
* Think and develop projects independently.
* Develop career as computer professional.

**PLACEMENT OPPORTUNITY**

This technical program is basically a foundation for technical PG programs and research. Now a days because of the economy boom, there is high placement opportunities in the field of Mechatronics in industries in India and across the world as well. UG program of mechanical engineering includes study of various aspects of Mechatronics to meet the requirements of various industries. A technical graduate can work for any industry big or small as a Mechatronics engineer and various roles like

* Automation engineer
* Production engineer
* Maintenance engineer
* Executive engineer

**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**Teaching and Examination Scheme for B. Tech. (Mechatronics 4 Year Program)**

**Edition 2014**

**Year: II Semester: III**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | MA - 201 | Integral Transforms & Complex Analysis | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| 2 | ME – 201 | Fundaments of Thermodynamics | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| 3 | ME – 205 | Material Sciences | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| 4 | ME – 206 | Production Process I | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| 5 | EC – 201 | Electric Devices & Circuits | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| 6 |  | **B. Elective (any one of the following)** | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
|  | ME - 212 | Instrumentation and Control |  |  |  |  |  |  |  |
|  | ME 209 | Object Oriented Programming |  |  |  |  |  |  |  |
|  | HS201 | Communication Skill |  |  |  |  |  |  |  |
|  |  | **B. Practicals / Sessionals** |  |  |  |  |  |  |  |
| 7 | ME – 260 | Production Process I Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| 8 | ME – 255 | Material Science Lab | 1 | 0 | 0 | 2 | 3 | 60 | 40 |
| 9 | ME – 261 | Machine Drawing Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| 10 | EC – 253 | EDC Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
|  |  | **C. Discipline and Co- Curricular Activities** |  |  |  |  |  |  |  |
| 11 | DC-201 | Discipline and **Co- Curricular Activities-III** | 2 | - | - | - | - | 100 | - |
|  |  | Total | 30 | 18 | 3 | 11 |  |  |  |
|  |  | Total Teaching Load |  | 32 | | |  |  |  |

**Year: II Semester: IV**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | ME - 203 | Mechanics of Solid | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| 2 | ME- 302 | Dynamics of Machine – II | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| 3 | ME - 405 | Operation Research | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| 4 | EC – 302 A | Microprocessor | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| 5 | EC – 204 | Digital Hardware Design | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| 6 |  | **B. Elective (any one of the following)** | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
|  | CP – 216 | Object Oriented Programming ( core java ) | - | - | - | - | - | - | - |
|  | CP – 605 | Information Security System | - | - | - | - | - | - | - |
|  | HS202 | Cognitive Skill | - | - | - | - | - | - | - |
|  |  | **B. Practicals / Sessionals** |  |  |  |  |  |  |  |
| 7 | ME - 253 | Strength of Material Lab | 1 | - | - | 2 | 3 | 60 | 40 |
| 8 | ME-352 | Dynamics Of Machine Lab | 2 | - | - | 3 | 3 | 60 | 40 |
| 9 | ME - 251 | Thermal Engg. Lab | 1 | - | - | 2 | 3 | 60 | 40 |
| 10 | EC – 254 | Digital Hardware Design lab | 2 | - | - | 3 | 3 | 60 | 40 |
|  |  | **C. Discipline and Co- Curricular Activities** |  |  |  |  |  |  |  |
| 11 | DC-202 | Discipline and Co-Curricular Activities-IV | 2 | - | - | - | - | 100 | - |
|  |  | Total | 30 | 18 | 4 | 10 |  |  |  |
|  |  | Total Teaching Load |  | 32 | | |  |  |  |

**L = Lecture T = Tutorial CE = Continuous Evaluation**

**S = Seminar P = Practical ESE = End Semester Examination**

**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**Teaching and Examination Scheme for B.Tech. (Mechatronics 4 Year Program)**

**Edition 204**

**Year: III Semester: V**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | ME -202 | Machine Design | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| 2 | ME-401 | Computer Aided Design | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| 3 | ME- 303 | Fluid Machines | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| 4 | ME - 301 | Production Process II | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| 5 | EE - 205 | Electro Mechanical Energy Conversion I | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| 6 |  | **B. Elective (any one of the following)** | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
|  | EC - 311 | Signal and Networking | - | - | - | - | - | - | - |
|  | ME - 407 | Reliability and Maintenance Engg. | - | - | - | - | - | - | - |
|  | HS301 | Verbal Non-Verbal Reasoning | - | - | - | - | - | - | - |
|  |  | **B. Practicals / Sessionals** |  |  |  |  |  |  |  |
| 8 | ME – 451 | CAD Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| 9 | EC – 355 | Microprocessor Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| 10 | EE - 253 | Electro Mechanical Energy Conversion I Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| 11 | ME – 353 | Fluid Machines Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
|  |  | **C. Discipline and Co- Curricular Activities** |  |  |  |  |  |  |  |
| 12 | DC-301 | Discipline and Co-Curricular Activities-V | 2 | - | - | - | - | 100 | - |
|  |  | Total | 30 | 18 | 2 | 12 |  |  |  |
|  |  | Total Teaching Load |  | 32 | | |  |  |  |

**Year: III Semester: VI**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | EC – 305 | Linear Integrated Circuit | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| 2 | EC – 208 | Telecommunication Engg. | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| 3 | ME - 318 | Automobile and IC Engine | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| 4 | EC – 405 | Microcontrollers & Embedded System | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| 5 | EC – 318 | Communication System | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| 6 |  | **B. Elective (any one of the following)** | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
|  | CP – 415 | Neural Networks | - | - | - | - | - | - | - |
|  | CP – 307 | Computer Graphics | - | - | - | - | - | - | - |
|  | HS302 | Employability Skills-IV:Technical Writing | - | - | - | - | - | - | - |
|  |  | **B. Practicals / Sessionals** |  |  |  |  |  |  |  |
| 7 | PE 302 | Mini project | 1 | 0 | 0 | 2 | 3 | 60 | 40 |
| 8 | ME - 362 | Automobile and IC engine | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| 9 | ME - 458 | CAD/CAM Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| 10 | EC – 453 | Microcontroller Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
|  |  | C. Discipline and Co-Curricular Activities |  |  |  |  |  |  |  |
| 11 | DC-302 | Discipline and Co-Curricular Activities-VI | 2 | - | - | - | - | 100 | - |
|  |  | Total | 30 | 18 | 3 | 11 |  |  |  |
|  |  | Total Teaching Load |  | 32 | | |  |  |  |

Note:- Industrial training for 30 days after 6th Semester Exams is compulsory.

**L = Lecture T = Tutorial CE = Continuous Evaluation**

**S = Seminar P = Practical ESE = End Semester Examinati**

**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**Teaching and Examination Scheme for B. Tech. (Mechatronics 4 Year Program)**

**Edition 2014**

**Year: IV Semester: VII**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | ME – 415 | Fundamental Of Robotics | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| 2 | EC – 407 | VLSI Design | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| 3 | EC – 619 | Wireless Sensor Networks | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| 4 | ME - 518 | Industrial Automation | 3 | 3 | 0 | 0 | 0 | 30 | 70 |
| 5 | ME - 520 | Supply Chain Management | 3 | 3 | 0 | 0 | 0 | 30 | 70 |
| 6 |  | **B. Elective (any one of the following)** | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
|  | EC – 601 | Embedded System Design | - | - | - | - | - | - | - |
|  | EC – 401 | Antenna & Wave Propagation | - | - | - | - | - | - | - |
|  | HS401 | Technical Aptitute |  |  |  |  |  |  |  |
|  |  | **B. Practicals / Sessionals** |  |  |  |  |  |  |  |
| 7 | EC – 456 | Signal Processing Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| 8 | EC – 353 | Electronic Engineering Design Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| 9 | PE401 | B. Tech Project(Stage – 1) | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| 10 | PT 401 | Summer Training Seminar | 2 | 0 | 0 | 2 | 3 | 60 | 40 |
|  |  | **C. Discipline andCo- Curricular Activities** |  |  |  |  |  |  |  |
| 11 | DC-401 | Discipline and Co- Curricular Activities-VII | 2 | - | - | - | - | 100 | - |
|  |  | Total | 29 | 18 | 1 | 11 |  |  |  |
|  |  | Total Teaching Load |  | 30 | | |  |  |  |

**Year: IV Semester: VIII**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | EC – 410 | Image Processing  & Pattern Recognition | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| 2 | ME – 408 | Product Design & Development | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| 3 | EE – 402 | Electrical Drives | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
|  |  | **B. Elective (any one of the following)** | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| 6 | EC – 615 | Micro-Electro-Mechanical-Systems (MEMS) |  |  |  |  |  |  |  |
|  | CP – 301 | Data Base Management System | - | - | - | - | - | - | - |
|  | EC – 403 | Wireless Communication | - | - | - | - | - | - | - |
|  |  | **B. Practicals / Sessionals** |  |  |  |  |  |  |  |
| 7 | ME – 460 | Product Design & Development Lab. | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| 8 | CP – 260 | Advanced Computer Programming Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| 9 | PE 402 | B Tech Project(stage 2) | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| 10 | SM 402 | B. Tech Seminar | 1 | 0 | 0 | 2 | 3 | 60 | 40 |
|  |  | **C. Discipline and Co- Curricular Activities** |  |  |  |  |  |  |  |
| 11 | DC-402 | Discipline and Co-Curricular Activities-VIII | 2 | - | - | - | - | 100 | - |
|  |  | Total | 22 | 12 | 1 | 11 |  |  |  |
|  |  | Total Teaching Load |  | 24 | | |  |  |  |

**L = Lecture T = Tutorial CE = Continuous Evaluation**

**S = Seminar P = Practical ESE = End SemesterExamination**

|  |  |  |
| --- | --- | --- |
| 3 | Networking & Related topics | 8 |
| 4 | Software Engineering and Related topics | 7 |
| 5 | Operating System (Windows, Linux, MS office) | 7 |
|  | **Total** | **36** |

**Reference Books:**

MCQs in Computer Science by Timothy Williams, TMH



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**SYLLABUS**

**B. TECH.**

Automobile Engineering 4 Year Program

**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**Teaching and Examination Scheme for B.Tech. (Automobile Engineering 4 Year Program)**

**Edition 2014**

**Year: II Semester: III**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | ME 201 | Fundamentals of Thermodynamics | 4 | 3 | 1 | - | 3 | 30 | 70 |
| 2 | ME 203 | Mechanics of Solid | 4 | 3 | 1 | - | 3 | 30 | 70 |
| 3 | ME 215 | Automotive Petrol engine | 3 | 3 | - | - | 3 | 30 | 70 |
| 4 | AE 201 | Production Process-I | 3 | 3 | 0 | - | 3 | 30 | 70 |
| 5 | MA 205 | Advance Engg. Mathematics | 4 | 3 | 1 | - | 3 | 30 | 70 |
| **6** |  | **B. Elective (any one of the following)** | 3 | 3 | - | - | 3 | 30 | 70 |
|  | HS 203 | Economics | - | - | - | - | - | - | - |
|  | EE 205 | Electro Mechanical Energy Conversion ­­–I | - | - | - | - | - | - | - |
|  | HS201 | Communication Skill | - | - | - | - | - | - | - |
|  |  | **C. Practicals / Sessionals** |  |  |  |  |  |  |  |
| 7 | ME 251 | Thermal Engg. Lab. – I | 2 | - | - | 3 | 3 | 60 | 40 |
| 8 | ME 253 | Strength of Material Lab. | 2 | - | - | 3 | 3 | 60 | 40 |
| 9 | ME 255 | Production Process Lab | 1 | -- | - | 2 | 3 | 60 | 40 |
| 10 | ME 261 | Engine testing lab | 1 | - | - | 2 | 3 | 60 | 40 |
|  |  | **Discipline and Co- Curricular Activities** |  |  |  |  |  |  |  |
| 11 | DC 201 | Discipline and Co- Curricular Activities – III | 2 |  |  |  |  | 100 |  |
|  |  | **Total** | **29** | **18** | **3** | **10** |  |  |  |
|  |  | **Total Teaching Load** |  | **31** |  |  |  |  |  |

**Year: II Semester: IV**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | ME 213 | Kinematics of machine -I | 3 | 3 | - |  | 3 | 30 | 70 |
| 2 | AE 208 | Fluid Engineering | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 3 | AE-212 | Automotive Diesel Engine | 3 | 3 | - |  | 3 | 30 | 70 |
| 4 | AE-214 | Motor Vehicle Technology | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 5 | AE-216 | Machine Design | 3 | 3 | - |  | 3 | 30 | 70 |
| 6 |  | **B. Elective (any one of the following** | 3 | 3 |  |  | 3 | 30 | 70 |
|  | ME 212 | Instrumentation & Control | - | - | - | - | - | - | - |
|  | EC-224 | Electronics engineering | - | - | - | - | - | - | - |
|  | EE 204 | Electro Mechanical Energy Conversion ­­-II | - | - | - | - | - | - | - |
|  | HS202 | Cognitive Skill | - | - | - | - | - | - | - |
|  |  | **C. Practicals / Sessionals** |  |  |  |  |  |  |  |
| 7 | EC-256 | Electronics Engineering Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 8 | AE 355 | Kinematics of machine lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 9 | AE 256 | Fluid Engineering Lab. | 2 | 0 |  | 3 | 3 | 60 | 40 |
| 10 | AE -260 | Motor Vehicle Technology Lab | 2 | 0 |  | 3 | 3 | 60 | 40 |
|  |  | **Discipline and Co- Curricular Activities** |  |  |  |  |  |  |  |
| 12 | DC 202 | Discipline and Co- Curricular Activities – IV | 2 |  |  |  |  | 100 |  |
|  |  | **Total** | **28** | **18** | **2** | **10** |  |  |  |
|  |  | **Total Teaching Load** |  | **30** |  |  |  |  |  |

**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**Teaching and Examination Scheme for B.Tech. (Automobile Engineering 4 Year Program)**

**Edition 2014**

**Year: III Semester: V**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | AE 301 | Heat transfer in IC engine | 3 | 3 | - |  | 3 | 30 | 70 |
| 2 | AE 303 | Automotive Electricals and  Electronics | 3 | 3 | - |  | 3 | 30 | 70 |
| 3 | AE 306 | Design of machine element II | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 4 | AE 307 | Automotive Transmission | 3 | 3 | - |  | 3 | 30 | 70 |
| 5 | AE 311 | Kinematics of machine -II | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 6 |  | **B.Elective (any one of the following)** | 3 | 3 |  |  | 3 | 30 | 70 |
|  | ME 313 | Facility Planning & Material Handling | - | - | - | - | - | - | - |
|  | EC 317 | Principle of Communication Systems | - | - | - | - | - | - | - |
|  | HS301 | Verbal Non-Verbal Reasoning | - | - | - | - | - | - | - |
|  |  | **C. Practicals / Sessionals** |  |  |  |  |  |  |  |
| 7 | AE 351 | Thermal engg. Lab-II | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 8 | AE 353 | Automotive electricals and  electronics lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 9 | ME254 | Machine Element Design Lab | 2 |  |  | 3 | 3 | 60 | 40 |
| 10 | AE 357 | Auto shop practice lab | 1 |  |  | 2 | 3 | 60 | 40 |
|  |  | **Discipline and Co- Curricular Activities** |  |  |  |  |  |  |  |
| 11 | DC 301 | Discipline and Co-Curricular Activities – V | 2 |  |  |  |  | 100 |  |
|  |  | **Total** | **27** | **18** | **2** | **9** |  |  |  |
|  |  | **Total Teaching Load** |  | **26** |  |  |  |  |  |

**Year: III Semester: VI**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | AE 302 | Auto chassis and auto system design | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 2 | AE 304 | Automatic control engineering | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 3 | ME 311 | Mechanical Vibration & Noise Viberation | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 4 | AE 308 | Vehicle Dynamics | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 5 | AE 310 | Auto Emission and pollution control | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  |  | **B. Elective (any one of the following)** | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  | ME 311 | Mechatronics | - | - | - | - | - | - | - |
|  | ME 314 | Numerical Methods and Applied Statistics | - | - | - | - | - | - | - |
|  | HS302 | Employability Skills-IV:Technical Writing | - | - | - | - | - | - | - |
|  |  | **C. Practicals / Sessionals** |  |  |  |  |  |  |  |
| 7 | AE 352 | Auto transmission lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 8 | AE 354 | Vehicle dynamics lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 9 | ME 357 | Mechanical Vibration & Noise Viberation Lab | 1 |  |  | 2 | 3 | 60 | 40 |
| 10 |  | Project Stage­I | 2 |  |  | 3 | 3 | 60 | 40 |
|  |  | **Discipline and Co- Curricular Activities** |  |  |  |  |  |  |  |
| 11 | DC 302 | Discipline and Co- Curricular Activities – VI | 2 |  |  |  |  | 100 |  |
|  |  | **Total** | **27** | **18** | **2** | **8** |  |  |  |
|  |  | **Total Teaching Load** |  | **28** |  |  |  |  |  |

**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**Teaching and Examination Scheme for B.Tech. (Automobile Engineering 4 Year Program)**

**Edition 2014**

**Year: IV Semester: VII**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | AE 401 | CAD | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 2 | AE 403 | Automatic heating, ventilation and air conditioning | 4 | 3 | 1 |  | 3 | 30 | 70 |
| 3 | AE359 | Safety and comfort of Vehicle | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 4 | AE 407 | Microprocessor application inautomobile | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 5 | AE 409 | Vehicle Aerodynamics and vehicle body Engg. | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 6 |  | **B. Elective (any one of the following)** | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  | ME 411 | Finite Element Analysis | - | - | - | - | - | - | - |
|  | HS401 | Technical Aptitute | - | - | - | - | - | - | - |
|  | BM 449 | Entrepreneurship Development | - | - | - | - | - | - | - |
|  |  | **C. Practicals / Sessionals** |  |  |  |  |  |  |  |
| 7 | AE 356 | Automotive system and pollution lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 8 | AE 453 | CAD lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
|  | AE 455 | Body engineering lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 9 | PT 401 | Training Seminar | 2 | 0 |  | 3 | 3 | 60 | 40 |
| 10 | PE 401 | Project stage-II | 2 | 0 |  | 3 | 3 | 60 | 40 |
|  |  | **Discipline and Co-Curricular Activities** |  |  |  |  |  |  |  |
| 11 | DC401 | Discipline and Co-Curricular Activities – VII | 2 |  |  |  |  | 100 |  |
|  |  | **Total** | **28** | **18** | **1** | **12** |  |  |  |
|  |  | **Total Teaching Load** |  | **31** |  |  |  |  |  |

**Year: IV Semester: VIII**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
|  |  | **A. Theory** |  |  |  |  |  |  |  |
| 1 | ME 410 | Computational fluid Dynamics and Heat Transfer | 3 | 3 | 0 | 0 | 3 | 30 | -70 |
| 2 | AE 404 | Industrial robotics | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  | ME 408 | Product Design and Development | 3 | 3 | 0 |  |  |  |  |
| 3 | AE 406 | Automotive MaintenanceManagement | 3 | 3 | 0 |  | 3 | 30 | 70 |
| 4 |  | **B.Elective (any one of the following)** | 3 | 3 | 0 |  | 3 | 30 | 70 |
|  | AE 402 | Alternative Fuels and EngineTribology | - | - | - | - | - | - | - |
|  | ME 412 | Operation Management | - | - | - | - | - | - | - |
|  |  | **C. Practicals / Sessionals** |  |  |  |  |  |  |  |
| 5 | AE 452 | Auto Maintenance lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 6 | AE 454 | Auto Reconditioning lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| 7 | SM 402 | Seminar | 3 | 0 |  | 6 | 3 | 60 | 40 |
| 8 | AE 456 | Computational fljid dynamics lab | 2 | 0 |  | 3 | 3 | 60 | 40 |
|  |  |  |  |  |  |  |  |  |  |
|  |  | **Total** | **22** | **15** | **0** | **13** |  |  |  |
|  |  | **Total Teaching Load** |  | **28** |  |  |  |  |  |

**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**LIST OF COURSES OFFERED**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course  Code** | **Course Name** | **Credits** | **Contact Hrs/Wk.** | | | **Exam  Hrs.** | **Weightage (in%)** | |
| **L** | **T/S** | **P** | **CE** | **ESE** |
| **AUTOMOBILE ENGINEERING** | | | | | | | | |
| AE 201 | Manufacturing Process | 3 | 3 | 0 | - | 3 | 30 | 70 |
| AE 202 | Design of Machine Elements –I | 3 | 3 | - |  | 3 | 30 | 70 |
| AE 204 | Machining and Machine Tool | 3 | 3 | - |  | 3 | 30 | 70 |
| AE 206 | Automotive System | 3 | 3 | - |  | 3 | 30 | 70 |
| AE 208 | Fluid Engineering | 4 | 3 | 1 |  | 3 | 30 | 70 |
| AE 210 | Computer Graphics and Design | 3 | 3 | - |  | 3 | 30 | 70 |
| AE-212 | Automotive Diesel Engine | 3 | 3 | - |  | 3 | 30 | 70 |
| ME 213 | KOM-I | 3 | 3 | - |  | - | - | - |
| AE-214 | Motor Vehicle Technology | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME 215 | Automotive Petrol engine | 3 | 3 | - | - | 3 | 30 | 70 |
| AE-216 | Machine Drawing & Machine Design | 3 | 3 | - |  | 3 | 30 | 70 |
| AE 252 | Elements of Machine Design - Lab I | 1 | 0 |  | 2 | 3 | 60 | 40 |
| AE 254 | Machining and Machine Tool Lab | 2 | 0 |  | 3 | 3 | 60 | 40 |
| AE 256 | Fluid Engineering Lab. | 1 | 0 |  | 2 | 3 | 60 | 40 |
| AE 258 | Software and Computer Graphics Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| AE-260 | Motor Vehicle Technology Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| AE 301 | Heat transfer in IC engine | 3 | 3 | - |  | 3 | 30 | 70 |
| AE 302 | Auto chassis and auto system design | 4 | 3 | 1 |  | 3 | 30 | 70 |
| AE 303 | Automotive Electricals and Electronics | 3 | 3 | - |  | 3 | 30 | 70 |
| AE 304 | Automatic control engineering | 3 | 3 | 0 |  | 3 | 30 | 70 |
| AE 305 | Advanced IC engine-I | 4 | 3 | 1 |  | 3 | 30 | 70 |
| AE 306 | Design of machine element II | 4 | 3 | 1 |  | 3 | 30 | 70 |
| AE 307 | Automotive Transmission | 3 | 3 | - |  | 3 | 30 | 70 |
| AE 308 | Vehicle Dynamics | 3 | 3 | 0 |  | 3 | 30 | 70 |
| AE 309 | Theory of Machines | 4 | 3 | 1 |  | 3 | 30 | 70 |
| AE 310 | Auto Emission and pollution control | 3 | 3 | 0 |  | 3 | 30 | 70 |
| AE 311 | Kinematics of machine -II | 4 | 3 | 1 |  | 3 | 30 | 70 |
| AE 351 | Thermal engg. Lab-II | 1 | 0 |  | 2 | 3 | 60 | 40 |
| AE 352 | Auto transmission lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| AE 353 | Automotive electrical and electronics lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| AE 354 | Vehicle dynamics lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| AE 355 | Dynamics of machine lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| AE 356 | Automotive system and pollution lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| AE 358 | Machine design lab II | 1 | 0 |  | 2 | 3 | 60 | 40 |
| AE359 | Safety and comfort of vehicle | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| AE 401 | CAD | 3 | 3 | 0 |  | 3 | 30 | 70 |
| AE 402 | Alternative Fuels and Engine Tribology | 3 | 3 | 0 |  | 3 | 30 | 70 |
| AE 403 | Automatic heating, ventilation and air conditioning | 3 | 3 | 0 |  | 3 | 30 | 70 |
| AE 404 | Industrial robotics | 3 | 3 | 0 |  | 3 | 30 | 70 |
| AE 405 | Advanced IC Engine II | 4 | 3 | 1 |  | 3 | 30 | 70 |
| AE 406 | Automotive Maintenance Management | 3 | 3 | 0 |  | 3 | 30 | 70 |
| AE 407 | Microprocessor application in automobile | 3 | 3 | 0 |  | 3 | 30 | 70 |
| AE 409 | Vehicle Aerodynamics and vehicle body Engg. | 3 | 3 | 0 |  | 3 | 30 | 70 |
| AE 451 | I C engines lab-II | 1 | 0 |  | 2 | 3 | 60 | 40 |
| AE 452 | Auto Maintenance lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| AE 453 | CAD lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| AE 454 | Auto Reconditioning lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| AE 455 | Body engineering lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| AE 456 | Comutational fluid Dynamics | 2 | 0 |  | 3 | 3 | 60 | 40 |
| **MECHANICAL ENGINEERING** | | | | | | | | |
| ME 101/ME 102 | Engg. Mechanics | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| ME 151/ME 152 | Auto CAD Lab | 1 | 0 | 0 | 2 | 2 | 60 | 40 |
| ME 153/ME 154 | Workshop Practice | 1 | 0 | 0 | 2 | 2 | 60 | 40 |
| ME 201 | Fundamentals of Thermodynamics | 4 | 3 | 1 | - | 3 | 30 | 70 |
| ME 202 | Machine Design | 3 | 3 | - |  | 3 | 30 | 70 |
| ME 203 | Mechanics of Solid | 4 | 3 | 1 | - | 3 | 30 | 70 |
| ME 204 | Industrial Engg. – I | 3 | 3 | - |  | 3 | 30 | 70 |
| ME 205 | Material Science | 3 | 3 | - | - | 3 | 30 | 70 |
| ME 206 | Production Process – I | 3 | 3 | - |  | 3 | 30 | 70 |
| ME 207 | Elements of Machine Design | 4 | 3 | 1 | - | 3 | 30 | 70 |
| ME 208 | Fluid Mechanics | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME 209 | Object Oriented Programming | - | - | - | - | - | - | - |
| ME 210 | Internal Combustion Engines | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME 212 | Instrumentation & Control | - | - | - | - | - | - | - |
| ME 251 | Thermal Engg. Lab. – I | 1 | - | - | 2 | 3 | 60 | 40 |
| ME 252 | Machine Design Lab. | 1 | 0 |  | 2 | 3 | 60 | 40 |
| ME 253 | Strength of Material Lab. | 1 | - | - | 2 | 3 | 60 | 40 |
| ME 253 | Strength of Material Lab. | 1 | - | - | 2 | 3 | 60 | 40 |
| ME 254 | Production Process – I Lab | 2 | 0 |  | 3 | 3 | 60 | 40 |
| ME 255 | Material Science Lab. | 1 | -- | - | 2 | 3 | 60 | 40 |
| ME 256 | Fluid Mechanics Lab. | 1 | 0 |  | 2 | 3 | 60 | 40 |
| ME 257 | Machine Drawing Lab | 2 | - | - | 3 | 3 | 60 | 40 |
| ME 258 | Internal Combustion Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| ME 260 | Production Process I Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| ME 261 | Machine Drawing Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| ME 301 | Production Process – II | 3 | 3 | - |  | 3 | 30 | 70 |
| ME 302 | Dynamics of Machine – II | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME 303 | Fluid Machines | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| ME 304 | Heat & Mass Transfer | 3 | 3 | 0 |  | 3 | 30 | 70 |
| ME 305 | Dynamics of Machine – I | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME 306 | Steam Turbine & Steam Power Plant | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME 307 | Fundamental of Aerodynamics | 3 | 3 | - |  | 3 | 30 | 70 |
| ME 308 | Automobile Engg. | 3 | 3 | 0 |  | 3 | 30 | 70 |
| ME 309 | Mechanical Vibration & Noise Engg. | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME 310 | Industrial Engg. – II | 3 | 3 | 0 |  | 3 | 30 | 70 |
| ME 311 | Mechatronics | - | - | - | - | - | - | - |
| ME 312 | Computational fluid Dynamics and Heat Transfer | - | - | - | - | - | - | - |
| ME 313 | Facility Planning & Material Handling | - | - | - | - | - | - | - |
| ME 314 | Numerical Methods and Applied Statistics | - | - | - | - | - | - | - |
| ME 318 | Automobile and IC Engine | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| ME 351 | Production Process Lab – II | 2 | 0 |  | 3 | 3 | 60 | 40 |
| ME 352 | Dynamics of Machine – II Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| ME 353 | Fluid Machines Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| ME 354 | Heat & Mass Transfer Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| ME 355 | Dynamics of Machine Lab – I | 1 | 0 |  | 2 | 3 | 60 | 40 |
| ME 356 | Automobile Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| ME 357 | Mechanical Vibration Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| ME 358 | Industrial Engg. Lab. | 1 | 0 |  | 2 | 3 | 60 | 40 |
| ME 362 | Automobile and IC engine | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| ME 401 | Computer Aided Design | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| ME 402 | Computer Aided Manufacturing | 3 | 3 | 0 |  | 3 | 30 | 70 |
| ME 403 | Refrigeration and Air-Conditioning | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME 404 | Power Plant Engg. | 3 | 3 | 0 |  | 3 | 30 | 70 |
| ME 405 | Operation Research | 4 | 3 | 1 |  | 3 | 30 | 70 |
| ME 406 | Production Process – III | 3 | 3 | 0 |  | 3 | 30 | 70 |
| ME 407 | Reliability and Maintenance Engg. | - | - | - | - | - | - | - |
| ME 408 | Product Design and Development | - | - | - | - | - | - | - |
| ME 408 | Product Design and Development | - | - | - | - | - | - | - |
| ME 409 | Gas Turbine & Jet Propulsion | 3 | 3 | 0 |  | 3 | 30 | 70 |
| ME 410 | Computational fluid Dynamics and Heat Transfer | - | - | - | - | - | - | - |
| ME 411 | Finite Element Analysis | - | - | - | - | - | - | - |
| ME 412 | Operation Management | - | - | - | - | - | - | - |
| ME 415 | Fundamental Of Robotics | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| ME 451 | CAD Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| ME 452 | CAM Lab | 1 | 0 |  | 2 |  | 60 | 40 |
| ME 453 | RAC Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| ME 454 | Production Process – III Lab | 2 | 0 |  | 3 |  | 60 | 40 |
| ME 458 | CAD/CAM Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| ME 460 | Product Design & Development Lab. | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| ME 518 | Industrial Automation | 3 | 3 | 0 | 0 | 0 | 30 | 70 |
| ME 520 | Supply Chain Management | 3 | 3 | 0 | 0 | 0 | 30 | 70 |
| **COMPUTER SCIENCE** | | | | | | | | |
| CP 101 | Computer Systems &Prog. | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| CP 102 | C++ | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| CP 151/CP 152 | Computer Programming Lab | 1 | 0 | 0 | 2 | 2 | 60 | 40 |
| CP 154 | OOPS Lab | 1 | 0 | 0 | 2 | 2 | 60 | 40 |
| CP 216 | Object Oriented Programming ( core java ) | - | - | - | - | - | - | - |
| CP 260 | Advanced Computer Programming Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| CP 301 | Data Base Management System | - | - | - | - | - | - | - |
| CP 307 | Computer Graphics | - | - | - | - | - | - | - |
| CP 415 | Neural Networks | - | - | - | - | - | - | - |
| CP 605 | Information Security System | - | - | - | - | - | - | - |
| **INFORMATION TECHNOLOGY** | | | | | | | | |
| IT 101/IT 102 | Information Technology | 2 | 2 | 0 | 0 | 3 | 30 | 70 |
| **ELECTRONICS & COMMUNICATION** | | | | | | | | |
| EC 201 | EDC | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| EC 204 | Digital Hardware Design | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| EC 208 | Telecommunication Engg. | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| EC-224 | Electronics engineering | - | - | - | - | - | - | - |
| EC 253 | EDC Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| EC 254 | Digital Hardware Design lab | 1 | - | - | 2 | 3 | 60 | 40 |
| EC-256 | Electronics Engineering Lab | 1 | 0 |  | 2 | 3 | 60 | 40 |
| EC 302 A | Microprocessor | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| EC 305 | Linear Integrated Circuit | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| EC 311 | Signal and Networking | - | - | - | - | - | - | - |
| EC 317 | Principle of Communication Systems | - | - | - | - | - | - | - |
| EC 318 | Communication System | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| EC 353 | Electronic Engineering Design Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| EC 355 | Microprocessor Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| EC 401 | Antenna & Wave Propagation | - | - | - | - | - | - | - |
| EC 403 | Wireless Communication | - | - | - | - | - | - | - |
| EC 405 | Microcontrollers & Embedded System | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| EC 407 | VLSI Design | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| EC 410 | Image Processing & Pattern Recognition | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| EC 453 | Microcontroller Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| EC 456 | Signal Processing Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| EC 601 | Embedded System Design | - | - | - | - | - | - | - |
| EC 615 | Micro-Electro-Mechanical-Systems (MEMS) |  |  |  |  |  |  |  |
| EC 619 | Wireless Sensor Networks | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| **ELECTRICAL ENGG.** | | | | | | | | |
| EE 101/EE 102 | Electrical & Electronics Engineering | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| EE 151/EE 152 | Electrical & Electronics Engg. Lab | 1 | 0 | 0 | 2 | 2 | 60 | 40 |
| EE 204 | Electro Mechanical Energy Conversion ­­–II | - | - | - | - | - | - | - |
| EE 205 | Electro Mechanical Energy Conversion ­­–I | - | - | - | - | - | - | - |
| EE 253 | Electro Mechanical Energy Conversion I Lab | 2 | 0 | 0 | 3 | 3 | 60 | 40 |
| EE 402 | Electrical Drives | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| **PHYSICS** | | | | | | | | |
| PY 101/PY 102 | Engg. Physics | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| PY 151/PY 152 | Engg. Physics Lab | 1 | 0 | 0 | 2 | 2 | 60 | 40 |
| **CHEMISTRY** | | | | | | | | |
| CY 101/CY 102 | Engg. Chemistry | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| CY 151/CY 152 | Engg. Chem. Lab | 1 | 0 | 0 | 2 | 2 | 60 | 40 |
| **ENGLISH** | | | | | | | | |
| EN 101 | Engineering English | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| EN 102 | Communication Techniques | 3 | 3 | 0 | 0 | 3 | 30 | 70 |
| EN 151 | English Communication Lab | 1 | 0 | 0 | 2 | 2 | 60 | 40 |
| EN 152 | Language Lab | 1 | 0 | 0 | 2 | 2 | 60 | 40 |
| **MATHS** | | | | | | | | |
| MA 101 | Engineering Mathematics- I | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| MA 102 | Engineering Mathematics- II | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| MA 201 | Integral Transforms & Complex Analysis | 4 | 3 | 1 | 0 | 3 | 30 | 70 |
| MA 205 | Advance Engg. Mathematics-III | 4 | 3 | 1 | - | 3 | 30 | 70 |
| **ENVIRONMENTAL STUDIES** | | | | | | | | |
| ES 101/ ES102 | Environmental Studies | 2 | 2 | 0 | 0 | 3 | 30 | 70 |
| **MANAGEMENT** | | | | | | | | |
| BM 449 | Entrepreneurship Development | - | - | - | - | - | - | - |
| **PROJECT** | | | | | | | | |
| PE 302 | Mini project | 1 | 0 | 0 | 2 | 3 | 60 | 40 |
| PE 401 | Major Project (Stage I) | 2 | 0 |  | 3 | 3 | 60 | 40 |
| PE 402 | Major Project | 3 | 0 |  | 6 |  | 60 | 40 |
| **TRAINING / SEMINAR** | | | | | | | | |
| PT 401 | Training Seminar | 2 | 0 |  | 3 | 3 | 60 | 40 |
| SM 402 | Seminar | 2 | 0 |  | 3 |  | 60 | 40 |
| **HUMANITIES AND SOCIAL SCIENCES** | | | | | | | | |
| HS 201 | Communication Skill | - | - | - | - | - | - | - |
| HS 202 | Cognitive Skill | - | - | - | - | - | - | - |
| HS 301 | Verbal Non-Verbal Reasoning | - | - | - | - | - | - | - |
| HS 302 | Technical Writing | - | - | - | - | - | - | - |
| HS 401 | Technical Aptitute | - | - | - | - | - | - | - |
| **DISCIPLINE AND EXTRA CURRICULAR ACTIVITIES** | | | | | | | | |
| DC 101 | Discipline and Co-Curricular Activities – I | 2 | 0 | 0 | 0 | 0 | 100 | 0 |
| DC 102 | Discipline and Co-Curricular Activities – II | 2 | 0 | 0 | 0 | 0 | 100 | 0 |
| DC 201 | Discipline and Co-Curricular Activities – III | 2 |  |  |  |  | 100 |  |
| DC 202 | Discipline and Co-Curricular Activities – IV | 2 |  |  |  |  | 100 |  |
| DC 301 | Discipline and Co- Curricular Activities – V | 2 |  |  |  |  | 100 |  |
| DC 302 | Discipline and Co- Curricular Activities – VI | 2 |  |  |  |  | 100 |  |
| DC 401 | Discipline and Co- Curricular Activities – VII | 2 |  |  |  |  | 100 |  |
| DC 402 | Discipline andCo- Curricular Activities – VIII | 2 |  |  |  |  | 100 |  |
|  |  |  |  |  |  |  |  |  |

**DETAIL SYLLABUS**

**Syllabus for B.Tech Automobile Engineering**

**Session 2014-15 III Semester**

**ME201: FUNDAMENTALS OF THERMODYNAMICS C(3,1,0)**

|  |  |
| --- | --- |
| **Class B.Tech III Sem.** | **Evaluation** |
| Schedule per week  Lectures : 3  Tutorial : 1 | Examination Time = Three (3) Hours  Maximum Marks = 100  [Mid-term(30) & End-term (70)] |

|  |  |  |
| --- | --- | --- |
| **Units** | **Contents of the Subject** | **No. of Hours. required** |
| **I** | Basic Concepts and Properties of Pure Substances: System, Properties, State and equilibrium, Processes and cycles, Temperature and pressure, Energy and Environment, Work and heat.  Properties of Pure Substance: Definition and laws of ideal gas, phases of pure substances & phase charge processes, property diagrams for phase change processes, Property tables for different state of liquid and vapour, Internal energy, Enthalpy and specific heats of ideal gas, solids and liquids . | 7 |
| **II** | Laws of Thermodynamics: Zeroth law of thermodynamics, temperature scale, First law of thermodynamics, steady flow energy equation, applications of steady flow energy equation, limitations of first law of thermodynamics, second law of thermodynamics , heat engine, Carnot cycle, absolute thermodynamics temperature scale, entropy, change of entropy for different process, equivalence of Kelvin-Planck and Clausius statement, Clausius inequality, second law efficiency and third law of thermodynamics. | 7 |
| **III** | Availability and Thermodynamic Relations: Available and unavailable energy, availability of steady flow and non-flow system. Helmholtz and Gibb’s function, important mathematical relations, Maxwell relations, T-ds relations, Joule-Thomson coefficient, clausius-claperyon equation. | 6 |
| **IV** | Gas Power Cycle: Otto cycle, Diesel cycle, dual cycle, Stirling cycle, Ericsson cycle, Atkinson cycle, Brayton cycle, mean effective pressure and efficiencies, four stroke and two stroke petrol and diesel engine, experimental determination of IHP,BHP and volumetric efficiency. | 6 |
| **V** | Vapor Power Cycle: Rankine cycle, Reheat cycle, Regeneration cycle, co-generation cycle, binary vapor and trinaryvapour power cycle. Calculation at efficiency, work ratio, back-work ratio, specific steam consumption rate, heat consumptions rate for vapor power cycle, vapor compression refrigeration cycle and properties of refrigerants. | 7 |

**List of Recommended Books:**

1. Engineering Thermodynamics, P.K.Nag, Tata McGraw Hill.
2. Engineering Thermodynamics, C.P.Gupta, RajendraPrakashNemi Chand & Bros.
3. Thermal Engineering, Mathur& Mehta.

**ME203 MECHANICS OF SOLID C(3,1,0)**

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| --- | --- |
| **Class B.Tech III Sem.** | **Evaluation** |
| Schedule per week  Lectures : 3  Tutorial : 1 | Examination Time = Three (3) Hours  Maximum Marks = 100  [Mid-term(30) & End-term (70)] |

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| --- | --- | --- |
| **Units** | **Contents of the Subject** | **No. of Hours. required** |
| **I** | **Stress and Strain:** Tension, compression, shearing stress and strain: Poission's ratio; Stress - strain relationship, Hooke's law; Elastic constants and their relations for a isotropic hookean material, anisotropy and orthotropy, thermal stresses, composite bars; simple elastic, plastic and visco-elastic behaviour of common materials in tension and compression test, stress - strain curve. Concept of factor of safety and permissible stress. Bolt, pin, cotter, key etc. subjected to direct stresses. Conditions for equilibrium. Concept of free body diagram; introduction to mechanics of deformable bodies. | 7 |
| **II** | **Members subjected to flexural loads:** Theory of simple bending, bending moment and shear force diagrams for different types of static loading and support conditions on beam. Bending stresses, Section modulus and transverse shear stress distribution in circular, hollow circular, I, Box, T, angle sections etc. | 6 |
| **III** | **Transverse deflection of beams:** Relation between deflection, bending moment, transverse deflection of beams and shaft under static loading area moment method, direct integration method: method of superposition and conjugate beam method. Variational approach to determine deflection and stresses in beam. Application to beam, lever, leaf spring etc. | 7 |
| **IV** | **Principles planes, stresses & strains:** Members subjected to combined axial, bending & Torsional loads, maximum normal and shear stresses; Concept of equivalent bending and equivalent twisting moments: Mohr;s circle of stress and strain. **Theories of Elastic Features:** The necessity for a theory, different theories, significance and comparision, applications. | 6 |
| **V** | **Torsion & Stability of equilibrium:** Torsional shear stress in solid, hollow and stepped circular shafts, angular deflection and power transmission capicity. Application to helical springs, shaft couplings.Instability and elatic stability. Long and short coloumns, ideal strut, Euler's formula for cripping load for columns of different ends, concept of equivalent length, ecentric loading, Rankine formulae and other empirical relations. Applications like connecting rod, piston rod, screw of screw-jack etc. | 7 |

**List of Recommended Books**

1. Mechanics of Solids: S.H. Crandall, N.C.Dahi&T.J.Lardner, McGraw Hill International Edition
2. Strength of Materials; G.H.Ryder, ELBS Publications Co., London
3. Element of Strength of Materials. J.P.Tinnoshnko&G.H.Young. Affiliated East West Press, New Delhi
4. Solid Mechanics , G.M.A.Kazmi, Tata McGraw Hill Publishing Co.Ltd., New Delhi
5. Machanics of Solids : Dr.AshishDutt Sharma, Vardhan Publication

**ME-215 AUTOMOTIVE PETROL ENGINE C(3,1,0)**

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| **Class B.Tech III Sem.** | **Evaluation** |
| Schedule per week  Lectures : 3  Tutorial : 1 | Examination Time = Three (3) Hours  Maximum Marks = 100  [Mid-term(30) & End-term (70)] |

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| **Units** | **Contents of the Subject** | **No. of Hours. required** |
| **I** | **UNIT I ENGINE CONSTRUCTION AND OPERATION**  Constructional details of four stroke petrol engine, working principle, air standard Otto cycle, actual indicator  diagram, two stroke engine construction and operation, comparison of four stroke and two stroke engine operation,firing order and its significance. Port Timing, Valve Timing Diagram. | 7 |
| **II** | **UNIT II SI ENGINE FUEL SYSTEM**  Carburetor working principle, requirements of an automotive carburetor, starting, idling, acceleration and normal  Circuits of carburetors. Compensation, maximum power devices, constant choke and constant vacuum carburetors,Fuel feed systems; mechanical and electrical fuel feed pumps. Petrol injection, MPFI.GDI System, Determination ofair-fuel ratio and numerical problems on air-fuel ratio calculations. | 7 |
| **III** | **UNIT III IGNITION SYSTEM**  Types and working of battery coil and magneto ignition systems, relative merits and demerits, centrifugal and  Vacuum advance mechanisms. Types and construction of spark plugs, electronic ignition systems. Transistorized coil Ignition system, capacitive discharge ignition system | 7 |
| **IV** | **UNIT IV COOLING AND LUBRICATION SYSTEM**  Need for cooling system, Types of cooling system: air cooling system, liquid cooling system, forced circulation  system, pressure cooling system. Lubrication system; mist, wet sump lubrication system, properties of lubricants | 6 |
| **V** | **UNIT V COMBUSTION AND COMBUSTION CHAMBERS**  Combustion in SI engine; stages of combustion, flame propagation, rate of pressure rise, abnormal combustion,  detonation, effect of engine variables on knock, knock rating. Combustion chambers; different types, factors controlling  combustion chamber design. Engine Management Systems, Performance curves & Evaluation, Emission & Emission  Control, Nano Problems, Heat release analysis. | 7 |

**TEXT BOOKS:**

1. Ganesan. V., “Internal Combustion Engines”, Tata McGraw-Hill Publishing Co., New Delhi, 2003.

2. MathurD.S.and Sharma R.P., “A course in Internal combustion engines”, DhanpatRai& Sons Publications, New Delhi, 2001.

3. Ramalingam. K.K., “Internal Combustion Engines”, SciTech Publications, Chennai, 2000.

REFERENCES:

1. Heldt. P.M., “High Speed Combustion Engines”, Oxford IBH Publishing Co., Calcutta, 1975.

2. Obert. E.F., “Internal Combustion Engines Analysis and Practice”, International Text Books Co., Scranton, Pennsylvania – 1988.

3. William H.Crouse, “Automotive Engines”, McGraw-Hill Publishers, 1985.

4. Ellinger. H.E., “Automotive Engines”, Prentice Hall Publishers, 1992.

5. John B.Heywood, “Internal Combustion Engine Fundamental”, McGraw-Hill, 1988.

6. Pulkrabek “Engineering Fundamentals of the Internal Combustion Engines”, Practice Hall of India, 2003

**AE201: PRODUCTION PROCESSES – I C(3,0,0)**

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| **Class B.Tech III Sem.** | **Evaluation** |
| Schedule per week  Lectures : 3  Tutorial : 0 | Examination Time = Three (3) Hours  Maximum Marks = 100  [Mid-term(30) & End-term (70)] |

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| **Units** | **Contents of the Subject** | **No. of Hours. required** |
| **I** | **Mechanics of Metal Cutting:** Elements of a cutting process: geometry of single point cutting tool; tool angles, chip formation; types of chips; chip breakers effects of cutting parameters; Typical cutting speeds and feeds for different tool and job materials; Orthogonal and obligue cutting; Theories of mechanics of metal cutting; cutting force measurement; various types of tool dynameter; thermal aspects of metal machining measurement of chip tool interface temperature; friction in metal cutting. | 7 |
| **II** | **Metal Joining Processes**: Principle of welding, soldering, brazing and adhesive bonding. Survey of welding and allied processes. Arc welding: power sources and consumables. Gas welding and cutting: Processes and equipments. Resistance welding: principle and equipments. Spot, projection and seam welding process. Atomic hydrogen, ultrasonic, plasma and laser beam welding, electron beam welding, and special welding processes e.g. TIG, MIG, friction and explosive welding, welding of C.I. and Al, welding defects. Electrodes and Electrode Coatings | 7 |
| **III** | **Machine Tools:** Constructional, details and main operation of Center Lathes,.Capstonand Turret Lathe: Shaper and Planner, Drilling and Boring machines, Milling machines, indexing methods. | 5 |
| **IV** | **Powder Metallurgy:** Powder manufacturing, mechanical pulverization, sintering, Electrolytic Process, chemical reduction, atomization, properties of metal powders, compacting of powders sintering, advantages and applications of P/M.  **Rapid Prototyping Operations:** Introduction, subtractive processes, additive processes, Virtual Prototyping and applications | 6 |
| **V** | **Grinding:** Abrasives: manufacturing and selection of grinding wheels; theory of grinding; characteristic terms used in grinding; classification; constructional features; principle of working; applications and limitations of different grinding machines. Honing, lapping superfinishing, buffing and polishing processes. | 7 |

**List of Recommended Books:**Production Technology by O.P.Khanna, DhanpatRai Publications, New Delhi

1. Workshop Technology, Vol. I by S.K. HazraChoudhary and A.K. HazraChoudhary Media Promotors& Publishers Pvt. Ltd., Bombay
2. Production technology by P.C.SharmaS.Chand& Company Ltd, New Delhi
3. Manufacturing process by Begeman
4. Manufacturing Processes & Material: I.E.Doyle,CarlKayser, Schrade, Leech.
5. Manufacturing Processes, Schey.

**MA205: ADVANCED ENGINEERING MATHEMATICS C(3,1,0)**

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| **Class B. Tech III Sem.** | **Evaluation** |
| Schedule per week  Lectures : 3  Tutorial : 1 | Examination Time = Three (3) Hours  Maximum Marks = 100  [Mid-term(30) & End-term (70)] |

|  |  |  |
| --- | --- | --- |
| **Units** | **Contents of the Subject** | **No. of Hours. required** |
| **I** | Fourier series: Fourier series, Half-range series, Harmonic analysis.  Integral Transforms: Fourier integral theorem, Fourier transforms, Convolution theorems, Inversion theorem for Fourier and Laplace transforms, Simple applications of these transforms to one dimensional problems. | 7 |
| **II** | Method of separation of variables - applications to the solution of wave equation in one dimension, laplace’s equation in two dimensions, Diffusion equation in one dimension.  Transform calculus : Laplace transform with its simple properties, applications to the solutions of ordinary and partial differential equations having constant co-efficient with special reference to wave and diffusion equation. | 7 |
| **III** | Complex Variable: Functions of a complex variable; Exponential, trigonometric, hyperbolic and logarithmic functions; Differentiation, Analytic functions, Cauchy-Riemann equations, conjugate functions; Application to two dimensional potential problems; Conformal transformations, Schwartz- Christoffel transformation; Cauchy’s Integral theorem. Taylor’s and Laurent’s expansions; Branch points, zeros, poles and residues; Simple problems on contour integration | 7 |
| **IV** | Boundary Value Problems: Equations for vibrations of strings, heat flow and electrical transmission lines; Laplace’s equation in Cartesian, cylindrical polar and spherical polar coordinates; Solution by separation of variables.Solution in Series: Differentiation and integration of infinite series, Series solution of differential equations; Bessel and Legendre equations, their series solution, elementary properties of Bessel functions and Legendre polynomials | 6 |
| **V** | Numerical Methods: Difference operators: forward, backward, central shift and average operators and relations between them. Newton Backward and Interpolation; Lagrange’s interpolation and the error formula for interpolation. Numerical differentiation and integration. Trapezoidal rule and Simpson’s one-third rule including error formula | 7 |

**List of Recommended Books:**

1. Advanced Engineering Mathematics, Kreyszig E., Wiley Eastern
2. Numerical Methods for Scientists and Engineers, Jain M.K., Iyenger S.R.K. Wiley Eastern
3. Theory of Ordinary Differential Equations Coddington, Tata McGraw Hill.
4. Elements of Partial Differential Equations, Ssneddon, Ian N., McGraw Hill
5. Fourier Series & Boundary Value Problems, James Brown and Churchill, Tata McGraw Hill.
6. Maths for Engineers Chandrika Prasad, prasadMudranalaya, Allahabad
7. Advanced Mathmatics for Engineers, Chandrika Prasad, prasadMudranalaya, Allahabad.

**HS 203 ECONOMICS C(L, T, P) = 3(3, 0, 0)**

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| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| I | Definition of Economics - various definitions, Nature of Economic problem, Production possibility curve  Economic laws and their nature. Relation between Science, Engineering, Technology and Economics.  Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility -  its practical application and importance | 7 |
| II | Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve,  Elasticity of demand, measurement of elasticity of demand, factors effecting elasticity of demand, practical  importance & applications of the concept of elasticity of demand.  Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and  External economics and diseconomies of scale. | 7 |
| III | Various concepts of cost - Fixed cost, variable cost, average cost, marginal cost, money cost, real cost  opportunity cost. Shape of average cost, marginal cost, total cost etc. in short run and long run.  Meaning of Market, Types of Market - Perfect Competition, Monopoly, Oligoply, Monoplistic Competition (Main  features of these markets) | 7 |
| IV | Supply and Law of Supply, Role of Demand & Supply in Price Determinition and effect of changes in demand and  supply on prices. | 7 |
| V | Nature and characteristics of Indian economy (brief and elementary introduction), Privatization - meaning,  merits and demerits. Globalisation of Indian economy - merits and demerits. Elementary Concepts of VAT, WTO,  GATT & TRIPS agreement | 7 |
|  | Total | 35 |

Reffernce Books:

1. Principles of Economics : P.N. Chopra (Kalyani Publishers).

2. Modern Economic Theory – K.K. Dewett (S.Chand

**EE-205 ELECTRO MECHANICAL ENERGY CONVERSION- I C(L.T.P) = 3(3,0,0)**

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| **Unit** | **COURSE CONTENTS** | **Hours** |
| **I** | **Electromechanical Energy Conversion:** Basic principles of electromechanical energy conversion. Basic aspects and physical phenomena involved in energy conversion. Energy balance. | **6** |
| **II** | **DC generators**: Construction, Types of DC generators, emf equation, lap and wave windings, equalizing connections, armature reaction, commutation, methods of improving commutations, demagnetizing and cross magnetizing mmf, interpoles, characteristics, parallel operation. Rosenberg generator. | **6** |
| **III** | **DC Motors:** Principle, back emf, types, production of torque, armature reaction and interpoles, characteristics of shunt, series and compound motor, DC motor starting. Speed Control of DC Motor: Armature voltage and field current control methods, Ward Leonard method. Braking, losses and efficiency, direct and indirect test, Swinburne’s test, Hopkinsion test, field and retardation test, single-phase series motor. | **8** |
| **IV** | **Transformers:** Construction, types, emf equation. No load and load conditions. Equivalent circuits, Vector diagrams, OC and SC tests, Sumpner’s back-to-back test, efficiency. Voltage regulation, effect of frequency, parallel operation, autotransformers, switching currents in transformers, separation of losses. | **8** |
| **V** | **Polyphase Transformers:** Single unit or bank of single-phase units, polyphase connections, Open delta and V connections, Phase conversion: 3 to 6 phase and 3 to 2 phase conversions, Effect of 3-phase winding connections on harmonics, 3-phase winding transformers, tertiary winding. | **8** |
|  | **Total** | **36** |

**References:**

1.) P.S.Bimbhra, Electrical Machinery, 2000, Khanna publishers New Delhi.

2. )J.Nagrath and D.P.Kothari, Electrical Machines 2000, TATA MCGRAW HILL Publication New Delhi.

3. )P.S.Bimbhra, Generalized theory of Electrical Machine, 1996, Khanna publishers, New Delhi.

4. )GopalK.Dubey, Fundamental of Electrical Drives, 2001 Narosa Publishing House, New Delhi

5. )Fitzrald,Kingsley and umans Electrical Machines 2000, TATA MCGRAW HILL Publication New Delhi.

6. ) Advance Electrical Technologies by H.Cotton

**HS 201 COMMUNICATION SKILLS C(L,T,P)=3(3,0,0)**

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| --- | --- | --- |
| **Unit** | **Course Contents** | **Hours** |
| 1 | Foundation and background of organizational behaviour, contemporary challenges-workforce diversity, cross – cultural dynamics, changing nature of managerial work, ethical issues at work, emotional intelligence in contemporary business. Perception, Personality, Learning, Motivation – Concepts and applications, individual decision making. | 7 |
| 2 | Understanding and managing group processes-interpersonal & group dynamics, Group cohesiveness, Group decision making Emotional Intelligence-concept and applications, Understanding work teams, power & politics, Empowerment, Conflict & Negotiation. | 8 |
| 3 | Purpose and process of communication; myths and realities of communication; paths of communication; oral communication; noise, barriers to communication; listening process, types of listening, deterrents to listening process, essentials of good listening; telephonic communication. | 6 |
| 4 | Non verbal communication; gestures, handshakes, gazes, smiles, hand movements, styles of working, voice modulations, body sport for interviews; business etiquettes; business dining, business manners of people of different cultures, managing customer care. | 7 |
| 5 | Written communication; mechanics of writing, report writing, circulars, notices, memos, agenda and minutes; business correspondence-business letter format, style of letter arrangement, types of letters, telex managers, facsimiles, electronic mail; diary writing; development resume. | 7 |
|  | Total | 35 |

**Reference Books:**

1. Enrich your English – by CIEFL (Academic Skills book)
2. Contemporary English Grammar – Raymond Murphy
3. Organizational Behavior, - Fred Luthans9thEdition, McGraw-Hill Irwin, 2002.
4. Organizational Behavior, Tenth Edition, TMG, 1998.John W. Newstorm and Keith Davis
5. . Business Communication Today – By Bovee, Thill, Schazman
6. G. Business Communication – by Pal and Korlahalli

**Labs:**

**ME251: THERMAL ENGINEERING LAB-1 C(L,T,P) = 1(0,0,2)**

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| Experiments  1. Comparative study of four stroke diesel and petrol engines.  2. Comparative study of two stroke petrol and diesel engines.  3. Studies of fuel supply systems of diesel and petrol engines.  4. Study of cooling, lubrication and ignition system in diesel and petrol engines.  5. To study various types of Boilers and to study Boiler mounting and accessories.  6. To study various types of Dynamometers.  7. To study Multi Stage Air Compressors.  8. To find the BHP, Thermal efficiency of four stroke diesel engine.  9. To prepare a comparison sheet of various automobiles (4 Wheeler and 2 Wheeler). |

**ME253: STRENGTH OF MATERIAL LAB C(L,T,P) = 1(0,0,2)**

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| Experiments  1. Izod Impact testing.  2. Rockwell Hardness Testing.  3. Spring Testing  4. Column Testing for buckling  5. Torsion Testing  6. Tensile Testing  7. Compression Testing  8. Shear Testing  9. Brinell Hardness Testing  10. Bending Test on UTM.  11. Study of Fatigue Testing Machine. |

**ME255: PRODUCTION LAB – I C(L,T,P) = 1(0,0,2)**

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| 1.Study of lathe machine, lathe tools cutting speed, feed and depth of cut.  2. To perform step turning, knurling and chamfering on lathe machine as per drawing.  3. Taper turning by tailstock offset method as per drawing.  4. To cut metric thread as per drawing.  5. To perform square threading, drilling and taper turning by compound rest as per drawing.  6. To study shaper machine, its mechanism and calculate quick return ratio.  7. To prepare mould of a given pattern requiring core and to cast it in aluminum.  8. Moisture test and clay content test.  9. Strength Test (compressive, Tensile, Shear Transverse etc. in green and dry conditions) and Hardness Test (Mould and Core).  10. Permeability Test.  11. A.F.S. Sieve analysis Test. |

**ME 256 ENGINE TESTING LAB C(L,T,P) = 1(0,0,2)**

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| ENGINE TESTING LAB  1. Study of hydraulic, electrical and eddy current dynamometers.  2. Valve timing and port timing diagram.  3. Performance and emission test on two stroke SI engine.  4. Performance and emission test on automotive multi-cylinder SI engine.  5. Performance test and emission on automotive multi-cylinder CI engine.  6. Retardation test on I.C. Engines.  7. Heat balance test on automotive multi-cylinder SI engine.  8. Heat balance test on automotive multi-cylinder CI engine.  9. Morse test on multi-cylinder SI engine.  10. Study of P-θ and P-V diagrams for IC engine with piezo-electric pick up, charge amplifier, angle |

**Syllabus for B.Tech Automobile Engineering**

**Session 2014-15 IV Semester**

**ME-213 KINEMATICS OF MACHINE –I C(3,1,0)**

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| **Class B.Tech III Sem.** | **Evaluation** |
| Schedule per week  Lectures : 3  Tutorial : 1 | Examination Time = Three (3) Hours  Maximum Marks = 100  [Mid-term(30) & End-term (70)] |

|  |  |  |
| --- | --- | --- |
| **Units** | **Contents of the Subject** | **No. of Hours. required** |
| **I** | **UNIT I BASICS OF MECHANISMS**  Definitions: Links- Rigid, flexible and fluid links. Kinematic pairs – Degrees of freedom, Kutzbach criterion, Grubler’s criterion (without derivation), Mechanism, structure, Mobility of Mechanism, Kinematic chains and inversions: Grashof’s law – Inversions of Four bar chain; Single slider crank chain and Double slider crank chain. | 7 |
| **II** | **UNIT II KINEMATICS OF LINKAGE MECHANISMS**  Displacement, velocity and acceleration analysis of simple mechanisms – Graphical method, Klein’s construction: Analysis of velocity and acceleration of single slider crank mechanism. Coriolis component of acceleration | 7 |
| **III** | **UNIT III KINEMATICS OF CAM MECHANISMS**  Types of cams, Types of followers, Terminology and definitions. Displacement diagrams- SHM, Uniform velocity, uniform acceleration and retardation and Cycloidal motion. Graphical construction of Cam profiles- Disc cam with knife-edge, roller, flat-faced followers and oscillating roller follower. | 7 |
| **IV** | **UNIT IV GEARS AND GEAR TRAINS**  Spur Gear terminology, law of toothed gearing- involutes and cycloidal tooth profiles – , Path of contact, Arc of contact, Contact ratio, Interference and Methods of avoiding interference in involute gears, Back lash, Comparison of involute and cycloidal teeth. Basics of helical, bevel, worm and rack and pinion gears (Basics only).Simple gear trains,Compound gear trains for large speed reduction, Epicyclic gear trains – tabular methods of finding velocity ratio. | 6 |
| **V** | **UNIT V FRICTION**  Introduction – Dry friction – Plate clutches. Belt drives – Flat & V belt drives – Materials used for belts, Velocity ratio, slip, creep. Ratio of driving tensions, angle of contact, centrifugal tension, Maximum tension of belt – power of transmission. | 7 |

TEXT BOOK

1. Rattan.S.S,”Theory of Machines”,,2ndEdition,Tata McGraw Hill Publishers,2005

REFERENCE BOOKS:

1. Ghosh A and Mallick.A.K,“Theory of Mechanisms and Machines”,3

3. Khurmi.R.S&Gupta.J.K, “Theory of Machines”, 15

4. SHIGLEY J.E, “Theory of Machines and Mechanisms”, 2nd Edition, McGraw Hill Inc., 1995rd

**AE 208 FLUID ENGINEERINC C (L, T, P) = 4(3, 1, 0)**

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| **Units** | **Contents of the Subject** | **Hours** |
| **I** | Introduction: Classification of fluids. Properties of fluids. Centre of pressure. Plane and curved surfaces. Buoyancy and stability of floatingbodies. | 7 |
| **II** | Fluid Dynamics: Laws of kinematics of fluid flow. Lagrangian and Eulerian method. Stream function and potential functions. Continuity,momentum and energy equations. Bernoulli’s equations and its applications. Pressure measurements, pitot static tube, venturimeter, andorifice plate. Applications of momentum equations. | 7 |
| **III** | Dimensional Analysis: Buckingham’s theorem, Non-dimensional numbers, similarities of flow. Model studies. | 7 |
| **IV** | Laminar and Turbulent Flows: Reynolds experiments. Flow relation between shear stress and pressure gradient. Flow between parallel plates.Characteristics of turbulent flow. Flow through pipes. Energy losses in pipes. Flow around immersed bodies. | 6 |
| **V** | Fluid Machinery: Principles of operations of centrifugal and axial pumps. Turbo blowers and turbines. Principles and working of gear, vaneand reciprocating pumps. | 7 |
|  | **Total** | **34** |

**List of Recommended Books:**

1. Shames I.H., Mechanics of Fluids, Kogakusha, Tokyo, 1998.

2. Rathakrishnan.E, Introduction to Fluid Mechanics, PrenticeHall, India, 1999.

3. Yuvan.S.W, Foundation of Fluid Mechanics, Prentice Hall, 1998

4. Milne Thomson, L.M., Theoretical Hydrodynamics, McMillan, 1985.

5. Kumar.K.L, Fluid Mechanics, Eurasia Publishing House, 1990.

**AE-212 AUTOMOTIVE DIESEL ENGINE C (L, T, P) = 3(3, 0, 0)**

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| **Class B.Tech IV Sem.** | | **Evaluation** | |
| Schedule per week  Lectures : 3  Tutorial : 1 | | Examination Time = Three (3) Hours  Maximum Marks = 100  [Mid-term(30) & End-term (70)] | |
| **Units** | **Contents of the Subject** | | **No. of Hours. required** |
| **I** | **UNIT I BASIC THEORY**  Diesel engine construction and operation, two stroke and four stroke diesel engine, dual cycle engines, diesel  cycle, fuel-air and actual cycle analysis, diesel fuel, ignition quality, Cetane number, diesel fuels standards and  specifications. | | 7 |
| **II** | **UNIT II FUEL INJECTION SYSTEM**  Types of fuel injection system, Requirements, air and solid injection, functions of components, jerk and distributor  type pumps common rail system, PTFI system pressure waves, injection lag, unit injector, mechanical and pneumatic  governors, fuel injector, types of injection nozzle, spray characteristics, injection timing, pump calibration. | | 7 |
| **III** | **UNIT III AIR MOTION, COMBUSTION AND COMBUSTION CHAMBERS**  Importance of air motion, swirl, squish and turbulence, swirl ratio, fuel air mixing, stages of combustion, delay  period, factors affecting delay period, knock in CI engines. Combustion chamber: design requirements, direct and  indirect injection combustion chambers, M type combustion chamber. Introduction -Inlet Manifold, Construction with  reference to Efficiency. | | 7 |
| **IV** | **UNIT IV SUPERCHARGING AND TURBOCHARGING**  Necessity and importance of supercharger, types of supercharging and turbo charging, relative merits, design  of Turbo charger Variable Geometrical Techniques, exhaust gas recirculation, charge cooling & Lubrication. | | 6 |
| **V** | **UNIT V DIESEL ENGINE TESTING AND PERFORMANCE**  Automotive and stationary diesel engine testing and related emission standards. Engine performance and emission  Characteristics, variables affecting engine performance and emission, methods to improve engine performance, heat  Balance, performance maps Engine management systems, CRDI, etc., Performance, Emission, Calculation& Testing of Emissions, Heat Release Analysis. | | 7 |

**TEXT BOOKS:**

1. 1. Ganesan. V “Internal Combustion Engines”, Tata McGraw-Hill Publishing Co., New Delhi, 2003.
2. 2. Mathur D.S. and Sharma R. P. “A course in Internal Combustion Engines”, DhanpatRai and Sons, 2002.

REFERENCES:

1. 1. Ramalingam. K.K. “Internal Combustion Engines Theory and Practice”, SciTech Publications (India) Pvt. Ltd. 2002.
2. 2. Heywood. J.B. “Internal Combustion Engine Fundamentals”, McGraw-Hill Book Co., 1988.
3. 3. Heinz Heister “Advanced Engine Technology”, SAE, 1995.
4. 4. Pulkrabek “Engineering Fundamentals of the Internal Combustion Engines”, Practice Hall of India 2003

**AE-214 MOTOR VEHICLE TECHNOLOGY C (L, T, P) = 4(3, 1, 0)**

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| **Class B.Tech V Sem.** | | **Evaluation** | | |
| Schedule per week  Lectures : 3  Tutorial : 0 | | Examination Time = Three (3) Hours  Maximum Marks = 100  [Mid-term(30) & End-term (70)] | | |
| **Units** | **Contents of the Subject** | | **No. of Hours. required** |
| **I** | **I.C ENGINES (INTRODUCTION):**  Working and difference between SI and CI Engines; Two and four stroke cycles; Theoretical heat cycles : ideal and actual otto and diesel cycle, mixed cycle; Numerical; Working of two and four stroke SI and CI engines; Scavenging methods of two-stroke petrol engines; Comparison of two and four stroke cycle engines.; Auto engines classifications –arrangement of cylinders, valves and camshaft ;Types of fuels used, engine speed, methods of cooling, engine balance; Principle of combustion, detonation and pre-ignition – differences.; Valve timing diagrams – SI and CI, two and four stroke engines. | | 7 |
| **II** | **ENGINE PERFORMANCE**:  Bore and stroke, swept and clearance volume, compression ratio, effect of C.R, engine torque, mean effective, bmep, bhp, Ihp, fhp; Engine efficiencies – air standard, mechanical, thermal, indicated thermal, brake thermal, volumetric, requirements of high volumetric efficiency, Factors.; Specific fuel consumption; Numerical | | 7 |
| **III** | **ENGINE COMPONENT PARTS:**  Cylinder block : Types; Crankcase, liners : wet and dry; Gaskets, Timing covers, oil pan, cylinder head; SI engines combustion chambers : types and comparison; CI engine combustion chambers : Direct and Indirect injection, Intake & exhaust ports; lubricating passages; Intake & Exhaust valves and mechanisms; Camshafts: Side & overhead, advantages and disadvantages; Valve seat and conical angles, Valve seat insert, Valve springs, locks, Rocker-shaft, rocker arm, push rod, Cam followers-types; Timing of valves; Intake and exhaust manifold; Mufflers-types; Crankshaft: Nomenclature; Flywheel-functions; Oil seals; Engine Bearings : Thrust, ball, taper roller, needle, split, journal; Bearing materials, properties; Connecting rod; Piston : function, types, materials, piston rings: types, design details, Piston Pins, Component material chart : All engine components. | | 7 |
| **IV** | **CHASSIS AND BODY:**  Types – unitized and separate body and chassis, Advantages, Designs: chassis frame; Chassis side and cross member, sections and joints; Body: requirements, main parts, Material composition, Body shape aerodynamic design, CD for different types of vehicles; Vehicle component‘s attachments, Front and Rear wheel drive component locations: advantages and disadvantages; Rear mounted engine and rear wheel drive : advantages; Definitions : wheel base, wheel track, minimum radius, front and rear overhang, ground clearance, grade ability, laden and unlade weight; Car seat and seat belt mounting and adjustment. | | 6 |
| **V** | **CLUTCH SYSTEM:**  Principle, requirements, operation, components of conventional single plate clutch, diaphragm clutch, multiple plate wet clutch, centrifugal clutch; Fluid coupling-characteristics, principle, velocity diagrams, efficiency and torque capacity curves; Comparison of conventional and diaphragm clutch and fluid coupling.Clutch operating systems: rod, cable, hydraulic; Clutch Plate: requirements, construction, material, linings : required properties, types; Numerical; Clutch faults and diagnosis, Clutch pedal free play. | | 7 |

**Reference Book:**

1. Crouse, W.H, ―Automobile Technology‖, Tata McGraw Hill.
2. Sethi, H. M, ―Automotive Technology‖, Tata McGraw

**AE-216 MACHINE DESIGN C (L, T, P) = 3(3, 0, 0)**

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| **Class B.Tech III Sem.** | **Evaluation** |
| Schedule per week  Lectures : 3  Tutorial : 1 | Examination Time = Three (3) Hours  Maximum Marks = 100  [Mid-term(30) & End-term (70)] |

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| **Units** | **Contents of the Subject** | **No. of Hours. required** |
| **I** | **Limits, Fits and Tolerance:-** Introduction - Tolerance - Fits - Terminology standard tolerances, positioning of tolerances - Fundamental deviation selection of tolerance Zones, selection of Fits, Methods of indicating fits on drawings | 7 |
| **II** | **Shafts couplings & Bearings: -** Introduction - Rigid or Fast coupling - Non Rigid of flexible couplings, couplings for shafts out of alignment loose or disengagement couplings. Bearings: Ring oiled Bearing, Swivel Bearing, Anti-friction Bearings | 7 |
| **III** | **Workshop tools and equipment: -** Lathe machine, drilling machine, shaper machine , shaper tool head, Machine swivel vice. Difference between Jigs and Fixtures | 6 |
| **IV** | **Materials& Manufacturing aspects in Design:** Properties and IS coding of various materials, Selection of materials from properties and economic aspects. Selection of manufacturing processes on the basis of design and economy, influence of rate of production, standard size, influence of limits, fits, tolerance of and surface finish. Change in the shape of the designed element of facilitate its production, Design of castings, working drawing | 6 |
| **V** | **Design for strength: -** Allowable stresses, detailed discussion on factor of safety (factor of ignorance): Stress concentration, causes and mitigation. Introduction of various design considerations like strength, stiffness, weight, cost, space etc., concept of fatigue failures. | 7 |

**List of Recommended Books:**

1. Machine Drawing: V. Lakshminarayan& M.L Mathur, Jain Brothers, N. Delhi
2. Machine Drawing: P.S.Gill, S.K.Kataria& Sons, N.Delhi
3. Machine Drawing: N. Sidherwar, P.Kannaiah, VVS Sastry, Tata McGraw Hill Publishing Co. Ltd.
4. Production Drawing: K.L.Narayana, P.Kannaiah&K.Venkata Reddy., New Age International (P) Ltd.
5. Machine Drawing: R.K. Dhawan, S.Chand& Co. Ltd. N. Delhi
6. Elements of Machine Design, N.C.Pandya&C.S.Shah, Charotar Book Stall, Anand.
7. Design of Machine Elements; V.B.Bhandari, Tata McGraw Hill Publishing Co. Ltd.
8. 'Mechanical Machine Design; R.C.Bahl&V.K.Goyal, Standard Publishing Distributors, Delhi
9. 'Mechanical Engineering Design; J.E.Shigley,McGraw Hill Book Co.

**EC- 256 ELECTRONICS ENGINEERING C (L, T, P) = 3(3, 0, 0)**

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| **Class B.Tech III Sem.** | | **Evaluation** | |
| Schedule per week  Lectures : 3  Tutorial : 1 | | Examination Time = Three (3) Hours  Maximum Marks = 100  [Mid-term(30) & End-term (70)] | |
| **Units** | **Contents of the Subject** | | **No. of Hours. required** |
| **I** | **HISTORICAL BACKGROUND:** Vacuum tubes; working of vacuum tube and their characteristics;  Vacuum diode; triode; tetrode and pentode  PN JUNCTION: Depletion layer; Barrier potential; Forward and reverse bias; Breakdown voltage; PIV; switching characteristics of p-n junction diode; knee voltage; load line; and operating Point Ideal p-n junction diode; junction capacitance; zener diode. | | 7 |
| **II** | **. RECTIFIERS AND FILTERS**: Half wave; centre tap full wave and bridge rectifier; percentage of regulation; PIV; ripple factor; C; RC; LC and PI filter; voltage doubler; clipping and clamping circuit; voltage regulation. | | 7 |
| **III** | **BIPOLAR JUNCTION TRANSISTOR:**Introduction; basic theory of operation of PNP ad NPN transistor-l characteristics; CB; CE and CC configuration | | 7 |
| **IV** | **FET: Introduction**; Theory of operation; JFETParameters; and JFET Amplifiers. MOSFET: Introduction; theory of operation; MOSFET parameters; application; graphical analysis of BJT and FET circuits; linear models of BJT and FET;pulse and large signal models of BJT and FET | | 6 |
| **V** | **. BIASING TECHNIQUES OF FET:**Introductory idea of multistage and feedback amplifiers; base bias; emitter feedback bias; collector voltage divider bias; Load line and operating point.  INTEGRATED CIRCUIT: Analysis of principle of integration. Introduction to Digital Integrated circuits; THYRISTORS: Introduction to thyristor family; SCR theory of operation; SCRcharacteristics and triggering; TRIAC: Theory of operation; Characteristics and control by SCR and TRIAC Introduction to op-amp; UJT: Introduction; Basic theory of operation characteristics and structure; Complementary and programmable UJT relaxation oscillator. | | 7 |

**TEXT BOOK**

Millman and Halkias, ―Electronic Devices and Circuits‖,

2nd Edition, Tata McGraw Hill, 2000

REFERENCE BOOKS

1. Millman and Halkias, ―Integrated Electronic‖, Tata McGraw Hill, 3rd Edition, 2001.

2. Boylestad and Nashelsky, ―Electronic Devices and Circuits‖, 4th Edition, Pearson Education, 1999.

3. Malvino, ―Electronic Principles‖, 5th Edition, Tata McGraw Hill, 2004.

4. Bell David A., ―Electronic Devices and Circuits‖,3rd Edition, Prentice Hall of India, 2007

5. Bhargave N. N., ―Basic Electronics and Linear Circuits‖, Tata McGraw Hill, 2007

**ME 212 INSTRUMENTATION AND CONTROL C (L, T, P) = 3(3, 1, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | System configuration, basic characteristic, calibration, classification and performance characteristics of a instrumentation system, Specification and testing of dynamic response.Strain Measurement : Electric Strain Gauges - Types ; Selection and Installation, Strain gauge circuits; temperature compensation and calibration; Use of Strain Gauges on Rotating Shafts, Load Cells, Mechanical and Optical Strain Gauges. | 7 |
| **II** | Various Mechanical, Electro- Mechanical & Photoelectrical Sensors for sensing ofDisplacement, Velocity, Acceleration, Torque, Force, Temperature from Low to High Range, flow, level of fluid , pressure, angular speed, voltage, frequency and current.Introduction to Multi-Channel Data-Acquisition System, Measurement Pods, Interface Hardware, Data Analysis Software, Interfacing. | 7 |
| **III** | Concepts and examples of automatic control systems, systems by differential equations, transfer function, block diagram, open and feedback control systems, signal flow graphs & its constructions. Control System components, error sensing devices and servo motors. | 7 |
| **IV** | Control for mechanical systems &processes ; speed control system for steam/gas turbines. A constant tension ;reeling system, Electro-mechanical systems. Thermal systems, Pneumatic systems; Mathematical Models of physical systems, Feedback characteristics of Control Systems.Time response analysis; transient response analysis, time response specifications, steady state-error. | 7 |
| **V** | Concepts of stability, Routh-Hurwiz stability criterion, relative stability. The root locustechnique, use of construction rules without any derivation.Frequency response analysis, Polar plots; stability in frequency domain, Bode / Logrithmic plots. Nyquist stability criterion. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Mechanical Measurements and Instrumentation, A.K. Sawhney, PuneetSawhney, DhanpatRai
2. Mechanical Measurements, Thomas G. Backwith, N. Lewis Buck, Roy, D., Marangoni, Narosa Publishing House
3. Industrial Instrumentation and Control, S.K.Singh, Tata McGraw Hill
4. Control Systems Engineering; I.J.Nagrath&M.Gopal, Wilay Eastern Limited

Automatic Control Engineering; Raxen, McGraw Hill, International Edition

**EE204 ELECTRO MECHANICAL ENERGY CONVERSION–II C(L,T,P) = 3(3,0,0)**

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| **UNIT** | **COURSE CONTENTS** | **Hours** |
| **I** | **Introduction:** General equation of inducted emf, AC armature windings: concentric and distributed winding, chording, skewing, effect on induced emf. Armature and field mmf, effect of power factor and current on armature mmf, harmonics. Rotating fields. | **6** |
| **II** | **Induction Motors:** Construction of squirrel cage and slip ring induction motor, basic principles, flux and mmf waves, induction motor as a transformer. Equivalent circuits, torque equation, torque-slip curves, no load and block rotor tests, circle diagram, performance calculation. Effect of rotor resistance. Cogging, Crawling. Double cage squirrel cage induction motor, induction generator, induction regulator. | **6** |
| **III** | **Starting and Speed Control of Induction Motors:** Various methods of starting and speed control of squirrel cage and slip ring motor, cascade connection, braking.**Single-Phase Induction Motor:** Revolving field theory, starting methods, equivalent circuits. | **8** |
| **IV** | **Synchronous Generator:** Construction, types, excitation systems, principles. Equation of induced emf, flux and emf waves, theory of cylindrical rotor and salient pole machines, tworeactance theory, phasor diagrams, power developed, voltage regulation, OC and SC tests, zero power factor characteristics, potier triangle and ASA method of finding voltage regulation, synchronization, parallel operation, hunting and its prevention. | **8** |
| **V** | **Synchronous Motors:** types, construction, principle, phasor diagrams, speed torque characteristics, power factor control, V-curves, starting methods, performance calculations, applications, synchronous condenser, synchronous induction motor. | **8** |
|  | **Total** | **36** |

**References:**

1) P.S.Bimbhra, Electrical Machinery, 2000, Khanna publishers New Delhi.

2) J.Nagrath and D.P.Kothari, Electrical Machines 2000, TATA MCGRAW HILL Publication New Delhi.

3) P.S.Bimbhra, Generalized theory of Electrical Machine, 1996, Khanna publishers, New Delhi.

4) GopalK.Dubey, Fundamental of Electrical Drives, 2001 Narosa Publishing House, New Delhi

5) Fitzrald,Kingsley and umans Electrical Machines 2000, TATA MCGRAW HILL Publication New Delhi.

**HS 202 CONGNITIVE SKILLS C (L,T,P)=3(3,0,0)**

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| **Units** | **Contents of the Subject** | **Hours** |
| 1 | Introduction to Mindfulness, Mindfulness Exercise, DBT Life Skills – Distress Tolerance | 8 |
| 2 | Mindfulness Exercise, DBT Life Skills – Emotion Regulation | 8 |
| 3 | Mindfulness Exercise, DBT Life Skills – Interpersonal Effectiveness | 7 |
| 4 | Mindfulness Exercise, Anxiety Disorders, Depression, and Personality Disorders, Acceptance: Living in the Here-and-Now as a Way of Life | 7 |
| 5 | Mindfulness Exercise, Introduction to Dialectical Behavior Therapy (DBT), Dialectic Philosophy, Wise Mind | 7 |
|  | **Total** | **37** |

**Reference Books:**

1. ShivaniD.R. (1998): NGO Development Initiative & Policy – Vikas Publications

**LAB**

**IV Semester ( EC- 256 ) ELECTRONICS ENGINEERING LAB C(L,T,P) = 1(0,0,2)**

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| 1. Study V-I characteristics of diode; and its use as a capacitance.  2. Study of the characteristics of transistor in Common Base configuration.  3. Study of the characteristics of transistor in Common Emitter configuration.  4. Study of V-I characteristics of a photo-voltaic cell.  5. Study of characteristics of MOSFET/JFET is CS configuration.  6. Plot characteristics of thyristor.  7. Plot characteristics of UJT.  8. Plot characteristics of diac and Triac.  9. Introduction to Orcad PSPICE Software.  10. Simulation of semiconductor device circuits using Orcad PSPICE |

**AE 355 KINAMICS OF MACHINE LAB C (L, T, P) = 1(0, 0, 2)**

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| 1. To verify the relation T= I. ω. ωp for gyroscope.  2. To plot force v/s radius and lift v/s speed curves for governors.  3. To plot pressure distribution curves on a journal bearing.  4. To perform wheel balancing and wheel alignment test.  5. To perform static and dynamic balancing on balancing setup.  6. To determine mass moment of inertia of a fly wheel.  7. Study of a lathe gear box.  8. Study of a sliding mesh automobile gear box.  9. Study of planetary gear box.  10. Study of single suspension Test , seat Dynamic Test.  11. Study of ride comfort test system , noise measurement system.  12. Study of damping material effectiveness measurement system , Various Hydraulicand electromechanical actuator. |

**IV Semester ( AE 256 ) Fluid Engineering Lab.. C (L, T, P) = 1(0, 0, 2)**

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| 1. Determine Metacentric height of a given body.  2. Determine Cd, Cv& Cc for given orifice.  3. Determine flow rate of water by V-notch.  4. Determine velocity of water by pitot tube.  5. Verify Bernoulli’s theorem.  6. Determine flow rate of air by Venturi meter  7. Determine flow rate of air by orifice meter  8. Determine head loss of given length of pipe.  9. Determine flow rate of air by nozzle meter. |

**IV Semester (AE-260 ) MOTOR VEHICLE TECHNOLOGY LAB C(L,T,P) = 1(0,0,2)**

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| **LIST OF EXPERIMENTS**  1. Identify, write specifications and draw sketches of i) General Tools ii) Measuring Tools iii) Special Tools used in an automobile workshop and Practice to use them.  2. Identify various assemblies and sub assemblies of an automobile chassis. Draw layout and explain function of each unit.  3. Study of 4 stroke C.I and S.I engines. Draw Sketches and explain the function of each component.  4. Study of 2 stroke S.I engine. Draw Sketch and explain the function of each component.  5. Study the Cooling System of an Automotive Engine sketch the various components and explain function of each.  6. Identification of components of single plate, multi plate clutch system. Draw sketch and explain function of each component.  7. Identifications of components of sliding mesh constant mesh and synchromesh gear box. Draw power flow diagrams at various speeds.  8. Identify and give functions of each component of differential and rear axle assembly.  9. Study construction of different types of Automobile wheels and tyres and draw their sketches.  10. Study the propeller Shaft, Slip joint and universal Joints of a Vehicle. Draw sketches and label various components parts. |

**Syllabus for B.Tech Automobile Engineering**

**Session 2014-15V Semester**

**AE 301 HEAT TRANSFER IN IC ENGINE C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Introduction of heat transfer:** Temperature, heat and thermal equilibrium, basic definition and law of heat transfer, modes of heat transfer, steady and unsteady heat transfer, and significance of heat transfer. **Conduction Heat Transfer**: Fourier equation, general heat conduction equation: Cartesian co-ordinate, cylinder co-ordinate, spherical co-ordination, conduction through plane wall, composite wall cylindrical, multi cylindrical wall, spheres. Critical thickness of insulation, heat transfer from extended surface , steady state flow of heat along a rod, governing differential equations and their solution, heat dissipation from infinite long fin, insulated tip , fin performance . | 7 |
| **II** | **Convection**: Stroke energy equation, hydrodynamic and thermal boundary layers: laminar boundary layer equation; forced convection appropriate non dimensional members, flow over flat plate, similarity solution. Von-karman’s method, effect of Prandtl number. Laminar flow through circular pipe. **Natural Convection**: Dimensional analysis Grashoff number, boundary layers in external flow (flow over a flat plate only), boundary layer equations and their solutions. Heat transfer Correlation. | 7 |
| **III** | **Radiation:** Salient features and characteristics of radiations, absorptive, reflectivity and transmissivity, spectral and spatial energy distribution, wavelength distribution of black body radiation, planck’s law. Total emission power. Stefan Boltzman law, Wien‘s displacement law,kirchoff’s law , intensity of radiation & Lambert’s consine law. | 7 |
| **IV** | **Heat transfer in IC engine:** Water and air cooling of engines, combustion systems and variation of gas temperatures, heat transfer coefficients, calculations of heat rejection to coolant. Heat transfer, temperature distribution and thermal stress in piston, piston ring, cylinder liner. Heat transfer through cylinder head, fins and valves, Effect of various operating parameter on engine heat transfer. | 7 |
| **V** | **Heat exchangers used in IC engine :** Principles of different type of Heat exchanger. Type of radiators , inter cooler and after cooler . EGR cooling and EGR coolers. Engine coolant and their properties. | 7 |
|  | **Total** | **35** |

**AE 303 AUTOMOTIVE ELECTRICAL AND ELECTRONICS C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Storage Batteries**: Principles, construction and operation of lead acid battery, battery capacity, efficiency, rating and performance. Determination of battery size. Electrolyte, Battery tests, Battery charging equipment and methods. Battery faults. | 7 |
| **II** | **Starter and charging system:** Starting system requirements, sizing of starter motor and selection, characteristics of starter motor, type of starting, motor drive mechanisms, starter switch, starter system fault. DC Generator & AC alternators. Magneto. Armature reaction, cut out relay, voltage and current regulator system for generator and alternators. | 7 |
| **III** | **Auxiliary systems:** Types of lamps used in automobile, head light, tail light, fog lights, brake light, side indicator, parking and other indicating lights. Principle of automotive illumination, dash board lights, indicators and meters, speedometers, electric horn, wind shield wiper, heaters & defrosters, electric horn and relay devices, Different types of gauges and indicators. Electrical fuel pump. | 7 |
| **IV** | **Ignition system:** Working of coil ignition system and its components, spark advance mechanisms, limitations of coil ignition systems. Advantages of electronic ignition systems, types of solid state ignition systems and their principle of operation. Contact less electronic ignition system, electronic spark timing ands its control. | 7 |
| **V** | **Automotive sensors:** Description and working of different engine and vehicle sensors such as speed sensor, tyre pressure sensor, oxygen sensors, fuel level sensor etc. | 7 |
|  | **Total** | **35** |

**AE 306 DESIGN OF MACHINE ELEMENTS II C (L, T, P) = 4(3, 1, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Fatigue Considerations in Design: Variable load, loading pattern, Endurance stresses, influence ofsize, surface finite, notch sensitivity & stress concentration, Goodman line, soderberg, design ogmachine members subjected to combined, steady and alternating stresses. Design of finite life.Design of shafts under Variable Stresses.Design of Springs:Helical compression, torsional and leaf springs. Springs under Variable Stresses. | 7 |
| **II** | Design of Bolts: Preloading of bolts; effects of initial tension and applied load bolts subject tovariable stresses.Design of weldments: welds subjected to eccentric loading and combined stresses.Design of curved members: Crane hook, body of C-clamp, machine frame etc | 7 |
| **III** | Design of flywheelsDesign of belt, rope and pulley drive system, chain & sprocket drive systems. | 7 |
| **IV** | Design of Gear: lewis and Buckkhingam equations; wear and Dynamic load considerations, designand force analysis of spur, helical, beval and worm analysis of spur, helical, bevel and worm gears.Bearing reactions due to gear tooth forces, | 7 |
| **V** | Design of sliding & journal bearing: method of lubrication, hydrodynamic, hydrostatic, boundaryetc. Minimum film thickness and thermal equilibrium.Selection of anti-friction bearings for different loads and load cycle Mounting of the bearings.Methods of lubrication, selection of oil seals. | 7 |

**AE 307 AUTOMOTIVE TRANSMISSION C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Transmission requirements:** Requirements of transmission system, general arrangementsfor power transmission for front engine, rear engine vehicle, four wheel drive vehicle, deadaxle and axle less transmission.  **Clutch:** Single plate, multi plate clutch, centrifugal clutch, electromagnetic clutch,constructional details, torque capacity and clutch friction materials. | 7 |
| **II** | **Gear box:** Requirements of gear box, sliding mesh gear box, constant mesh gear box,synchromesh gear box, epicyclic gear box, velocity ratio and gear ratio for vehicle,performance characteristics in different speed , overdrive. | 7 |
| **III** | **Hydrodynamic drive:** Fluid Coupling : principle of operation, constructional details,torque capacity and performance curve.**Torque converter** : principle of operation, constructional details, torque capacity andperformance curve. Multistage torque converter, converter fluid | 7 |
| **IV** | **Hydrostatic drive:** Various types of hydrostatic system, working principle of hydrostaticsystem, advantage and limitations, Jenny hydrostatic drive, comparison of hydrostatic andhydrodynamic drive.**Electric drive:** Principle of electric drive, Early ward Leonard control system, ModifyLeonard control system, advantage of electric drive, limitation of electric drive. | 7 |
| **V** | **Automatic Transmission:** Need for automatic Transmission, Chevrolet turbo glidetransmission system, torque flite, Automatic transmission fluid, effect of automatictransmission on vehicle performance and fuel economy. | 7 |
|  | **Total** | **35** |

**AE 311 KINEMATICS OF MACHINE II C (L, T, P) = 3(3, 0, 0)**

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| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| **I** | **INTRODUCTION:** Mechanisms and Machines: Kinematics links; pairs; chains; Kinematics i.nversions; Four bar planer mechanisms; mobility and range of movement; Miscellaneous mechanisms; (straight line; steering; pantograph) | 7 |
| **II** | **KINEMATIC SYNTHESIS OF MECHANISMS:** Type; number and dimensional synthesis; function generation /Path generation/position generation; two and three position synthesis of four bar/Slider crank mechanisms by graphical and analytical methods; Freudenstein‘s equation; precision positions; structural error; Chebychev‘s spacing; Transmission angle | 7 |
| **III** | **CAMS:** Classification of cams and followers; disc cam nomenclature; Construction of displacement/velocity/acc; for different types of follower motions; Synthesis of cam profile by graphical and analytical approaches; Cams with specified contours/ tangent and circular arc cams | 7 |
| **IV** | **BALANCING OF ROTATING COMPONENTS**: Static/dynamic balancing; Balancing of rotating masses; Two plane balancing-graphical and analytical methods; balancing of rotors; field balancing; balancing machines | 7 |
| **V** | **BALANCING OF RECIPROCATING PARTS**: Balancing of single cylinder engine; balancing of multicylinder - inline/radial/V-type engines; firing order | 7 |
|  | **Total** | **35** |

**TEXT BOOK** Rattan, S. S., ―Theory of Machines‖, Tata McGraw Hill, 2nd Edition, 2007

**REFERENCE BOOKS**

1. Shigley, J. E., ―Theory of Machines and Mechanisms‖, Oxford, 3rd ed, 2009

2. Rao, J. S, and Dukkipatti., ―Mechanism and Machine Theory‖, New Age International

**ME 313 FACILITIES PLANNING & MATERIAL HANDLING C (L, T, P) = 3(3, 0, 0)**

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| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| **I** | Plant Location: The ideal location. Proximity to market. Proximity to raw materials, Transportation costs. The labour supply. electric power. Water and land costs. Local Taxes. Security from attack. Specialised communities, Climate, Urban, Suburban, and small town locations, Plant location trends, Best location for small plants. Incentive offered by State Government for dispersal of industries. Planned Industrial centres Government industrial estate - public sector plants and their location, growing competition for industry amoung states to locate in their midst. centralisation v/s decentrlisation - decentralisation by horizontal and vertical methods. soures of information concern in location. Moving to a new location. Moving costs. To lease or buy or build an industrial plant. | 7 |
| **II** | Plant Location techniques: Euclidean distance, squared euclidean distance, rectilinear distance, linear distance methods, Prolems on multi-location. Plant layout: introduction to plant design, types of manufacturing processes. Plant location, influence of location on layout, Industrial Buildings. Influences of Buildingon Layout, Classical types of layout product layout and Process layout and practical layouts. | 7 |
| **III** | Planning the Layout: Various operational Research techniques for balancing of assembly lines, Fabrication line balancing. Safety Engineering; Safety in Machine shop, forging shop, carpentry shop, welding shop and foundary shop. safety in critical storage area. storing explosive materials, gases and inflammable liquids. | 7 |
| **IV** | MATERIAL HANDLING: Types of materials handled in an engineering plant, basic principles of material handling. Engineering and economic factors. Classifications of material handling equipment's according to operating principle, construction and nature of service. Gravity equipment's - Chutes, belt and rolling conveyers. Gravity roller spirit's Fixed systems of power driven conveyers, Belt, chain slot, apron, wire aush, Pellet, roller flight, cross bar and chain trolley type of conveyers, Arm, vertical Belt and suspended tray type of elevatos, reciprocation elevators industrial elevators, screw conveyers, ribbon conveyers, bucket elevators, etc. Skip hoists, drag scrapers, tramways and cableways, Pneumatics and hydraulic conveyers. | 7 |
| **V** | Cranes ; jib electric overhead travelling (E.O.T.), cantilever cranes. Track systems; Overhead track of onorail system. Industrialrailways,locomotivecranes.Portable conveyers; Hand trucks, Forkit trucks. Container system of transport; Unit loads, riteriaetion of unit load riteria Co-ordination of handling with production; copntinous, riteriae and intermittent type. Applicationof time and motion study. Organisational and selection of material handling system. Operation, maintenance, and safety precaution Selection of plant layout from material handling riteria. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Practical Plant Layout, Muther, McGraw Hill
2. Plant Layout & Design, Immer, McGraw Hill
3. Material Handling, Immer, McGraw Hill
4. Facilities Planning, Tomphins James A & White John Wiley & Sons.
5. Facility Layout & Location, Francis R.C. & White J.A.Prentice Hall.

**EC 317 PRINCIPLE OF COMMUNICATION SYSTEMS C(L,T,P) = 3(3,0,0)**

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| **Units** | **Course Contents** | **Hours** |
| 1 | **Noise Effects in Communication Systems:** Resistor noise, Networks with reactive elements, Noise temperature, Noise bandwidth, effective input noise temperature, Noise figure. Noise figure and equivalent noise temperature in cascaded circuits | 7 |
| 2 | **Amplitude Modulation:** Frequency translation, Recovery of base band signal, Spectrum and power relations in AM systems. Methods of generation and demodulation of AM-DSB, AMDSB/ SC and AM-SSB signals. Modulation and detector circuits for AM systems. AM transmitters and receivers. | 7 |
| 3 | **Frequency Modulation:** Phase and freq. modulation and their relationship, Spectrum and bandwidth of a sinusoidally modulated FM signal, phasor diagram, Narrow band and wide band FM. Generation and demodulation of FM signals. FM transmitters and receivers, Comparison of AM, FM and PM. Pre emphasis and de-emphasis. Threshold in FM, PLL demodulator. | 7 |
| 4 | **Noise in AM and FM:** Calculation of signal-to-noise ratio in SSB-SC, DSB-SC, DSB with carrier, Noise calculation of square law demodulator and envelope detector. Calculation of S/N ratio in FM demodulators, Super-heterodyne receivers. | 7 |
| 5 | **Pulse Modulation Systems:** Sampling theorem, Generation and demodulation methods of PAM, PWM, PPM. | 7 |
|  | Total | 35 |

**HS 301 VERBAL & NON-VERBAL REASONING C(L,T,P)=3(3,0,0)**

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| **Units** | **Course Contents** | **Hours** |
| 1 | [Logical Sequence of Words](http://www.indiabix.com/verbal-reasoning/logical-sequence-of-words/), [Blood Relation Test](http://www.indiabix.com/verbal-reasoning/blood-relation-test/), [Syllogism](http://www.indiabix.com/verbal-reasoning/syllogism/) | 7 |
| 2 | [Series Completion](http://www.indiabix.com/verbal-reasoning/series-completion/), [Cause and Effect](http://www.indiabix.com/verbal-reasoning/cause-and-effect/), [Dice](http://www.indiabix.com/verbal-reasoning/dice/) | 7 |
| 3 | [Venn Diagrams](http://www.indiabix.com/verbal-reasoning/venn-diagrams/), [Cube and Cuboids](http://www.indiabix.com/verbal-reasoning/cube-and-cuboid/)[Analogy](http://www.indiabix.com/verbal-reasoning/analogy/) | 7 |
| 4 | [Seating Arrangement](http://www.indiabix.com/verbal-reasoning/seating-arrangement/), [Character Puzzles](http://www.indiabix.com/verbal-reasoning/character-puzzles/), [Direction Sense Test](http://www.indiabix.com/verbal-reasoning/direction-sense-test/) | 7 |
| 5 | [Classification](http://www.indiabix.com/verbal-reasoning/classification/), [Data Sufficiency](http://www.indiabix.com/verbal-reasoning/data-sufficiency/), [Arithmetic Reasoning](http://www.indiabix.com/verbal-reasoning/arithmetic-reasoning/), [Verification of Truth](http://www.indiabix.com/verbal-reasoning/verification-of-truth/) | 7 |
|  | Total | 35 |

**Reference Books:**

‘Reasoning’ by R.S. Aggarwal

**LAB**

**ME 254 MACHINE DESIGN LAB C (L, T, P) = 2(0, 0, 3)**

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| **LIST OF EXPERIMENTS**  1. Selection of material & IS coding  2. Selecting fit & assigning tolerances  3. Examples of Production considerations.  **Problems on**   1. Knuckle & Cotter joints 2. Torque: Keyed joints & shaft couplings 3. Design of screw fastening 4. Bending: Beams, Levers etc. 5. Combined stresses: Shafts, brackets, eccentric loading |

**AE 351 THERMAL ENGINEERING LAB – II C (L, T, P) = 1(0, 0, 2)**

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| 1. For Given apparatus determine :  a. Thermal conductivity of given insulating powder.  b. Critical thickness of insulation.  c. Thermal resistant of insulating powder five parts.  d. To plot theoretical temperature profile by dividing the thickness in minim  e. State all assumption applied in above calculation  2. To find emmisivity of a grey body relative to a given black body and to find out theStefan Boltzman constant.  3. To perform the experiments on pin fin test rig in forced convection by neglectingradiation losses and to calculate:  a. Convective heat transfer coefficient. (Experimentally & using empiricalcorrelation).  b. Efficiency, Effectiveness.  c. Comparison of experimental & theoretical temperature profile  d. Heat the same exercise by considering radiation losses.  4. To find the connective heat transfer coefficient of a given cylinder in verticalposition by neglecting radiation losses by assuring.  a. Constant surface temperature.  b. Constant heat flux & compare with experimental heat transfer coefficient by neglecting radiation losses & by considering radiation losses.  5. Perform the experiment No. 4 by using cylinder in horizontal position.  6. To find the overall heat transfer coefficient of parallel flow / Counter flow HeatExchanger.  7. To determine the efficiency and effectiveness of an automobile radiator. |

**AE 353 AUTOMOTIVE ELECTRICALS AND ELECTRONICS LAB C (L, T, P) = 1(0, 0, 2)**

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| 1. Study of different type of Battery construction and different battery test.  2. Study of different automotive electrical system (Starting system, Ignition system,lighting system, wiring harness.)  3. Assembling and dismantling of Starter motor used in automobile.  4. Assembling and dismantling of alternator used in automobile.  5. Trouble shooting with Ignition system.  6. Study of different color code system used in automotive wiring system.  7. Study of different Electrical Equipments& Accessories ( Speedometer, Warning lights , Electric Horn , Wind shield wipers system )  8. Study of different sensor used in modern automotive system.  9. Study of various electronics system ( Electronic fuel injection system, Electronicignition system , Air bag , ABS , lectronic fuel injector cleaner). |

**AE 357 AUTOSHOP PRACTICE LAB C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENTS**  1. Identification and specifications of standard and non standard tools and garage equipments used in an Automobile repair workshop.  2. Wet / Dry servicing of a vehicle which includes washing; cleaning; changing engine oil; oil filter; air filter and fuel filter and engine tuning.  3. Dismantle clutch assembly from a vehicle; Inspect and replace defective parts; reassemble and adjust clutch free play.  4. Overhaul gear box and propeller shaft with U J Cross of Maruti vehicle.  5. Study the steering geometry of a vehicle. Carry-out wheel balancing and wheel-alignment of vehicle.  6. Remove punctured tyre from vehicle; repair the puncture; and do tyre rotation  7. Overhaul master cylinder (Single and Tandem) of hydraulic brake system of vehicle and do bleeding operation.  8. Overhaul front suspension of Maruti Vehicle.  9. Remove engine from Maruti vehicle; dismantle engine; clean its components and  (A) Inspect engine for damaged/defective and worn out parts. (i) Water jackets; (ii) oil galleries; (iii) cracks;(iv) main and big end bearings; (v) crankshaft (vi) cam shaft;(vii) connecting rod(vii) timing gears etc. (B) Measurement and recording of: (i) Cylinder bore dimensions; its ovality; taper and wear (ii) Ovality; taper and wear of crankshaft; (iii) Connecting rod alignment; inspect the components for wear and tear; (iv) Engine cylinder ridge cutting; boring and honing.  10. Reassemble the Engine and mount engine on the vehicle. |

**Syllabus for B.Tech Automobile Engineering**

**Session 2014-15 VI Semester**

**AE 302 AUTO CHASSIS AND AUTO SYSTEM DESIGN C (L, T, P) = 4(3, 1, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Introduction of Auto System Design: Aspects of Auto Design, Design Procedure, Principleof Design, Classification of design, Basic requirements of design, Quality of DesignEngineer.Automotive chassis and chassis frame: general considerations related to chassis layout,power plant location, weight distribution, stability, types of frame, materials, calculation ofstresses on sections construction details, loading points, testing of frames in bending andtorsion | 7 |
| **II** | Design of IC Engine Parts: General considerations of Engine Design, Principle ofSimilitude, and Design of Engine Components like: Piston, Cylinder, Connecting rod,Crank shaft, Valves. | 7 |
| **III** | Design of Clutch: Types of friction clutches, requirements of clutches, general designconsideration, design the equation for power transmitted through single plate and multiplate clutch for Uniform wear and uniform pressure, design for dimensions of clutch,equation for centrifugal clutch. | 7 |
| **IV** | Design of Brake: General design considerations, braking efficiency, braking torque on theshoe, effect of expanding mechanism of shoes on braking torque, braking of vehicle fortwo wheel drive and four wheel drive, braking of vehicle for curved path calculation ofmean lining pressure and heat generation during brake operation. | 7 |
| **V** | Design of Suspension System: Function suspension system in automobile, design of helicalcoil spring, leaf spring, materials for spring, standard sizes of automobile suspensionspring.Propeller Shaft: Design of Propeller shaft, Design of universal Joint. | 7 |
|  | **Total** | **35** |

**AE 304 AUTOMATIC CONTROL ENGINEERING C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Introduction: Concepts of automatic controls, open and closed loop systems, concept offeedback control. Requirements of an ideal control system.Differential equations for mechanical systems, transnational and rotational systems,Electrical systems such as servos, D.C. motors, A.C. Servomotors, Hydraulic systems,hydraulic servos meters, thermal systems, integrating devices, temperature control systems,error detection. | 7 |
| **II** | Systems Response: First and second order system response to step, ramp and sinusoidalinputs. Concept of time constant and its importance in speed response. Response of asystem to an external disturbance. Mathematical concept of stability. Routh’s Hurwitzcriterion. | 7 |
| **III** | Block diagrams, Signal Flow Graphs and Transfer Function: Definition of transferfunction, block representation of system elements. Reduction of block diagrams and signalflow paths, Basic properties, signal flow graphs, gain formula to block diagrams. | 7 |
| **IV** | Frequency Response: Polar and rectangular plots for frequency response. Experimentaldetermination of frequency response. System analysis using Niquest diagrams, relativestability, concept of margin gain and phase margin. M & N cycles. | 7 |
| **V** | Systems Analysis: Systems Analysis using logarithmic Plots: Bode attenuation diagrams,Stability analysis using Bode diagrams, Simplifies Bode diagrams; Systems Analysis usingRoot Locus Plots: Definitions of root locus plots and root loci. Graphical relationship,setting systems gain. System Compensation | 7 |
|  | **Total** | **35** |

**ME 311 MECHANICAL VIBRATION AND NOISE ENGINEERING C (L, T, P) = 4(3, 1, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Sound level and subjective response to sound; Frequency dependent human response to sound, Sound pressure dependent human response. Decibel scale; Decibel addition, subtraction and averaging. Relationship among sound power, sound intensity and sound pressure level. Sound spectra. Octave band analysis. Loudness. Noise: Effects, Ratings and Regulations; Non-auditory effects of noise on people, Auditory Effects of noise, Noise standards and limits in India. Major sources of the noise; Industrial noise sources. Industrial noise control-strategies; Noise control at the source, Noise control along the path, Acoustic barriers, Noise control at the receiver. | 7 |
| **II** | Scope of vibration, important terminology and classification, Degrees of freedom, Harmonic motion; vectorial representation, complex number representation, addition. Derivation of equation of motion for one dimensional longitudinal, transverse and torsional vibrations without damping using Newton’s second law, D’ Alembert’s principle and Principle of conservation of energy. Compound pendulum and centre of percussion. Damped vibrations of single degree of freedom systems. Viscous damping; under damped, critically damped and over damped systems, Logarithmic decrement. Vibration characteristics of Coulomb damped and Hysteretic damped systems. | 7 |
| **III** | Forced vibrations of single degree of freedom systems. Forced vibration with constant harmonic excitation. Steady state and transient parts. Frequency response curves and phase angle plot. Forced vibration due to excitation of support. Vibration Isolation and transmissibility; Force transmissibility, Motion transmissibility. Forced vibration with rotating and reciprocating unbalance. Materials used in vibration isolation. | 7 |
| **IV** | System with two degrees of freedom; principle mode of vibration, Mode shapes. Undamped forced vibrations of two degrees of freedom system with harmonic excitation. Vibration Absorber; Undamped dynamic vibration absorber and centrifugal pendulum absorber. Many degrees of freedom systems: exact analysis. | 7 |
| **V** | Many degrees of freedom systems: approximate methods; Rayleigh’s, Dunkerley’s, Stodola’s and Holzer’s methods. Vibrations of continuous systems; Transverse vibration of a string, Longitudinal vibration of a bar, Torsional vibration of a shaft. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Mechanical Vibrations; G.K.Grover, Nemi Chand & Bros., Roorkee
2. Vibration Theory & Applications; W.T.Thomson
3. Vibration & Noise for Engineers; K.K.Purja, Dhanpat Rai & Sons, Delhi
4. Theory & Problems of Mechanical Vibrations; W.W.Seto, Schaum's Outline Series, McGraw Hill International Editions
5. Mechanical Vibrations, Den Hartog
6. Vibration Problems in Engineering, Timshenko

**AE 308 VEHICLE DYNAMICS C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Introduction; Vehicle Dynamics Definitions as prescribed by SAE, Newtonian andlagrangian formulations of multibody systems.Handling and stability characteristics: Steering geometry, fundamental equations for truerolling, Ackerman steering gear. Steady state handling neutral steer, under steer and oversteer, steady state response, yaw velocity, lateral acceleration, curvature response,directional stability | 7 |
| **II** | Performance characteristics of road vehicle; Various forces opposing vehicle motion, theirnature and factors affecting these forces. Tractive effort and power available from theengine, equation of motion, maximum tractive effort and weight distribution, stability ofvehicle on slop, road performance curves, acceleration, grad ability, drawbar pull.Transient operation of vehicles: inertia effects, equivalent mass, equivalent moment ofinertia, time taken in synchronization during change of gears, effect of flywheel inertia onacceleration, dynamic of vehicles on banked track, gyroscopic effects , net driving power. | 7 |
| **III** | Braking performance; Braking of vehicles, brakes applied to rear wheels, front wheel andall four wheels, motion on straight and curved path, mass transfer effects, brakingefficiency, stopping distance, reaction time and stopping time, brake locking anti lockdrives, calculation of mean lining pressure and heat generation during brakes. | 7 |
| **IV** | Vehicle ride characteristics: Human response to vibration, vehicle ride models, road surfaceprofile as a random function, frequency response function, evaluation of vehicle verticalvibration to ride comfort criterion. | 7 |
| **V** | Two wheeler dynamics: Stability & handling, vehicle motion ride control, various vehiclemodels, gyroscopic effect, effect of tyre and vehicle parameter on stability and handlingcharacteristic. | 7 |
|  | **Total** | **35** |

**AE 310 AUTO EMISSION AND POLLUTION CONTROL C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Engine emissions and air pollution: Constituents of engine exhaust responsible for airpollution and their effect on human health, plant ecology, ozone layer depletion and globalwarming, Photochemical smog, greenhouse gases. Kyoto protocol and carbon trading.Formation of Pollutants: Combustion generated and other pollutants, general mechanismsand kinetics of formation of carbon-monoxide, unburnt hydrocarbon, oxides of nitrogenand particulate matter due to combustion, effect of air-fuel ratio on emissions, extendedZeldovitch mechanism for formation of NOx, soot and smoke formation. NOx-particulatetrade-off. | 7 |
| **II** | Emissions from Spark ignition engines: Types of emission form spark ignition engines,importance of mixture formation, lean and rich mixture, study of various mechanism offormation of unburnt hydrocarbon, effect of various design and operating variables onformation of CO, UBHC and NOx. Discussion on different technologies for reducingengine out emissions from a spark ignition engine, gasoline port injection and gasolinedirect injection. Evaporative emissions and their control. | 7 |
| **III** | Emissions from Compression Ignition engines: Types of emissions from compressionignition engine, effect of various design and operating variables on formation of NOx,smoke and particulate matter. Discussion of various technologies for reducing engine outemissions from a compression ignition engine such as turbo charging, inter-cooling, fuelinjection pressure, injection timing retard, exhaust gas recirculation (EGR) etc. | 7 |
| **IV** | Exhaust After treatment: Need for exhaust aftertreatment, fundamentals of catalytic converters, three-way catalyst, diesel oxidation catalyst, diesel particulate filter, effect of fuel sulfur on after treatment devices. Emission Test Procedures: Various test cycles for emission testing of two-three wheelers, passenger cars, utility vehicles, light and heavy duty commercial vehicles used in India, Europe, Japan and USA. Test procedures for various types of evaporative emissions | 7 |
| **V** | Study of emission standards for two-three wheelers, passenger cars, utility vehicles, lightand heavy duty commercial vehicles used in India, Europe, Japan and USA.Equipment for Emission Measurements: NDIR analyzers, Flame ionization detector,chemiluminescence analyzer, constant volume sampling, measurement of smoke andparticulate matter. | 7 |
|  | **Total** | **35** |

**ME 304 MECHATRONICS C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Introduction about Mechatronics, scope of Mechatronics, application, process control automation and N/c Machines.  **Hydraulic And Pneumatic Actuation Systems:** Overview: Pressure Control Valves, Cylinders, Direction Control Valves, Rotary Actuators, Accumulators, Amplifiers, and Pneumatic Sequencing Problems. | 7 |
| **II** | **Electrical Actuation Systems:** Switching Devices, Mechanical Switches **–** SPST, SPDT, DPDT, Debouncing keypads; Relays, Solid State Switches, Diodes, Thyristors, Transistors, Solenoid, Types Devices: Solenoid Operated Hydraulic and Pneumatic Vlaves, Electro-Pneumatic equencing Problems. Control of DC Motors, Permanent Magnet DC Motors, Control of DCMotors, Bush less Permanent Magnet DC Motors, AC Motors, Stepper Motors, Stepper Motor Controls, Servo Motors. | 7 |
| **III** | **Sensors and transducers and application:** Performance Terminology, Static and Dynamic Characteristics, Displacement, Position and Proximity Sensors, Potentiometer Sensors, Strain Gauge Element, LVDT, Optical Encoders, Pneumatic Sensors, Hall Effect Sensors,Tachogenerators, Strain Gauge Load Cell, Thermostats, Photo Darlington. Interfacing Sensors in Mechantronic System as – Temperature Switch Circuit, Float Systems |  |
| **IV** | **Interfacing controllers:** Interfacing, Buffers, Darlington Pair, I/O Ports, Interface Requirements, Handshaking, Serial and Parallel Port Interfacing, Peripheral Interface, Adapters.  **Data Acquisition and Control System -** Introduction, Quantitizing theory, Analog to Digital Conversion, Digital to Analog (D/A) conversation, transfer function, transient response & frequency response & frequency response, stability criteria. | 7 |
| **V** | **Design of Mechatronic systems -** Introduction, Automatic front and book and cutting in steel rolling mill, lift control system, CNC lathe, temperature control of a heat treatment furnace, EOT crane control panel, Grey grain separators, electrode arm control in electric arc furnace. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Mechatronics Engineering, Tomkinson, D. and Horne, J., McGraw Hill, 1996
2. Mechatronics, Bolton, W., Longman, 1995
3. Mechatronics, HMT Hand Book, 1998
4. Understanding Electro-Mechanical Engineering, Kamm, L.J., IEEE Press, New York, 2000
5. NitaigourPremchandMahalik, Mechatronics, Tata Mcgraw-Hill
6. J.P. Holman, Mechanical Measurements,McGraw-Hill
7. T.K.Kundra, P.N.Rao And N.K.Tewari,Numerical Control and Computer AidManufacturing,Tata McGraw-Hill.

**ME 310 Numerical Methods and Applied Statistics C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Errors and significant digits, Roots of algebraic equations Bisection method, secant method,NewtonRaphson method, Graff’s root- squaring method, Iterated synthetic division with quadratic factors method for finding complex roots, | 7 |
| **II** | Solutions of systems of equations (Gauss elimination, Gauss Jordan, and Partition method for linear system of equations, power method for partition, method for linear system of equations, power method for finding eigen values), Forward, backward , central and Divided differences, Newton’s formula of interpolation for equal and unequal intervals. Lagrange’s interpolation  formula, Stirling’s and Bessell’s formula, | 7 |
| **III** | Numerical differentiation, Numerical Integration:- Trapezoidal, Simpson’s rule and Gaussian integration (only formula applications) Differential equations and their solutions. Numerical methods for ordinary differential equations (Picard method, Taylor series method, Euler’s method, RangaKutta Method, Predictor- corrector method, Adams- Bashforth method). | 7 |
| **IV** | Sampling theory: Introduction: Moments, Moment generating functions, Skewness, Kurtosis, Correlation and Regression, Normal sampling distributions; Binomial distribution, Poisson distribution, Normal distribution; Sampling distribution of the means; sampling distribution of the differences of the means; sampling distributions of proportions. | 7 |
| **V** | Tests of Significance; t-distributions, chi square distributions, F-distributions.  Regression And Correlation; Linear regression; correlation, multiple correlation partial correlation Confidence Limits; Large samples, small samples, error bands in regression | 7 |

**Reference Books:**

1. **B.V.RAMANA.,** McGraw Hill
2. **B.RAM, PEERSON PUBLICATION**
3. **E.KRIZING, WILLY PUBLICATION**

**HS 302 EMPLOYABILITY SKILLS–IV: TECHNICAL WRITING C(L,T,P) = 3(3,0,0)**

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| **Units** | **Course Contents** | **Hours** |
| 1 | Writing Process- Intro of various types of writings, Gathering, Writing, Reviewing, Editing, Indexing, Testing | 7 |
| 2 | Review Writing- Internal, Friendly and Anonymous reviews, Quantity review, Quality review, Precis Wring, Paragraph Writing, Report Writing- Science and research reports, business Reports, Business Report, Business overview | 7 |
| 3 | Letter Writing- Letter of Inquiry, Letter of adjustment, Claim Letter and follow of Letter, Letter of acceptance, Letter of refusal | 7 |
| 4 | Job search correspondence- cover letter, CV and resume | 7 |
| 5 | Writing Mails- User Guides, Reference Guide, Online helps, Website, Technical Proposal Writing. | 7 |
|  | Total | 35 |

**LAB**

**AE 352 AUTO TRANSMISSION LAB C (L, T, P) = 1(0, 0, 2)**

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| 1.Technical Specification of two and four wheeled (Petrol and diesel) vehicle and troubleshooting chart of all the chassis and transmission components.  2. Dismantling and assembly of chassis and transmission component by using specialtools measurement and omparison like clutches, gearboxes, propeller shafts,differential gearbox, steering mechanism and braking system, inspection for wearand tear, crack breakdown, servicing and cleaning and necessary adjustments.  3. Calculation of gear ratios of respective assemblies.  4. Study of torque converter.  5. Study of janny hydrostatic drive.  6. Study of Ward Leonard control system. |

**AE 354 VEHICLE DYNAMICS LAB C (L, T, P) = 1(0, 0, 2)**

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| 1. Study of Vehicle stability test.  2. To perform static and dynamic balancing on balancing setup.  3. To perform the wheel balancing test.  4. Study of various parameter at the time of application of brake ( Braking efficiency & stopping distance , Reaction time and stopping time)  5. Study of Antilock braking system.  6. Study of different steering system used in automobile.  7. Study of ride comfort in Vehicle.lights , Electric Horn , Wind shield wipers system )  8. Study of different sensor used in modern automotive system.  9. Study of various electronics system ( Electronic fuel injection system, Electronicignition system , Air bag , ABS , Electronic fuel injector cleaner). |

**ME 357 MECHANICAL VIBRATION LAB C (L, T, P) = 1(0, 0, 2)**

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| **LIST OF EXPERIMENTS**   1. To verify relation T=2 √L/g for a simple pendulum. 2. To determine radius of gyration of compound pendulum. 3. To determine the radius of gyration of given bar by using bifilar suspension. 4. To determine natural frequency of Spring mass System. 5. Equivalent spring mass system 6. To determine natural frequency of free torsional vibrations of single rotor system (a) Horizontal rotor (b) Vertical rotor. 7. To verify the Dunkerleys rule. 8. Study of free damped torsional vibration to performing the experiment to find out damping co-efficient. 9. To conduct experiment on trifilar suspension   10. Vibration of beams concept of more than one degree of freedom Excrtation using eccentric mass.  11. Critical speed of shafts.  12. Study of vibration measuring instruments. |

**Syllabus for B.Tech Automobile Engineering**

**Session 2014-15 VII Semester**

**AE 401 CAD/CAM C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Introduction: Role of computers in design and manufacturing. Influence of computers inmanufacturing environment. Product cycle in conventional and computerizedmanufacturing environment. Introduction to CAD and CAM. Advantages anddisadvantages of CAD and CAMHardware for CAD: Basic hardware structure, working structure, working principles,usages and types of hardware for CAD. Input/output devices, memory, CPU, hardcopy andstorage devices. | 7 |
| **II** | N C System: Definition, applications, Historical background Role of Computers inManufacturing.Numerical Control in CAM: Definition, Historical Background, basic components of NCsystem, Fundamentals of NC: Procedure, Coordinate system, motion control systems,Advantages of NC systems. Economic of NC. machining centers. | 7 |
| **III** | Part Programming: Numerical control part programming: punched tape, tape coding &format. Manual part programming, Computer aided part pragramming NC partprogramming languages. Automatically programmed, tools programming (APT).Description of compact & NC programming with interactive graphics. | 7 |
| **IV** | Computer Numerical Control: Principle of operation of CNC, Features of CNC,Development in CNC systems, Adaptive Control, Direct Numerical Control (DNC)Standard Communication interfaces, Programmable Logic Controllers (PLCs)Communication networks, Trends\* New Development in NC | 7 |
| **V** | Robot Technology: Introduction, Industrial Robots, Robot physical Configuration, BasicRobot motions, Technical features such as work volume, precision of movement speed ofmovement, weight carrying capacity, type of drive systems, Introduction to RobotLanguages, End Erectors, work cell control and interlocks, Robotic sensors, Robotapplications & economics, Intelligent robots, interfacing of a vision system with a Robot. | 7 |
|  | **Total** | **35** |

**AE 403 AUTOMOTIVE HEATING, VENTILATION AND AIR CONDITIONING (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| I | Air conditioning fundamentals:, fundamentals of refrigeration, basics of vehicle airconditioning system, location of air conditioning component in a car – schematic layout ofa refrigeration system, component like compressor, condenser, fan blower, expansiondevice – expansion valve calibration , evaporator pressure regulator ,low and high pressureswitch. | 7 |
| II | Air conditioning heating system: automotive heaters – manually controlled air conditioner– heater system –automatically control air conditioner – air conditioning protection withheater diagnosis chart. | 7 |
| III | Refrigerants: Introduction ,classification, properties, selection criteria, commonly usedrefrigerants, eco friendly refrigerants, global warming and ozone forming potential ofrefrigerants, containers, handling of refrigerants. | 7 |
| IV | Psychrometry: Introduction, Psychrometric properties, Inside and outside design conditionsof air conditioning system.Air distribution: introduction, factors affecting design of air distribution system, types ofair distribution system, air flow through the dashboard recirculating unit, duct system,ventilation, vacuum reserve | 7 |
| V | Air conditioning maintenance and service : cause of air conditioner failure, troubleshooting of air conditioning system, servicing heater system, removing and replacingcomponents, leak testing, compressor service, charging and discharging, performancetesting. | 7 |
|  | Total | 35 |

**AE359 Safety and comfort of Vehicle C(L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| I | Design of the body for safety, energy equation, engine location, deceleration of vehicle inside passengercompartment, deceleration on impact with stationary and movable obstacle, concept of crumble zone, safety sandwich construction | 7 |
| II | Active safety: driving safety, conditional safety, perceptibility safety, operating safety- passive safety: exterior safety, interior safety, deformation behaviour of vehicle body, speed and acceleration characteristics ofpassenger compartment on impact | 7 |
| III | Seat belt, regulations, automatic seat belt tightener system, collapsible steering column, tiltable steering wheel, air bags, electronic system for activating air bags, bumper design for safety. | 7 |
| IV | Collision warning system, causes of rear end collision, frontal object detection, rear vehicle object detection system, object detection system with braking system interactions | 7 |
| V | Steering and mirror adjustment, central locking system , Garage door opening system, tyre pressure control system, rain sensor system, environment information system | 7 |
|  | Total | 35 |

**TEXT BOOK**  
1. Bosch - “Automotive Handbook” - 5th edition - SAE publication - 2000.  
  
**REFERENCES**  
1. J.Powloski - “Vehicle Body Engineering” - Business books limited, London - 1969.  
2. Ronald.K.Jurgen - “Automotive Electronics Handbook” - Second edition- McGraw-Hill Inc., - 1999

**AE 407 MICROPROCESSOR APPLICATION IN AUTOMOBILE C(L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| I | Architecture: General 8 bit microprocessor and its architecture 8085, Z-80 and MC 6800MPU and its pin function: Architecture-Function of different sections. | 7 |
| II | Instruction Set: instruction format-addressing modes-instruction set of 8085 MPU-TSTATE-Machine cycle and instruction cycles-Timing diagrams-Different machine cycles-Fetch and execute operations-estimation of execution times. | 7 |
| III | Assembly Language Programming: Construct of the language programming-Assemblyformat of 8085-Assembly Directive-Multiple precision addition and subtraction-BCD toBinary and Binary to BCD, Multiplication, Division, Code conversion using look up tables-Stack and subroutines. | 7 |
| IV | Data Transfer Schemes: Interrupt structure-Programmed I/O-Interrupt driven I/O, DMASerialI/O.Types of interfacing devices: Input/Output ports 8212, 8255, 8251, 8279. Octal latches andtristate buffers-A/D and D/A converters-Switches, LED’s ROM and RAM interfacing. | 7 |
| V | Applications: Data acquisitions- Temperature control-Stepper motor control-Automotiveapplications Engine control, Suspension system control, Driver information. | 7 |
|  | Total | 35 |

**AE 409 VEHICLE AERODYNAMICS AND VEHICLE BODYENGINEERING C(L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| I | Introduction: Importance of vehicle design in modern automobile industries. Criteria for vehicle body design, Types of frame , construction details, loading points, testing of frames in bending and torsion. Different types of metal joining process used in vehicle body construction. | 7 |
| II | Car Body Details: Types : Saloon , Convertibles, Limousine, Sedan , Hatchback , Racing and sports car. Car visibility- driver's visibility, regulation, visibility test, method of improving visibility and space in cars , Safety in design of car , Car body construction. Bus Body Details : Types: Mini bus, single Decker bus, Double Decker bus, articulated bus , Bus body layout , floor height, engine location, entrance and exit , seat layout , seat dimension. Construction details- frame construction , double skin construction, types of metal section used , conventional and integral type construction. Commercial vehicle Details: Types of body : Flat platform , drop side , fixed side , tipper body , tanker body , light commercial vehicle body types – dimension of driver seat in relation to control- Driver cabin design. | 7 |
| III | Vehicle aerodynamics: Introduction , Aerodynamics forces , Drag, Drag reduction, stability and cross winds various body optimization technique for minimum drag, Wind tunnel testing, Scale model testing, | 7 |
| IV | Body Load: symmetric & asymmetrical vertical loads in car. different load case in vehicle- Bending case , Torsion case, Combined bending and torsion , lateral loading Idealized structure – Structural surface –shear panel method. Body material trim and mechanism: Steel sheet , timber , plastic , GRP, FRP , Properties of materials- corrosion – anticorrosion method. Selection of paints and various processes. Body trimming process- dent beating tools, riveting method, welding method. Body mechanism- door lock mechanism, window glass winding mechanism. | 7 |
| V | Safety in vehicle design: Basics of impacts protection, design for crashworthiness, front impact and side impact analysis, bumper system , energy absorbent forms. Indian Motor acts and its application- The motors vehicle acts 1988, Driving license, Registration of vehicles, Rules of the road, Motor Insurance. | 7 |
|  | Total | 35 |

**ME 411 FINITE ELEMENT ANALYSIS C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Stress strain and deformation relations, plane - stress, planes strain, Principles of minimum PotentialEnergy, principle of virtual work. | 7 |
| **II** | Stiffness method for steady state problems of discrete systems (Bar, trusses, one dimensional heat transfer system) Element stiffness matrix, Assembly of elements, global stiffness matrix and its properties, Node numbering, Displacement and force Boundary conditions, Transformations matrix, Gauss elimination method | 7 |
| **III** | Displacement - Based FEM for solid mechanics;Derivation of finite element equilibrium equations, Langrangian elements (I-D & 2-D elements); CST, rectangle, aspect ratio shape functions, lumping of loads, computability and convergence requirements. Stress calculations Isopohmetric Derivation of Stiffness matrices, bar and plane bilinear elements, Seredipity elements, natural coordinates, numerical integration, Co-continuity p and h refinement | 7 |
| **IV** | Variational Method: Variational Approach for known functional of field problems.Weighted Reidual Methods: Point collection, subdomain collocation, methods of least square, Galerkin. Application of these methods to one dimensional boundary value problems; Structures, fluid mechanics and heat transfer. | 7 |
| **V** | Finite Elements in Dynamics and Vibrations: Introduction, Dynamic Equations, Mass and Damping Matrics, Mass Matrics, Consistent and Diagonal, Damping, Natural frequencies and Mode Shapes. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Introduction to Finite Elements in Engineering, Tirupathi R. Chandrapatla and Ashok D. Belagundu, Prentice Hall of India. Ltd.
2. Comcept and Applications of Finite Element Analysis, Robert D. Cook. David S. Malkus. Michaiel E. Palesha, John Wiley & Sons.
3. Finite Element Procedures, Klaus Jurgan Bathe, Prentice Hall of India, New Delhi

**HS 401 TECHNICAL APTITUDE C(LTP)=3(3,0,0)**

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| **Units** | **Course Contents** | **Hours** |
| 1 | PPL (Principal of Programming Language, C, C++, Java, Asp.net, DSA | 7 |
| 2 | DBMS, RDBMS | 7 |

**BM 449 ENTREPRENEURSHIPDEVELOPMENT C (L, T, P) =3 (3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Need scope and characteristics nature of entrepreneurship ventures in India economic and industrial heritage and entrepreneurship development; current economic and industrial environment with special reference to enterpreneurial ventures and economic growth. Understanding Human Behaviour time management, group dynamics, conflict and stress management | 7 |
| **II** | Small, medium and large industrial sectors, Industrial potential and identification of opportunities, demand and resource based industries, service sector, corporate entrepreneurship, entrepreneurship and technocrat entrepreneurship.**SSI:** definition and legal frame planning for small enterprise; major policies, organization of SSI units, reservation of items for SSI units, role of SIDO, NSIC and SSI corporate. | 7 |
| **III** | Marketing and Price distribution Methods of sales promotion state and central government purchase procedures: promotional and advertising methods, marketing research policies & Strategies, price determinate expert policies Financing of small scale industries, tax concession to SSI units. Machinery on Hire Purchases, Controlled & Scarce Raw Materials. | 7 |
| **IV** | **Production Planning:** Elements of production process managing production life cycle, PERT, CPM; managing production support services, product licensing, patenting; certification agencies, ISO 9000, and 14000, CS 8000 series; Testing facilities, Quality Control. | 7 |
| **V** | Project identification, decision making area money, market, machinery and material; Project planning and executing; working capital management sources and uses of funds; ration analysis; break even analysis, cost control; time control; Evaluation and preparation of project report | 7 |
|  | **Total** | 35 |

**Reference Books:**

1. Organization & Management of Small Scale Industries: Desai, J.V. Himalaya, Bombay, 1985
2. Management of Small Scale Industries: 3rd Himalaya, Bombay, 1986
3. The Story of an Entrepreneur: M.Nath, IMT Monographs
4. Small Industry Entrepreneurs Handbook: Mohan, K.K. Bombay Productivity Services International
5. Handbook of Entrepreneurship: Rao&Pareek. New Delhi: Learning System, 1978

**LAB**

**AE 356 AUTOMOTIVE SYSTEM AND POLLUTION LAB C (L, T, P) = 1(0, 0, 2)**

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| 1. Chassis and transmission components- sketches, functions, material  2. Study of NDIR Gas analyzer and Fill  3. Study of Chemi-luminescent NOx analyzer.  4. Measurement of HC, CO, CO2, O2 using exaust gas analyzer. Diesel smokemeasurement.  5. Testing and servicing of electrical equipments and accessories; battery, generator, alternator, starter motor, ignition systems and spark plug.  6. Inspection and testing of vehicle and engines and preparation of test charts. |

**AE 453 CAD/CAM LAB C (L, T, P) = 1(0, 0, 2)**

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| 1. Analysis of simple automotive components by using FEM package.  2. Auto lisp programming – writing and execution of at least 3 programs (2D only)  3. Using Pro/E or any other standard solid modular getting a hardcopy of 4 different automotive 3D objects.  4. a). Study of NC Machine and simulation of cutting/milling operations using CAM package.  b) Machining and simulation of at least two jobs using NC Machine /CAM package.  5. Clutch Complete design of clutch component, components and assemblies drawing using drafting software.  1. Gear Box: Gear train calculation, Layout of gear box , calculation of bearing loads and selection of bearing. Complete assembly drawing using drafting software. |

**AE 455BODY ENGINEERING LAB C (L, T, P) = 1(0, 0, 2)**

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| 1. Perform the visibility test on the vehicle.  2. Study of different types of tool used in body shop  3. Perform the various joining processes welding, riveting) in the body material.  4. Assembling and dismantling of various body mechanisms like door lockmechanism, window winding machine mechanism, passenger seat mechanism.  5. Perform the dent beating process on the metal sheet.  6. Study and perform the various painting process on the car.  7. Make the different scale model (Bus body model, TATA 407 model).  8. Study of Modern vehicle design.  9. Study of vehicle crash analysis. |

**Syllabus for B.Tech Automobile Engineering**

**Session 2014-15VIII Semester**

**ME 410 COMPUTATIONAL FLUID FLOW & HEAT TRANSFER C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | Review of basic fluid mechanics and the governing (Navier-Stokes) equations.Types of partial differential equations- hyperbolic, parabolic and elliptic.Traditional solution methods- method of characteristics, separation of variables, Greens function method. | 7 |
| **II** | Preliminary computational techniques: Discretisation, converting derivatives to discrete algebraic expressions, spatial derivatives, time derivatives. Approximation of derivatives, Taylor series expansion, general techniques. Accuracy of discretisation process-higher order vs lower order formulae. | 7 |
| **III** | Finite difference method: conceptual implementation, application to transient heat conduction problem.Convergence, consistency and stability of FD equation. | 7 |
| **IV** | Weighted residual methods: General formulation, Introduction to Finite Volume method.Finite Volume method: Equations with first derivatives and second derivatives. FV method applied to Laplace’s equation. | 7 |
| **V** | Finite Element method: Linear interpolation, quadratic interpolation, two dimensional interpolations. Application to heat transfer problems. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Computational Fluid Dynamics: The Basics with [Applications](http://www.indiastudychannel.com/resources/37094-Syllabus-University-Pune-M-E-Chemical-Engg-Semester-I-Computational-Fluid-Dynamics.aspx), John D.Anderson, McGraw Hill, 1995.
2. Computational Flow Moeling for Chemical Reactor Engineering, V. V. Ranade, Process Engineering Science, Volume 5, 2001.
3. Fundamentals of Grid Generation, Patrick Knupp and Stanly Steinberg, CRC Press,1994.
4. Turbulence Modelling for CFD, D.C. Wilcox 1993,

**AE 404 INDUSTRIAL ROBOTICS C(L, T, P) = 3(3, 0, 0)**

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| --- | --- | --- |
| **Units** | **Course Contents** | **Hours** |
| I | Introduction : Automation and robotics, Brief history of robotics , Development in robotics,Economics aspects of robots, Advantage and disadvantage of using robots I industries.Overview of robots – Present and future applications.Production Design for Robotic Assembly: Production design for robotic and automaticassembly, consideration for assembly oriented product design. Robot safety. | 7 |
| II | Classification and structure of robotic system: .Classification, Geometrical configurations,wrist and its motions, End effectors and its type, links and joints. Robot drive system : – Hydraulic, Electric and pneumatic drive system, Resolution, accuracy and repeatability, Advantage and disadvantage of drive system. | 7 |
| III | Control system and components: Basic control system concept and models, Transferfunction and block diagram of spring mass system, Controllers – proportional,proportional and integral, proportional and derivative, PID, transient and response tosecond order system. Robot actuation and Feedback component – position, velocitysensors. | 7 |
| IV | Robot arm kinematics: Introduction, Direct and inverse kinematics, rotation matrix,rotation matrix about an arbitrary axis, Homogeneous transformation, links, joint and theirparameters, D-H representation. Trajectory Planning: Introduction, general consideration on trajectory planning, jointinterpolated trajectory, planning of Cartesian path trajectories | 7 |
| V | Robot programming and languages : introduction, manual teaching, lead through teaching,programming language – AML and VAL, storing and operating, Task programs.Sensors: Internal state sensors, tactile sensor, proximity sensing, range sensing, forcetorque sensor, elements of computer vision, sensing and digitizing function in machinevision- sampling- quantization-encoding-image storage. Image processing and analysis,feature extraction and object recognition. Artificial intelligence | 7 |
|  | Total | 35 |

**AE 406 AUTOMOTIVE MAINTENANCE & MANAGEMENT C(L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| I | Automobile maintenance: Importance of maintenance, scheduled and unscheduledmaintenance. Preparation of check lists, analysis of breakdown, preventive measures, unitreplacement system, maintenance schedule, chassis lubrication schedule, componentretrieval, estimating repair cost, maintenance record, warranty period, servicing. Inspectionforms. Log books. Trip sheets. Other maintenance record forms.Garage Practice: Types of service station/garage, layout of garage. Factors affecting layout,tools &equipments, transport service undertakings, design a layout for different garage. | 7 |
| II | Engine Maintenance: Dismantling of engine components, cleaning methods, visualinspection and dimensional check of various engine components, minor and major tune up,reconditioning and repairing methods of engine components. Assembly procedure, specialtools used for maintenance, repair and overhauling.Cooling systems- Anti corrosion and antifreeze solutions, radiator, and thermostat.Lubrication oil topping up, oil change, oil relief valve; fuel feed systems, FIP adjustmentand testing, injector testing. | 7 |
| III | Chassis and drive line maintenance: mechanical automotive type gear box- mechanicalautomatic types. Final reduction, propeller shaft, front and rear suspension systems, brakesystems-hydraulic, servo, air. Air bleeding, steering system, axles, wheel alignment- tires. | 7 |
| IV | Electric system maintenance: Battery testing method, starter motor, charging system- a DCgenerator, AC alternator, regulator, ignition system- coil ignition, transistor assistedignition, capacitor discharge ignition. Electric horn, wiper motor, flasher, electric fuelpump, gauges. Lighting system- head lights focusing. Wiring harness testing. | 7 |
| V | Body repair: minor body panel beating, tinkering, shouldering, Painting : Introduction of automotive paints , types of paints, corrosion and anticorrosionmethod, rubbing polishing, working of paint booth ,door lock mechanism, window glassactuation mechanism. | 7 |
|  | Total | 35 |

**ME 408 PRODUCT DESIGN AND DEVELOPMENT C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Importance of new product-Definition-importance-Development Process -** Importance of new product for growth of enterprise. Definition of product and new product. Responsibility for new product development. Demands on product development team. Classification of products from new product development. Point of view- Need based/Market pull products, Tech. push, Platform based, Process based and customized products. New product development process and organization. Generic product development process for Market Pull Products. Modification of this process for other types of products. | 7 |
| **II** | **Need analysis- Problem Formulation -** Establishing economic existence of need, Need Identification and Analysis, Engineering Statement of Problem, Establishing Target Specification. | 7 |
| **III** | **Generation of Alternatives and Concept Selection -** Concept generation- a creative process, Creativity, Road Elects to creative thinking- Fear of criticism and Psychological set. Tools of creativity like brain storming, Analogy, Inversion etc., Creative thinking Process. Concept feasibility and Concept Selection, Establishing Engineering Specification of Products. | 7 |
| **IV** | **Preliminary & detailed design- Design Review -** Preliminary design- Identification of subsystems, Subsystem specifications, Compatibility. Detailed design of subsystems, component design, Preparation of assembly drawings. Review of product design from point of view of Manufacturing, Ergonomics and aesthetics. | 7 |
| **V** | **Management of New Product – development and Launch -** New Product Management’s Challenges – Maintaining focus, Promotion of Right Culture, Management of Creativity, Top Management attention. Design Team Staffing and Organization. Setting key mile stone, Identification of Risk Areas, Project Execution and Evaluation Product Launch Strategies.  Project Planning – Project Task matrix, estimation of time & resources, project scheduling. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Product Design and Manufacturing, Chital AK and Gupta RC,PHI
2. Product Design and Manufacturing, Ulrich KtandEppinger SD McGraw Hill
3. Product Design and Manufacturing, Lind beck JR, Prentice Hall.
4. Engineering Design Method, Cross, Nigel, John Wiley & Sons.
5. Design for Strength & Production; C.Ritz and F. Koenigsbenger.
6. Human Factors in Engineering and Design; Mark S. Sanders, Ernest J. M.Cormick.
7. Engineering Design, G.E.Deiter.

**AE 402 ALTERNATIVE FUELS AND ENGINE TRIBOLOGYC C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| I | Introduction: estimation of petroleum reserves, need for alternative fuels, availability and properties of alternative fuels. Merits and demerits of alternative fuels.Alcohols: properties of alcohol as SI engine fuel, ethanol and methanol, ethanol- gasoline blends,methanol -gasoline blend, combustion characteristics in the fuel engines, performance and emissioncharacteristics. | 7 |
| II | Compressed natural gas, LPG and biogas, availability of CNG properties, modification required touse in engine- performance and emission characteristics of CNG vehicles SI and CI Engines.Use of LPG in SI engine: performance and emission for LPG.Biogas generation, properties, performance and emission characteristics, storage, handling andsafety aspects, | 7 |
| III | Bio-diesel: different sources of vegetable oils use of straight vegetable oils in engine, -Tran etherification,bio-diesel, bio-diesel properties and standards, biodiesel blends. Engine performanceand emission characteristics with use of biodiesel and its blends, worldwide trends in use of biodiesel.Hydrogen : hydrogen as SI engine fuel, properties combustion characteristics, port injection, timedinjection, direct injection of hydrogen in engines, backfire arrest, performance and emissioncharacteristics, production, storage and handling, safety aspects | 7 |
| IV | Engine Tribology of Fundamentals: function of engine lubrication, fundamental of lubrication regimesof lubrication-hydrodynamic, mixed and boundary lubrication, elasto hydrodynamiclubrication, description of engine components working of each of these regimes. | 7 |
| V | Engine Lubrication System: engine lubrication system and their components, bearing lubrication,lubrication of piston, ring and liners, mechanisms of lubricating oil consumption, method of measuring engine oil consume\ptin, positive crank case ventilation.Cylinder liner and its fitment, characterization and measurement of cylinder liner surface finish, oilfilters- full flow and bypass filters, importance of air filter, wet and dry air filtration. Wear ofdifferent engine parts.Lubricating Oils: classification and service rating of lubricating oils, detailed study of differentproperties of lubricating oils, oil additives, oil drain intervals and used oil analysis, oil coolers. | 7 |
|  | Total | 35 |

**ME 412 OPERATIONS MANAGEMENT C (L, T, P) = 3(3, 0, 0)**

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| **Units** | **Course Contents** | **Hours** |
| **I** | **Operations Management:** An Overview - Systems concepts in Operations Management, Objectives in Operations Management, Operations management Decisions, Productivity concepts and measurement, Types of Production Systems. Aggregate planning and master scheduling Objectives of Aggregate planning Methods, Master Scheduling, Objectives, Master Scheduling Methods. | 7 |
| **II** | **Forecasting Demand:** Forecasting Objectives and uses, Qualities & Quantities methods of Forecasting, Opinion and Judgmental Methods Time Series Methods, Exponential Smoothing, Regression and Correlation Methods, Time Series Analysis,Application and Control of Forecasts.Capacity Planning: Capacity Strategy, aspects of Capacity Planning, Determination of Capacity Requirement, Types of capacity, Evaluation of Alternative plant size, Traditional Economic Analysis, Cost-Volume Profit Analysis. | 7 |
| **III** | Materials Management: Scope of Materials Management, Purchase system and procedure, purpose of Inventories, Classification of inventory, factors effecting inventory, inventory models, probabilistic models, inventory systems classification, selective inventory control, stores management, standardization codification and variety reduction. Material and Capacity Requirements Planning Overview, MRP and CRP, MRP Underlying concepts, system parameters, MRP Logic, CRP Activities. | 7 |
| **IV** | Scheduling and controlling Production Activities: Introduction, PAC Objectives and Date Requirements. Scheduling Strategy and Guidelines., Scheduling Methodology, Priority Control, Capacity Control | 7 |
| **V** | Just in Time (JIT) in manufacturing planning & control. Major-elements, Characteristics of Just in Time System pre-requisite for JIT manufacturing, Elements of Manufacturing, Eliminating Waste, Enforced, Problem Solving and Continuous Improvements, Benefits of JIT Purchasing, The Kanban System JIT implementation in Industries.Bottleneck scheduling and theory of constraints. Issues in choosing manufacturing technologies and strategies: product life cycle, standardization, simplification, diversification, value analysis. | 7 |
|  | **Total** | **35** |

**Reference Books:**

1. Production and Operations Management, Adam Everett E.& Elbert Ronald J., PHI
2. production & Operation Management; S.N.Charry, TMH
3. Manufacturing planning and control systems; Berry W.L.Whybark D.C. VollmanT.E.galgotia Publication Pvt. Ltd.
4. Operations Management: Theory and Problems Monk J.G. McGraw Hill.

**LAB**

**AE 452 AUTO MAINTENANCE LAB C (L, T, P) = 1(0, 0, 2)**

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| 1. Study and practice on service station equipments and their specifications and servicing of vehicles.  2. Study of the faults in the electrical systems such as headlights, side or parking lights, trafficator lights, electric horn, starter and charging system, wind screen wiper.  3. Simple tinkering and soldering works of body panel, study of door lock and window glass rising mechanisms.  4. Adjustment of pedal play in clutch, brake and hand brake lever and steering wheel play; air bleeding from hydraulic brakes and diesel fuel system  5. Wheel bearing, tightening and adjustment.  6. Removal and fitting of tires and tubes.  7. Drawing of general wiring diagram of various vehicles, like mopeds, scooters, motorcycles, cars. |

**AE 454 AUTO RECONDITIONING LAB C (L, T, P) = 1(0, 0, 2)**

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| 1. Study and practice of engine analyzer.  2. study and practice of wheel alignment (Mechanical and computerized) and wheel balancing.  3. Testing of vehicle on chassis dynamometer and models on wind tunnel.  4. Study and practice on  a. Connecting rod alignment  b. Cylinder re-boring machine  c. Valve re-facing machine  d. Brake drum skimming machine  5. Study and practice on  a. Fuel injection pump calibration equipment  b. Nozzle tester  c. Nozzle grinding machine  6. Study of tyre re-treading and vulcanizing.  7. study and practice on body repair- tinkering and painting  8. Heat light focusing test and visibility test  9. experimental study of microprocessors as applied to automobiles |