**VASAVI COLLEGE OF ENGINEERING(AUTONOMOUS)**
**Ibrahimbagh, Hyderabad-31**
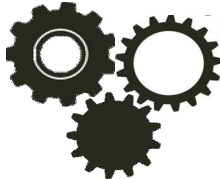
Approved by A.I.C.T.E., New Delhi and
Affiliated to Osmania University, Hyderabad-07

**Sponsored by**
**VASAVI ACADEMY OF EDUCATION**
**Hyderabad**



**STUDENT HAND BOOK**

**Academic Regulations (Autonomous) and Syllabi of**
**THIRD YEAR B.E (MECHANICAL) w.e.f 2016–17**



**DEPARTMENT OF MECHANICAL ENGINEERING**

**+91-40-23146060, 23146061**
**Fax: +91-40-23146090**
**Website: www.vce.ac.in**

**DEPARTMENT VISION**

To nurture and establish global leadership in the field of mechanical engineering and develop competent human resources with values and ethics.

**DEPARTMENT MISSION**

To nurture an environment of research, innovation and knowledge through the latest teaching-learning practices in mechanical engineering.

**PROGRAM EDUCATIONAL OBJECTIVES (PEOS)**

- To have an in-depth technical knowledge in the chosen field of specialization in mechanical engineering

- To demonstrate commitment to solve technical problems and to work in multi-disciplinary teams

- To exhibit the skills to contribute to their organization and make well informed decisions

- To advance professionally through publications in the form of reports and technical papers.

- To have lifelong learning.

# ABOUT THE COLLEGE

**VISION**

*Striving for a symbiosis of technological excellence and human values*

Established in 1981 by Vasavi Academy of Education under the stewardship of Late Sri Pendekanti Venkata Subbaiah, a veteran statesman of independent India and by a few eminent people from different walks of life Vasavi College of Engineering represents a rich tradition of excellence in technology based education in a stimulating environment. From a modest beginning with just three undergraduate programs, viz., B.E. degree programs in Civil, Mechanical and Electronics & Communication Engineering, with dedicated efforts for over **33** years, it has now grown into a mighty center of learning with excellent and well-developed infrastructural facilities, offering 6 undergraduate programs, viz., B.E. in Civil, Mechanical, Electrical & Electronics, Electronics & Communication Engineering, Computer Science & Engineering, and Information Technology, in addition to a 3-year postgraduate program in Computer Applications (MCA), and 2-Year Postgraduate Programmes in CSE, ECE, EEE and Mechanical Engineering.

All the undergraduate (B.E) programs were accredited by National Board of Accreditation (NBA) for the academic years 2013-2015. The college sought fresh approval for NBA accreditation for two eligible PG programs and MCA program. The college has been recognized under 12(B) and 2(f) sections of the University Grants Commission (UGC).

**MISSION**

*To arm the young brains with competitive technology and nurture the holistic development of the individuals for a better tomorrow.*

The college has been granted **autonomy by the University Grants Commission**, New Delhi and Osmania University, Hyderabad for all the programs it offers for a period of six years with effect from 2014-15.

The College has 185 highly qualified and experienced faculty members consisting of Professors, Associate Professors and Assistant Professors and around **158** technical and supporting staff. The college has very good infrastructural facilities which go beyond the curriculum requirements. The college offers value-added courses in GIS, CAD/CAM, DSP, VLSI, Networking, J2EE and communication skills to bridge the gap between the curriculum and the requirements of the Industry. Finishing school has been made part of curriculum from the second year onwards to improve the skills of the students.

A Research & Development (R&D) Cell is established by personnel from industry / research organization to encourage the faculty and the students in acquiring additional qualifications and knowledge.

This Cell also facilitates the faculty for interaction with industry/research organizations in getting sponsored

**QUALITY POLICY**

*Education without quality is like a flower without fragrance. It is our earnest resolve to strive towards high standards of teaching, training and developing human resources.*

research projects. In addition, the college extends consultancy in various fields of engineering and technology. The Center for Counseling and Placement at Vasavi College of Engineering provides personal and career-related support to its students. The educational experience at the college is enlivened and enriched by an array of extra-curricular activities to fulfill the cultural and emotional needs of students.

A good number of ranks in university examinations are secured by our students every year. The all-round development of a student is achieved by exposing him/her to the outside world in a systematic and well planned manner. Just not marks and ranks, but also ethics and morals are incorporated into psyche of a student at Vasavi in a cautious way. This unification of tradition and technology makes Vasavi a place for paradise of learning.

## ACADEMIC RULES AND REGULATIONS
## FOR FOUR YEAR B.E DEGREE COURSE
### w.e.f 2016-17 Academic Year

### 1. RULES OF PROMOTION

**ATTENDANCE:** The *minimum aggregate attendance* percentage for BE program *is 75%*. On medical grounds 65% attendance with valid medical certificate will be considered. A candidate who did not meet above attendance requirements is not eligible to appear for the semester examinations.

*A student is allowed to use medical condonation facility only 4 (four) times in the entire period of 8 semesters in the span of 4 years B.E program.*

### 2. ASSESSMENT AND EVALUATION SYSTEM:

There will be continuous and comprehensive evaluation of students. The distribution of sessional (internal) and semester examination marks for *B.E programme* are given below:

**SESSIONALS EXAMS (internals)**
**Theory: 30 Marks**

- **20** Marks each for two internal examinations in a semester and 10 marks for assignments and quizzes etc together.
- **Average of two tests** will be considered for calculating internal exams marks to which assignment/quiz marks will be added for obtaining total CIE marks.
- Every student should secure a **minimum of 40% aggregate marks in the internal exams.**

**Lab: 25 Marks**

 **15** marks for day-to-day laboratory class work which will be awarded based on the average of all experiments.
- 10 marks for the internal examination.

*SEMESTER EXAMS*

- Semester theory examinations will be conducted for 70 marks. A student should secure a minimum of 40% marks in each subject for a pass.

- Semester laboratory examinations will be conducted for 50 marks. A student should secure a minimum of 50% marks for a pass.

*In addition, a student shall secure a minimum of 40% marks in a theory subject and 50% marks in lab from sessional exams and semester examinations put together for a pass.*

### 3. PROMOTION RULES TO NEXT HIGHER CLASS

| S No | Semester/Class | Conditions to be fulfilled for |
|------|----------------|-------------------------------|
| 1 | From 1/4 BE, I-SEM to 1/4 BE, II-SEM | Regular course of study of 1/4 B.E, I-SEM and 40% aggregate sessional marks in I-SEM |
| 2 | From 1/4 BE, II-SEM to 2/4 BE, I SEM | (a) Regular course of study of 1/4 B.E-II SEM and <br>(b) Must have secured at least 50% of total credits prescribed for 1/4 B.E. |
| 3 | From 2/4 BE, I-SEM to 2/4 BE, II-SEM | Regular course of study of 2/4 BE, I-SEM and 40% aggregate sessional marks in II- SEM |
| 4 | From 2/4 BE, II-SEM to 3/4 BE, I SEM | (a) Regular course of study of 2/4 BE II SEM <br>(b) Must have secured at least 50% of total credits prescribed for 2/4B. E and passed in all the subjects 1/4 B.E. |
| 5 | From 3/4 BE, I-SEM to 3/4 BE, II-SEM | Regular course of study of 3/4 B.E, I-SEM, and 40% aggregate sessional marks in I- SEM |
| 6 | From 3/4 BE, II-SEM to 4/4 BE, I SEM | (a) Regular course of study of 3/4 B.E, II-SEM <br>(b) Must have secured at least 50% of total credits prescribed for 3/4 B.E and passed in all the subjects 2/4 B.E. |
| 7 | From 4/4 BE, I-SEM to 4/4 BE, II-SEM | (a) Regular course of study of 4/4 B.E, I-SEM and 40% aggregate sessional marks in II-SEM |

## VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
### SCHEME OF INSTRUCTION AND EXAMINATION w.e.f 2016-17
### DEPARTMENT OF MECHANICAL ENGINEERING
#### B.E. III YEAR - I-SEMESTER

| SI No. | Syllabus Ref.No. | SUBJECT | Periods per Week | | | | Duration in Hours | Maximum Marks | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | D | P | | SEM Exam | Sessi–onals | |
| | | **THEORY** | | | | | | | | |
| 1 | ME3010 | Dynamics of Machines | 4 | - | - | - | 3 | 70 | 30 | 3 |
| 2 | ME3020 | Design of Machine Elements | 4 | - | - | - | 3 | 70 | 30 | 3 |
| 3 | ME3030 | Manufacturing Processes | 4 | - | - | - | 3 | 70 | 30 | 3 |
| 4 | ME3050 | Hydraulic Machinery & Systems | 4 | - | - | - | 3 | 70 | 30 | 3 |
| 5 | ME3110 | Refrigeration & Air Conditioning | 4 | 1 | - | - | 3 | 70 | 30 | 3 |
| 6 | CE2090 | Environmental Studies | 4 | - | - | - | 3 | 70 | 30 | 3 |
| 7 | HS3110 | Finishing School-III (Soft Skills-III) | 2 | - | - | - | 1½ | 35 | 15 | 1 |
| 8 | ME3120 | Finishing School-III (Technical Skills-III) | 2 | - | - | - | 1½ | 35 | 15 | 1 |
| | | **PRACTICALS** | | | | | | | | |
| 1 | ME3011 | Manufacturing Processes Lab | - | - | - | 3 | 3 | 50 | 25 | 2 |
| 2 | ME3021 | Fluids & Hydraulic Machinery Lab | - | - | - | 3 | 3 | 50 | 25 | 2 |
| | | **TOTAL** | 28 | 1 | | 6 | | 590 | 260 | 24 |
| | | **GRAND TOTAL** | 35 | | | | – | 850 | | |

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### DEPARTMENT OF MECHANICAL ENGINEERING
### SYLLABUS FOR B.E. 3/4 I-SEMESTER
### DYNAMICS OF MACHINES

| Instruction : 4 Periods /week | Sem Exam Marks : 70 | Subject Reference Code : ME 3010 |
|---|---|---|
| Credits : 3 | Sessional Marks: 30 | Duration of Sem Exam : 3 Hrs |

| Course objectives | Course Out comes |
|---|---|
| The objectives of this course are to: | On completion of the course, the student will be able to: |
| 1. **identify** the forces involved in mechanisms and gyroscopic effects in vehicles. | 1. **calculate** the gyroscopic couple and interpret its effect in designing engineering systems. |
| 2. **formulate** equations for rigid body dynamics. | 2. **solve** the rigid body dynamic equations. |
| 3. **interpret** the cause and effects of unbalancing in machines. | 3. **calculate** balancing masses required for rotating and reciprocating components. |
| 4. **relate** forces and torque required to overcome friction in mechanical systems. | 4. **calculate** the forces and torque including friction in mechanical systems. |
| 5. **show** the working principle of governors and flywheels in controlling speed of engines. | 5. **calculate** the operational characteristics in Governor and design of flywheels. |

### UNIT-I
**Static and Dynamic:** Force analysis of 4-bar and slider crank mechanisms. Study of dynamically equivalent system, Inertia forces on connecting rod.
**Gyroscope:** Gyroscopic couple, gyroscopic effects in vehicles.

### UNIT-II
**Introduction to Rigid body dynamics:** Basic concepts in 3-D rigid-body mechanics, Newton-Euler Equations, Formulation of equations of motion for inter-connected bodies

### UNIT-III
**Balancing**
Forces due to rotating shaft carrying several masses in several planes. Rotary balancing on single plane and multiple planes, Shaking forces in single cylinder engine, Partial balancing of reciprocating masses. Balancing of multi cylinder in-line engines, V type engines and Radial engines.

### UNIT-IV
**Friction:** Screw threads, pivots, collars, clutches
**Brakes and Dynamometers:** Block,band,block and band,internally expanding shoe brakes. Prony brake, rope brake, belt transmission, epicyclic gear transmission, torsion dynamometers.

**UNIT-V**

**Governors:** Classification of governors, Watt, Porter, Hartnell and Hartung governors, Controlling Force, Stability, Isochronism, Sensitivity, Power and Effort of governors.

**Flywheels:** Functions, Differences between flywheel and governor. Turning moment diagrams, flywheel analysis for I.C. Engines and Presses.

**Learning Resources:**

1. S.S. Rattan, *"Theory of Machines"*, Tata McGraw Hill, Tata McGraw Education Pvt. Ltd., New Delhi 2010.
2. Thomas Bevan, *"The Theory of Machines"*, CBS Publishers & Distributors, 2004.
3. John J. Uicker, Jr., Gordon R. Pennock, Joseph E. Shigley, *"Theory of Machines and Mechanisms"*, Oxford University Press, 2003.
4. R.L. Norten, *"Kinematics and Dynamics of Machinery"* Tata McGraw Education Pvt. Ltd., New Delhi 2009.
5. Ahmed A Shabana *"Dynamics of multibody systems"*, 4th ed, Cambridge University Press, 2013

**DEPARTMENT OF MECHANICAL ENGINEERING**
**SYLLABUS FOR B.E. 3/4 I-SEMESTER**
**DESIGN OF MACHINE ELEMENTS**

| Instruction : 4 Periods /week | Sem Exam Marks : 70 | Subject Reference Code   : ME 3020 |
|---|---|---|
| Credits        : 3 | Sessional Marks: 30 | Duration of Sem Exam : 3 Hours |

| Course objectives | Course Out comes |
|---|---|
| The objectives of this course are to : | On completion of the course the student will be able to: |
| 1. **understand** the stresses in machine members due to various types of loads and failure of components according to theories of failures. | 1. **select** the proper material for the machine component based on theories of failure and estimate the factor of safety. |
| 2. **analyze** the components under variable loading for infinite and finite life. | 2. **determine** the sizes under different types of fatigue loads and estimate the life of the components. |
| 3. **design** of machine elements under torsion, bending, axial loads and a combination of these. | 3. **calculate** the size of machine elements for transmitting torque, bending moment and axial loads. |
| 4. **design** of various joints and fasteners for a given load to be transmitted. | 4. **identify** the type of joints and fasteners required for a given application. |
| 5. **design** of various screws, rivited and welded joints. | 5. **predict** the type of failure and estimate the efficiency. |

**UNIT-I**

**Design considerations of Machine Elements**. Materials used in machine design and their specifications according to Indian Standards. Codes and standards used in design. Important mechanical properties of materials used in design. Preferred numbers. Manufacturing considerations in design. Review of types of loads and simple stresses. Stresses due to Bi-axial and Tri-axial loads. Factor of safety. Theories of failures. Design of components subjected to impact loading.

**UNIT-II**

**Design for Fatigue:** Fluctuating stresses, fatigue strength and endurance limit, Stress concentration factor and Notch sensitivity. Factors affecting fatigue strength. S-N diagram, Soderberg and Modified Goodman's diagrams for fatigue design. Cumulative fatigue - Miner's rule.

**UNIT-III**

**Design of shafts**: solid, hollow and splined shafts under torsion, bending and axial loads. ASME code for design of shafts. Design of keys. Design of couplings - Muff, Split muff, Flange, Flexible, Marine type couplings. Design of pulleys and chain drives.

## UNIT-IV

Design of Bolts and nuts, locking devices for nuts, bolts of uniform strength, bolted joints under eccentric loads.
Design of Cotter and Knuckle joints.

## UNIT-V

**Design of Screws:** Design of power Screws and screw jack. Differential and Compound Screws.
Design of rivetted and welded joints under direct and eccentric loads.

**Learning Resources:**
1. M.F. Spotts, *"Design of Machine Elements"*, Pearson Edu, 7th ed. 2003.
2. V. B. Bhandari, *"Design of Machine Elements"*, Tata McGraw- Hill Publ, 3rd Edn. 2010.
3. P.C. Sharma & D.K. Aggarwal, *"Machine Design"*, S.K. Kataria & Sons, 10th edn, 2003.
4. J.E. Shigley & Charles R. Mischke *"Mechanical Engineering Design"*, Tata McGraw-Hill., 6th ed. 2010.
5. NC Pandya and CS Shah, *"Machine Design"* , Charotar publishing House

**Online Resources:**
   http://nptel.ac.in/courses/112105124

**DEPARTMENT OF MECHANICAL ENGINEERING**
**SYLLABUS FOR B.E. 3/4 I-SEMESTER**
**MANUFACTURING PROCESSES**

| Instruction : 4 Periods /week | Sem Exam Marks : 70 | Subject Reference Code : ME 3030 |
|---|---|---|
| Credits : 3 | Sessional Marks : 30 | Duration of Sem Exam : 3 Hours |

| Course objectives | Course Out comes |
|---|---|
| The objectives of this course are to: | On completion of the course the student will be able to: |
| 1. **understand** casting process, materials and ingredients used for casting and its design. | 1. **design** riser and gating system to produce required Casting in Sand moulding process |
| 2. **learn** the types of furnaces used for casting, different types of casting processes. | 2. Become **familiar** with Special casting processes and the equipment |
| 3. **explain** principles of Welding processes, Types of welding processes. | 3. **understand** the techniques of solid state and arc welding processes |
| 4. Become **familarized** with special welding processes and welding defects | 4. **choose** welding process for special applications |
| 5. **list** the types of forming processes, unconventional forming processes | 5. **explain** various forming processes. |

## UNIT-I

**Casting Process :** Casting terms, pattern materials, types of patterns, pattern allowances, colour code for patterns, Moulding sands, core sands, properties of moulding sand and its ingredients, different types of moulding machines, Directional solidification, use of chaplets, chills, riser and gating design.

## UNIT-II

**Special Casting Processes:** Shell moulding, Co2 moulding, die casting, centrifugal casting, investment or lost wax process; Casting defects, causes and remedies, Inspection and testing of casting. Furnaces used in foundry-Cupola, Induction and Arc furnace.
Processing of plastics - Extrusion, Injection moulding, Blow moulding and Thermoforming.

## UNIT-III

**Welding Processes:** Solid state welding processes - Friction welding, Forge welding, Explosive welding and ultrasonic welding, Gas welding, Arc welding- SMAW, SAW, GMAW, GTAW, PAW, Atomic hydrogen welding, Welding defects, principle of Soldering and Brazing.

## UNIT-IV
**Special Welding Processes:** Laser beam welding, Electron beam welding, Thermit welding, and Electro slag welding. Resistance welding processes - Spot welding, Projection welding, Seam welding, Butt welding, weldability.

## UNIT-V
**Forming Processes:** Cold & Hot working, Yield criteria, Process description of Forging, Rolling, Extrusion, Wire drawing, Blanking, Piercing, Bending, Deep drawing, Stretch forming, Spinning. Introduction to unconventional forming processes-Explosive forming, Electro-magnetic forming, Electro-hydraulic and rubber pad forming.

## Learning Resources:
1. P.N.Rao, *"Manufacturing Technology,"* Vol. 1, Tata McGraw Hill Publ., 3rd Ed., 2011.
2. Amitabh Ghosh & Mallick, *"Manufacturing Science",* Assoc. East west Press Pvt. Ltd. 4th Ed., 2011.
3. Roy A. Lindberg, *"Materials & Process of Manufacturing",* Prentice Hall of India, 5th Ed.l992.
4. Serope Kalpakjian, *"Manufacturing Engineering and Technology",* Addison, Wesley Publishing Company, 2006
5. George.E. Dieter, *"Mechanical Metallurgy",* McGraw-Hill Book Company, 1988

**DEPARTMENT OF MECHANICAL ENGINEERING**
**SYLLABUS FOR B.E. 3/4 I-SEMESTER**
**HYDRAULIC MACHINERY AND SYSTEMS**

| Instruction : 4 Periods /week | Sem Exam Marks :70 | Subject Reference Code: ME3050 |
|---|---|---|
| Credits : 3 | Sessional Marks : 30 | Duration of Sem Exam :3 Hrs |

| Course Objectives | Course Outcomes |
|---|---|
| The objectives of this course are to: | On completion of the course the student will be able to: |
| 1. **list** the effect of hydrodynamic forces on various types of vanes. | 1. **apply** fundamental knowledge to understand effect of hydrodynamic forces on various types of vanes. |
| 2. **describe** the working of reciprocating pumps and their performance. | 2. **estimate** the performance and draw performance characteristics curves for reciprocating pumps. |
| 3. **analyze** centrifugal pumps and their performance. | 3. **calculate** the performance of the centrifugal pump and draw characteristic curves. |
| 4. **compare** **h**ydroturbines and evaluate their performance. | 4. **design** and **estimate** the efficiency of turbines with study of characteristic curves. |
| 5. **understand** basic concepts of hydraulic circuits and symbolic representation of various components. | 5. use the **knowledge** of different types of fluid control valves and apply to draw hydraulic circuits. |

## UNIT-I
**Hydraulic Machines:** Classification– Impulse momentum equation– Layout of hydraulic power plant – Working principle –
**Impact of jet on vanes** – Force exerted by a jet striking and work done (i) a fixed flat vertical vane held normal to the jet flow (ii) At the centre of a fixed symmetrical curved vane (iii) At one end of fixed symmetrical and unsymmetrical curved vanes (iv) Flat vertical vane moving in the direction of jet (v) A series of flat vertical moving vanes (vi) At the centre of a symmetrical moving curved vane (vii) A symmetrical curved vane moving in the same direction as that of jet at inlet (viii) At one end of an un-symmetrical moving curved vane (ix) Hinged plate

## UNIT-II
**Reciprocating Pumps:** Classification, working principle-single and double acting pumps-discharge, work done and power required to drive the pumps-slip, % slip and negative slip- variation of pressure head in the
Suction and delivery pipes due to acceleration of piston- variation of pressure head due to friction in the suction and delivery pipes
**Indicator diagrams- Ideal and actual diagrams** –Effect of piston acceleration and pipe friction on indicator diagram- Maximum speed at which the pump must run to avoid separation during suction and delivery strokes-Air vessels- Function of air vessels- Work saved by fitting air vessels to single and double acting pumps – Discharge of liquid into and out of air vessels- Performance characteristic curves.

## UNIT-III : Centrifugal pumps:

Classification – Working principle – Comparison over reciprocating pumps – Velocity triangles – Manometric head – Work done per second – Head equivalent of work done – Manometric, mechanical and overall efficiencies – Pressure rise in the impeller – Minimum starting speed – Specific speed – Physical significance of specific speed – Model testing – Conditions of similarity of CF pumps – Priming – Performance characteristic curves – Troubles (operational difficulties), reasons and remedies in CF pumps – Cavitation – Effects of Cavitation – Precautions against Cavitation.

## UNIT-IV: Hydraulic Turbines:

Classification of impulse and reaction turbines – Construction and working of Pelton wheels, Francis turbine and Kaplan turbine – Velocity triangles – Work done (power developed) – Hydraulic, Mechanical and Overall efficiencies – Maximum efficiency – Comparison between Impulse and reaction turbines – Comparison between Francis and Kaplan turbines – Specific speed – Physical significance of specific speed – Unit quantities – Model testing of turbines – Conditions for similarity of turbines – Draft tubes – functions and types of draft tubes – Surge tanks – Functions and types of surge tanks – Performance characteristic curves.

## UNIT-V: Industrial Hydraulics:

Basic components of hydraulic circuits. **Hydraulic oils:** Properties and types of hydraulic oils; **External Pumps:** Working principles of external Pumps - gear, lobe, vane, radial piston and axial piston; **Valves:** Construction details and actuating methods of sliding spool directional control valves. Specification of D.C. valve; working of - flow control, pressure relief, pressure reducing and sequencing valves; **Actuator and hydraulic motor:** Working and construction details of single acting and double acting actuator and hydraulic motor; Symbolic representation of various components; Circuit for control of single & double acting actuators; Regenerative circuit; Speed control methods of actuators: meter-in, meter-out, and bleed off; selection criteria for pumps and actuators.

### Learning Resources:

1. Bansal, R.K., *"A text book of Fluid Mechanics and Hydraulic Machines",* Laxmi Publication (P) Ltd., New Delhi, 2010
2. Modi, P.N., and Seth, S.M., *"Hydraulic and Fluid Machines",* Standard Book House, New Delhi, 2004
3. Ramamrutham, S.R Narayan, *"Hydraulics, Fluid Mechanics and Fluid machines",* Dhanpat Rai & Sons, New Delhi, 2006
4. Kumar, K.L., *"Engineering Fluid Mechanics",* S. Chand Limited, New Delhi, 2008
5. Majumdar, S.R., *"Oil Hydraulic Systems – Principles and Maintenance",* Tata McGraw Hill, 2004

**DEPARTMENT OF MECHANICAL ENGINEERING**
**SYLLABUS FOR B.E. 3/4 I-SEMESTER**
**REFRIGERATION & AIR CONDITIONING**

| Instruction : 4+1 Periods /week | Sem Exam Marks : 70 | Subject Reference Code: ME 3110 |
|---|---|---|
| Credits : 3 | Sessional Marks : 30 | Duration of Sem Exam : 3 Hrs |

| Course objectives | Course Out comes |
|---|---|
| The objectives of this course are to : | On completion of the course the student will be able to: |
| 1. **discuss** basics of refrigeration and air conditioning, compare the properties of refrigerants and analyze the air refrigeration& air craft refrigeration systems | 1. **classify** refrigerants and analyze the performance of air refrigeration and air craft refrigeration systems. |
| 2. **explain** the working of single stage and multistage vapour compression refrigeration systems. | 2. **solve** problems in vapour compression refrigeration systems and evaluate their performance. |
| 3. **describe** the working of vapour absorption refrigeration system, steam jet refrigeration system, pulse tube refrigeration system, thermoelectric refrigeration system and solar refrigeration systems. | 3. **compare** VAR and VCR systems and **express** working principles various refrigeration systems. |
| 4. **describe** various principles of psychrometry | 4. **define** different properties of psychrometry and list different air conditioning systems. |
| 5. **estimate** the cooling loads of an air conditioned building, list different equipment used in air conditioning plant and learn different applications of R&A/C. | 5. **compute** cooling loads of an a/c building, identify different equipment used and explain different applications of Refrigeration and Air conditioning systems. |

## UNIT – I

**Introduction to Refrigeration:** Definition of Refrigeration and Air–conditioning –Necessity of Refrigeration and its applications – Methods of Refrigeration, unit of Refrigeration and COP. Reversed Carnot cycle – limitations, effect of operating temperatures

**Properties of Refrigerants:** Classification of Refrigerants Refrigerant Nomenclature Desirable properties of Refrigerants – Thermodynamic, Chemical and Physical properties. Alternative Refrigerants to HCFC refrigerants and Future refrigerants.

**Aircraft refrigeration System:** Analysis of Bell Colemen cycle / reversed Brayton cycle, open and dense air system. Application to aircraft refrigeration, simple cooling system, bootstrap simple evaporative system, regenerative cooling system and reduced ambient cooling system

## UNIT – II

**Vapor Compression Refrigeration System:** Working principle and essential component of a simple vapour compression refrigerator cycle, compressor, condenser, evaporator and expansion devices. Analysis of the cycle, COP, Representation of the cycle on T –S, P– H Charts.

Dry and wet compression, effect of operating conditions like evaporating pressure, condenser pressure, liquid sub cooling and vapour super heating performance of the system.

Applications of VCR system: Domestic Refrigerator and water cooler.
Low temperature refrigeration system (with single load system) – compound compression with water inter cooler and flash inter cooler with single expansion valve. Cascade refrigeration system – analysis, advantages and applications.

## UNIT – III

**Vapour absorption Refrigeration system:** Simple absorption system, COP, practical Ammonia refrigeration absorption system, Lithium Bromide absorption system, Electrolux Refrigerator, common refrigerant and absorbents properties. Comparison with vapour compression refrigeration system.

Working principle, advantages and applications of Steam Jet Refrigeration System, Thermoelectric refrigeration system, pulse tube refrigeration system and solar refrigeration system

**Introduction to Cryogenics:** Linde system and Claude system, applications of cryogenics.

## UNIT –IV

**Psychrometry:** Psychrometric properties, Psychrometric chart and its construction and representation of Psychrometric processes on the chart – heating & cooling with humidification and dehumidification and adiabatic dehumidification, adiabatic chemical dehumidification and mixing processes, types and working of psychrometers.

**Introduction to Air conditioning:** Requirement of comfort air conditioning, Thermodynamics of human body, body temperature, metabolism, body defense, effect of heat on performance, ASHRE comfort chart, effective temperature.

## UNIT – V

**Cooling load calculations for building air conditioning:**
Different sources of heat: Heat flow due to conduction, sun load due to direct solar radiation, load from occupants, equipment load, infiltration air load and miscellaneous heat sources, fresh air load, Energy conservation for building air conditioning.

**Design of Air conditioning system**: All fresh air load, Re-circulated air, Re circulated air with Reheat coil and Re circulated air used for heating the air coming out of conditioner.

Concept of by-pass factor, sensible heat factor, Apparatus Dew Point, Room Sensible Heat Factor (RSHF), Gross Sensible Heat Factor (GSHF).

**Air conditioning systems and Equipment:** Window/Split air conditioner, packaged air conditioner and central air conditioning system. Humidifiers, Dehumidifiers, filters, grills fans and blowers.

**Learning Resources:**

1. Stocker W.S., Refrigeration & Air Conditioning, McGraw Hill, New Delhi, 2004.
2. Roy J.Dossat, Principles of Refrigeration SI Version, Wiley Easten Limited, New Delhi
3. Arora C.P. Refrigeration and Air Conditioning, Tata McGraw Hill, New Delhi, 2004
4. Arora S.C. and Domkundwar S., A course in refrigeration and air conditioning, Dhanpat Rai and sons, 2004.
5. Manohar Prasad., Refrigeration and Air conditioning, New Age International publishers, New Delhi
6. Dr.S.S.Banwait & Dr.S.C.Laroiya., Birla's Properties of Refrigerant &Psychrometric Tables &charts in S.I. Units. (DATA BOOK)

**Online Resources:**

Prof Ramgopal, IIT Kharagpur ., Web and Video material of NPTEL

**DEPARTMENT OF MECHANICAL ENGINEERING**
**SYLLABUS FOR B.E. 3/4 I-SEMESTER**
**ENVIRONMENTAL STUDIES**

| Instruction :4 Periods /week | Sem Exam Marks :70 | Subject Reference Code : CE 2090 |
|---|---|---|
| Credits : 3 | Sessional Marks :30 | Duration of Sem Exam :3 Hrs. |

| COURSE OBJECTIVES | COURSE OUTCOMES |
|---|---|
| *In this subject the students will* | *Upon the completion of this course students will be able to* |
| 1. Describe various types of natural resources available on the earth surface.<br>2. Explain the concepts, energy flow in ecosystem along with the biotic and abiotic components of various aquatic ecosystems.<br>3. Identify the values, threats of biodiversity, endangered and endemic species of India along with the conservation of biodiversity.<br>4. Explain the causes, effects and control measures of various types of pollutions and environmental protection acts.<br>5. Describe the methods for water conservation, the causes, effects of global warming, climate change, acid rain, ozone layer depletion, various types of disasters and their mitigation measures. | 1. Describe the various types of natural resources.<br>2. Differentiate between various biotic and abiotic components of ecosystem.<br>3. Examine the values, threats of biodiversity, the methods of conservation, endangered and endemic species of India.<br>4. Illustrate causes, effects, control measures of various types of environmental pollutions and environmental protection acts.<br>5. Explain the causes, effects of climate change, global warming, acid rain and ozone layer depletion, various types of disasters and their mitigation measures and list the methods of water conservation and watershed management. |

**UNIT-I :**
**Environmental Studies:** Definition, scope and importance, need for public awareness. Natural resources: Water resources; floods, drought, conflicts over water, dams-benefits and problems. Effects of modern agriculture, fertilizer-pesticide problems, water logging salinity. Energy resources, growing energy needs, renewable and non-renewable energy sources. Land Resources, land as a resource, land degradation, soil erosion and desertification.

**UNIT-II :**
**Ecosystems:** Concepts of an ecosystem, structure and functions of an ecosystem, producers, consumers and decomposers, energy flow in ecosystem, food chains, ecological pyramids, aquatic ecosystem (ponds, oceans, estuaries).

**UNIT-III :**
**Biodiversity:** Genetic species and ecosystem diversity. Value of biodiversity, threats to biodiversity, endangered and endemic species of India, conservation of biodiversity.

**UNIT-IV :**
**Environmental Pollution:** Causes, effects and control measures of air pollution, water pollution, soil pollutions, noise pollution, thermal pollution and solid waste & e-waste management.
**Environment Protection Act:** Air, water, forest and wild life acts.

**UNIT-V :**
**Social Aspects and the Environment:** Water conservation, watershed management, and environmental ethics. Climate change, global warming, acid, rain, ozone layer depletion. EIA, population explosion.
**Disaster Management:** Types of disasters, impact of disasters on environment, infrastructure, and development. Basic principles of disaster mitigation, disaster management, and methodology, disaster management cycle, and disaster management in India.

**Learning Resources :**
1. Deswal S. and Deswal A., *A Basic Course on Environmental studies*, Dhanpat Rai & Co Pvt. Ltd. 2004.
2. Benny Joseph, *Environmental Studies*, Tata McGraw-Hill, 2005.
3. Suresh K. Dhameja, *Environmental Studies*, S.K. Kataria & Sons, 2010.
4. De A.K., *Environmental Chemistry*, New Age International, 2003.
5. Odum E.P., *Fundamentals of Ecology*, W.B. Sunders Co., USA, 2004.
6. Sharma V.K., *Disaster Management*, National Centre for Disaster Management, IIPE, Delhi, 1999.
7. Rajagopalan R., *Environmental Studies*, Second Edition, Oxford University Pr 2013.

**DEPARTMENT OF MECHANICAL ENGINEERING**
**SYLLABUS FOR B.E. 3/4 I-SEMESTER**
**FINISHING SCHOOL-III: SOFT SKILLS**

| Instruction : 2 Periods/ week | Sem. Exam Marks: 35 | Subject Ref. Code: HS 3110 |
|---|---|---|
| Credits    :1 | Sessional Marks: 15 | Duration of Sem. Exam : 1.5 Hrs. |

| Course Objective: | Course Outcomes |
|---|---|
| This is a foundation course and aims at enhancing employability skills in students. Students will be introduced to higher order thinking skills and problem solving on the following areas - Arithmetic ability, Numerical ability and General reasoning. Students will be trained to work systematically with speed and accuracy while problem solving.<br>The three major areas covered in this course include<br>1. Numerical Ability<br>2. Arithmetic Ability<br>3. General reasoning | **At the end of the course students will be able to:**<br>• Solve questions on the above mentioned areas using short cuts and smart methods<br>• Understand the fundamentals concepts of Aptitude skills<br>• Perform calculations with speed and accuracy |

## UNIT – I : QUANTITATIVE APTITUDE - NUMERICAL ABILITY

- Numerical Ability
- Introduction to higher order thinking skills
- Speed Maths
- Number systems
- LCM & HCF

## UNIT – II: QUANTITATIVE APTITUDE- ARITHMETIC ABILITY FOUNDATION

- Arithmetic Ability
- Percentage
- Profit loss and discounts
- Ratio proportions Allegations and mixtures
- Averages

## UNIT – III: QUANTITATIVE APTITUDE- ARITHMETIC ABILITY ADVANCED

- Arithmetic Ability
- Time speed and distance
- Time and work
- Interest calculations

## UNIT – IV: REASONING ABILITY – GENERAL REASONING PART 1

- General Reasoning
- Coding decoding
- Directions
- Series completions

## UNIT – V: REASONING ABILITY- GENERAL REASONING PART 2

- General Reasoning
- Analogies
- Classification
- Alphabet test
- Mathematical operations

**DEPARTMENT OF MECHANICAL ENGINEERING**
**SYLLABUS FOR B.E. 3/4 I-SEMESTER**
**FINISHING SCHOOL-III: TECHINCAL SKILLS**

| Instruction : 2 Periods/ week | Sem. Exam Marks: 35 | Subject Ref. Code: HS 3120 |
|---|---|---|
| Credits    :1 | Sessional Marks: 15 | Duration of Sem. Exam : 1.5 Hrs. |

| COURSE OBJECTIVES | COURSE OUTCOMES |
|---|---|
| The objectives of this course are to:<br>1. **identify** MATLAB as a calculator<br>2. **apply** MATLAB for solving matrices<br>3. **formulate** script files and plots using MATLAB<br>4. **develop** logical statements and 3D plots using MATLAB<br>5. **examine** solution of differential equations using MATLAB | On completion of this course, students will be able to:<br>1. **use** MATLAB as a calculator<br>2. **perform** matrix operations using MATLAB<br>3. **generate** 2D plots using MATLAB<br>4. **apply** syntax for logical operations using MATLAB<br>5. **solve** differential equations using MATLAB |

## UNIT –I

Starting MATLAB, MATLAB Windows., Working in Command Windows, Working with Arthematic operations with scalars, order of preference, using MATLAB as a calculator, Display of formats, Elementary Math-building functions, Assignment operators, rules about variables, Examples of MATLAB applications, Problems.

**UNIT-II**
Creating Arrays and matrices, matrix operations, Examples of Applications.

## Unit III

Script files, Creating, saving and running a script file, Global variables, input and output commands. 2D plots, Plots with special graphics, Multiple plots, examples. Creating a function file., runnning function file., feval command.., examples and mathematical applications.

## Unit IV

Progamming in Mat lab, conditional statements, loops, nested loops, Examples, Polynomials, curve fitting and interpolation, Examples and Applications, 3D plots, line plots, mesh and surface plots, plots with special graphics., view command, Examples.

## Unit V

Differentiation and integration, Solving ordinary Equations with one variable, Finding minimum and maximum of a function, Numerical integrtion, solving Ordinary differential equations, Non-linear equations.

**Learning Resources:**
1. Agam Kumar Tyagl, *"MATLAB and Simulink for Engineers"*, Oxford Higher Education, 2010
2. Rudra Pratap, *" Getting started with MATLAB"*, Oxford University Press, 2010

**DEPARTMENT OF MECHANICAL ENGINEERING**
**SYLLABUS FOR B.E. 3/4 I-SEMESTER**
**MANUFACTURING PROCESSES LAB**

| Instruction : 3 Periods /week | Semester End Exam Marks : 50 | Subject Ref. Code: ME 3011 |
|---|---|---|
| Credits : 2 | Sessional Marks: 25 | Duration of Sem. Exam : 3 Hrs |

| Course Objectives | Course Outcomes |
|---|---|
| The objectives of this course are to: | On completion of the course the student will be able to: |
| 1. **design** and manufacturing of sand castings and to study defects of casting. | 1. test sand properties, make gating system and prepare mould for sand casting. |
| 2. **understand** welding principles, types of welding methods and welding defects. | 2. join materials using different welding techniques, study of welding properties and defects. |
| 3. **study** different forming processes | 3. manufacture components using drawing, blanking, piercing and injection moulding operations. |

**Foundry**
1. Single piece pattern making with wood as material considering allowances (Draft, Shrinkage and Machining)
2. Green sand mould making processes with complete sprues, gates, riser with design.
3. Testing of green sand properties
4. Melting and casting of aluminum metal and Study of defects in castings by DP test

**Welding**
1. Identification of different types of flames and making a butt joint with gas welding.
2. Making a lap joint by resistance welding process and strength evaluation.
3. Analysis of bead geometry using AC and DC welding processes.
4. Demo of TIG and MIG welding processes.
5. Exercise on submerged arc welding.

**Forming**
1. Evaluation of formability using Erichsen cupping test.
2. Design study of simple dies and performing blanking and piercing operations using mechanical/ fly presses and measurement of forces in the operation and comparing with the theoretical loads.
3. Study of simple, compound and progressive dies and making simple components.
4. Evaluation of process variables in injection moulding.

***Note***: Minimum twelve experiments to be completed.

## DEPARTMENT OF MECHANICAL ENGINEERING
## SYLLABUS FOR B.E. 3/4 I-SEMESTER
## FLUIDS & HYDRAULIC MACHINERY LAB

| Instruction : 3 Periods /week | Semester End Exam Marks : 50 | Subject Ref. Code: ME 3021 |
|---|---|---|
| Credits : 2 | Sessional Marks: : 25 | Duration of Sem. Exam : 3 Hrs |

| Course Objectives | Course Outcomes |
|---|---|
| The objectives of this course are to: <br> 1. provide practical **knowledge** in verification of principles of fluid flow . <br> 2. impart **knowledge** in measuring pressure, discharge and velocity of fluid flow . <br> 3. **understand** frictional losses in pipes . <br> 4. gain **knowledge** in performance testing of Hydraulic Turbines and Hydraulic Pumps . | On completion of the course the student will be able to:: <br> 1. **identify** the regims of flow. <br> 2. **utilize** basic measurement techniques of fluid mechanics. <br> 3. **estimate** the frictional losses in pipe flow. <br> 4. **analyse** performance of turbines and pumps at different speeds and heads. |

1. Determination of type of flow by Reynolds apparatus.
2. Verification of Bernoulli's Equation for an incompressible flow.
3. Determination of discharge coefficient of venturimeter
4. Determination of discharge coefficient of orificemeter.
5. To study the head loss due to friction in pipe flow and determination of friction factor in pipe flow-Major losses.
6. Performance and characteristics curves of centrifugal pump at different speeds.
7. Performance and characteristics curves of self priming pump.
8. Performance and characteristics curves of reciprocating pump.
9. Performance and characteristics curves of gear pump.
10. Determination of impact coefficient of jet on given vane.
11. Performance and characteristic curves of pelton wheel.
12. Performance and characteristic curves of Francis Turbine.
13. Performance and characteristic curves of Kaplan turbine.
14. Study of Pneumatic circuits.

***Note***: Minimum twelve experiments to be completed.

| SI No. | Syllabus Ref.No. | SUBJECT | Scheme of Instruction Periods per Week | | | | Scheme of Examination Duration in Hours | Maximum Marks | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | D | P | | SEM Exam | Sessi–onals | |
| **THEORY** | | | | | | | | | | |
| 1 | ME3060 | Machine Design | 4 | 1 | - | - | 3 | 70 | 30 | 3 |
| 2 | ME3070 | Mechanical Vibrations | 4 | - | - | - | 3 | 70 | 30 | 3 |
| 3 | ME3080 | CAD/CAM | 4 | - | - | - | 3 | 70 | 30 | 3 |
| 4 | ME3090 | Machine Tools & Metal Cutting | 4 | - | - | - | 3 | 70 | 30 | 3 |
| 5 | ME3100 | Heat Transfer | 4 | 1 | - | - | 3 | 70 | 30 | 3 |
| 6 | HS3140 | Human Values and Professional Ethics-II | 2 | - | - | - | 3 | 70 | 30 | 1 |
| 7 | HS3210 | Finishing School-IV (Soft Skills-IV) | 2 | - | - | - | 1½ | 35 | 15 | 1 |
| 8 | IT2180 | Finishing School-IV (Technical Skills-IV) | 2 | - | - | - | 1½ | 35 | 15 | 1 |
| **PRACTICALS** | | | | | | | | | | |
| 1 | ME3031 | Dynamics of Machines Lab | - | - | - | 3 | 3 | 50 | 25 | 2 |
| 2 | ME3041 | CAD/CAM Lab | - | - | - | 3 | 3 | 50 | 25 | 2 |
| 3 | ME3051 | Machine Tools & Metal Cutting Lab | - | - | - | 3 | 3 | 50 | 25 | 2 |
| | | Total | 26 | 2 | | 9 | | 640 | 285 | 24 |
| | | GRAND TOTAL | 37 | | | | - | 925 | | |

## DEPARTMENT OF MECHANICAL ENGINEERING
## SYLLABUS FOR B.E. 3/4 II-SEMESTER
## MACHINE DESIGN

| Instruction : 4+1T Periods /week | Sem. Exam Marks : 70 | Subject Reference Code : ME 3060 |
|---|---|---|
| Credits : 3 | Sessional Marks: 30 | Duration of Sem. Exam : 3 Hours |

| Course objectives | Course Out comes |
|---|---|
| The objectives of this course are to:<br>1. **understand** the concepts of springs and their design.<br>2. **design** of gears under static and dynamic loads.<br>3. **design** of sliding and rolling contact bearings.<br>4. **design** the main components of IC-Engine.<br>5. **understand** the **concepts** of curved beams. | On completion of the course the student will be able to:<br>1. **design** helical and leaf springs.<br>2. **analyse** spur, helical, bevel and worm gears under strength and wear considerations.<br>3. **select** sliding and rolling contact bearings using Data books.<br>4. **estimate** the failure of IC engine parts under tortion and bending.<br>5. **design** of machine frames, crane hook, C-frames and channels. |

### UNIT – I
**Mechanical Springs:** Types of springs and Materials used. Design of Helical Springs based on stress, deflection and energy considerations. Concentric springs. Leaf springs: Stresses and deflection. Nipping of leaf springs.

### UNIT – II
**Gears:** Types of gears and materials used. Standards for gear specifications. Design of spur, helical, bevel and worm gears – strength and wear considerations. Types of failure of gear tooth and preventive measures.

### UNIT – III
**Bearings:** Materials used for Bearings, Classification of bearings. Viscosity of Lubricants. Theory of Hydrostatic and Hydrodynamic lubrication. Design of sliding contact bearings – for axial and thrust loads.

**Rolling Contact Bearings:** Different types of rolling element bearings and their constructional details. Static dynamic load carrying capacity, Load– life relationship, Design for cyclic loads, Selection of bearings using data book.

### UNIT– IV
**I.C. Engine Parts:** Design of piston, connecting rod and crank shafts (single throw and overhang).

### UNIT – V
Bending of members with initial curvature – rectangular, circular and trapezoidal sections. Design of crane Hooks, machine frames and C- clamps.

**Note:** Use of PSG design data book is permitted.

**Learning Resources:**
1. M.F. Spotts, Design of Machine Elements, pearson Edu, 7th ed. 2003
2. V.B. Bhandari, Machine Design, tata MCGraw– Hills Publications, 2010
3. P.C. Sharma & D.K. Aggarwal, Machine Design, S.K. Kataria & sons, 10th ed, 2003
4. J.E. Shigley, C.R. Mischke, Mechanical Engineering Design, Tata McGraw Hill Publications, 6th ed. 2003.
5. NC Pandya and CS Shah, "Machine Design" Charotar publishing House, 2005

**Design Data Book:**
Data book of engineers by PSG college-Kalaikathir Achchagam, Coimbatore

## DEPARTMENT OF MECHANICAL ENGINEERING
## SYLLABUS FOR B.E. 3/4 II-SEMESTER
## MECHANICAL VIBRATIONS

| | | |
|---|---|---|
| Instruction : 4 Periods /week | Sem. Exam Marks : 70 | Subject Reference Code : ME 3070 |
| Credits : 3 | Sessional Marks: 30 | Duration of Sem Exam : 3 Hrs |

| Course objectives | Course Out comes |
|---|---|
| The objectives of this course are to:<br>1) **formulate** mathematical models of problems in vibrations using Newton's second law and energy principles.<br>2) **determine** a complete solution to mechanical vibration problems using mathematical or numerical techniques for 2 D problems.<br>3) **determine** physical and vibration charecteristics of multi DOF systems.<br>4) **analyse** the continuous system vibration.<br>5) **understand** the importance of Vibration testing and testing devices. | On completion of the course, the student will be able to:<br>1) **construct** the equations of motion and solve for the motion and natural frequency.<br>2) **construct** the governing differential equation and its solution for a vibrating mass in a 2D system.<br>3) **solve** for the motion and the natural frequency for vibration of a multi degree of freedom damped or undamped system.<br>4) **solve** vibration problems that contain continuous systems.<br>5) **appreciate** the vibration measurement devices and their applications and procedures. |

### Unit-I: Introduction
Relevance of and need for vibrational analysis – Basics of SHM - Mathematical modelling of vibrating systems - Discrete and continuous systems - single-degree freedom systems - free and forced vibrations, damped and undamped systems.

### Unit-II: Two Degree freedom Systems
General solution to free vibration problem - damped free vibration - Forced vibration of undamped system - dynamic vibration absorbers.

### Unit-III: Multi Degree freedom Systems
Free and forced vibrations of multi-degree freedom systems in longitudinal, torsional and lateral modes - Matrix methods of solution-normal modes - Orthogonality principle-Energy methods, Eigen values and Eigen vectors

### Unit-IV: Continuous Systems
Torsional vibrations - Longitudinal vibration of rods - transverse vibrations of beams - Governing equations of motion - Natural frequencies and normal modes - Energy methods, Introduction to non linear and random vibrations.

### Unit-V: Vibration Measurement
Vibration monitoring - data acquistion - Vibration Parameter Selection- Vibration sensors-Accelerometers - Performance characteristics – Sensor mounting - Signal pre-amplification -Types of preamplifiers - Instrumentation - Real time analysis - Digital Fourier transforms - FFT Analysis.

### Learning Resources:
1. J.S.Rao and K.Gupta, "Introductory Course on Theory and practice of Mechanical Vibrations ", Wiley Eastern Ltd., 1991.
2. SS Rao, " Mechanical Vibrations ",
3. J.P.Den Hartog, " Mechanical Vibrations ", (4th Edition) McGraw Hill, New York, 1985.
4. L.Meirovitch, " Elements of vibration Analysis ", (2nd Ed) McGraw Hill, New York, 1985.
6. K.T. Thomson, "Mechanical Vibrations", John Wiley & Sons, 1993

### Online Resources:
http://nptel.ac.in/courses/

# DEPARTMENT OF MECHANICAL ENGINEERING
## SYLLABUS FOR B.E. 3/4 II-SEMESTER
### CAD / CAM

| Instruction : 4 Periods /week | Sem. Exam Marks : 70 | Subject Reference Code: ME 3080 |
|---|---|---|
| Credits : 3 | Sessional Marks: 30 | Duration of Sem Exam : 3 Hrs |

| Course objectives | Course Out comes |
|---|---|
| The objectives of this course are to : <br> 1. **analyze** different types of modelling techniques <br> 2. **learn** different types 2D transformations <br> 3. **understand** different types of Numerical Control machines <br> 4. **learn** parts classification and coding system, process planning and flexible manufacturing system <br> 5. **discuss** GT, CAPP, FMS and CIM | On completion of the course the student will be able to: <br> 1. **compare** the different types of modeling techniques and explain the central role solid models play in the successful completion of CAD/CAM-based product development. <br> 2. **develop** transformations for 2D geometric modeling. <br> 3. **explain** the basic concepts of CNC machines and their programming. <br> 4. **explain** the importance of group technology, computer aided process planning, flexible manufacturing system. <br> 5. **understand** the latest technologies in computer aided manufacturing. |

## UNIT – I
**Introduction to computer aided design and manufacturing.**
**Geometric modeling:** Wire frame modeling: wire frame entities and their definitions. Interpolation and approximation of curves. Concept of parametric and non–parametric representation of circle and helix curves,
**Synthetic Curves:** Parametric representation of cubic spline, Bezier and B– spline curves, continuity, properties and characteristics of splines. Concepts of NURBS.

## UNIT – II
**Surface modeling:** Analytical surfaces: Definitions of planar, surface of revolution, Tabulated cylinder. Synthetic surfaces: Cubic and Bezier surfaces.
**Solid modeling: C**– rep and B– rep and feature instancing approaches.
**2D Transformation and their mathematics:** Translation, scaling, rotation, shearing and reflection about arbitrary points. Concatenated transformations.

**CAD Database and Data exchange:** CAD Database and structure, IGES and PDES format.

## UNIT – III
**Numerical Control of Machine Tools:** Features and elements of NC. Positional, paraxial and contouring types. Definitions of axes, Definitions of interpolation, post– processor, preparatory and miscellaneous functions, canned cycles, tool length and cutter radius compensation. CNC programming using G and M codes for simple turning and milling operations.

## UNIT –IV
**Computer Numerical Control:** CNC, DNC and adaptive control systems. Typical configurations and relative features. Machining centers, Introduction to FANUC, SINUMERIC controllers.
**Industrial Robots:** Robot Anatomy, Configurations, Controls, Drivers, Programming methods and applications.

## UNIT – V
**Group Technology:** Part families, layout, parts classification and coding system. Opitz, MICLASS CODE system
**Computer Aided Process Planning:** Variant and Generative process planning.
**Flexible Manufacturing System & Computer Integrated Manufacturing System:** Building blocks of Flexible Manufacturing systems and their control, Elements of CIMS. CAD/CAM Integration, Introduction to 3D printing and Reverse Engineering.

**Learning Resources:**
1. Arvid R. Eide, Roland D. Jenison, Lane H. Mashaw, larry L. Northup, "Introduction to Engineering Design" MCGraw– Hill, 1998.
2. Ibrahim Zeid. CAD/CAM, Theory and Practice, McGraw Hill Inc. New York, 2011.
3. Grover, MP and Zimmers E.W., CAD/CAM, Prentice Hall of India, 1989.
4. Rao P.N., CAD/CAM: Principles and Applications, 2nd Edition, Tata McGraw Hill, New Delhi, 2004.
5. Yoram Koren, Computer Control of Manufacturing Systems, McGraw Hill Inc. New York, 1994

## DEPARTMENT OF MECHANICAL ENGINEERING
## SYLLABUS FOR B.E. 3/4 II-SEMESTER
## MACHINE TOOLS & METAL CUTTING

| | | |
|---|---|---|
| Instruction : 4 Periods /week | Semester End Exam Marks : 70 | Subject Ref. Code : ME 3090 |
| Credits : 3 | Sessional Marks : 30 | Duration of Sem. Exam : 3 Hrs |

| Course objectives | Course Out comes |
|---|---|
| The objectives of this course are to: | On completion of the course the student will be able to: |
| 1. **discuss** construction of various machine tools and their variants. | 1. **classify** different types of machine tools used in the industry. |
| 2. **explain** the working of milling machines and their application to gears and screws. | 2. **manufacture** gears and screws and various finishing operations. |
| 3. **describe** and understand various non-conventional machining methods and various work holding methods. | 3. **understand** the various work holding devices and non-conventional machining methods. |
| 4. **understand** the fundamentals of metal cutting with emphasis on tool materials and forces. | 4. **compute** forces in machining operations and **apply** them for **analysis.** |
| 5. **analyze** the wear of the tool and its effect on machining, influence of temperature in metal cutting and economics machining. | 5. **understand** and **appreciate** the use of coolants and effect of temperatures in metal cutting |

### UNIT-I
**MACHINE TOOLS:** Constructional features and specifications of machine tools, Kinematic structure of lathe, types of lathes, capstan and turret lathes, Drilling and Boring machines and various operations with applications, tool and work holding devices. Differences between shaper, planer and slotter, Quick return mechanisms.

### UNIT-II
**MILLING:** Fundamentals of Milling operation and types of milling, dividing head and Indexing methods.
**SCREWS AND GEAR MANUFACTURING:** Tapping, Chasers, Thread rolling, Thread milling, thread grinding, Gear shaping, Gear hobbing, Gear shaving and Grinding.

**SURFACE FINISHING:** Units of surface finish, types of grinding, Abrasives and bonds used for grinding wheels, specifications and selection of grinding wheels. Broaching, Lapping, Honing, Polishing, Buffing Super finishing and Burnishing.

### UNIT-III
**JIGS AND FIXTURES:** Design principles for location and clamping. Quick clamping devices, Types of Jigs and Fixtures.
**NON-TRADITIONAL MACHINING:** Principles of working and applications of USM, AJM, EDM, ECM, LBM, and EBM (Mechanism, MRR and process parameters in each case).

### UNIT-IV
**CUTTING TOOL MATERIALS:** High carbon steel, HSS, Stellites, Carbides, Coated carbides, Diamonds. Tools material properties.
**TOOL GEOMETRY:** Nomenclature of single point cutting tool by ASA and ORS systems. Geometry of drills, milling cutters.
**CHIP FORMATION:** Types of chips, BUE, chip breakers.
**MACHINING:** Orthogonal and Oblique cutting, Mechanics of metal cutting, Merchant analysis, Shear angle, Solutions of Merchant and Lee & Shafer.

### UNIT-V
**THERMAL ASPECTS OF METAL CUTTING:** Sources of heat generation and heat distribution, various methods of temperature measurement, Cutting fluids and applications.
**TOOL WEAR, TOOL LIFE AND MACHINABILITY:** Types of wear, mechanism of tool wear, Tool life and Machinability, Machinability index, Taylor's tool life equation.
**ECONOMICS OF MACHINING:** Tool life for maximum production, minimum cost.

### Learning Resources:
1. B.L. JuneJa and Shekon, "Fundamentals of Metal Cutting & Machines Tools", Wiley Eastern Ltd. 1987.
2. P.N. Rao, "Manufacturing Technology – Metal Cutting & Machine Tools", Vol. 2, Tata McGraw Hill Education Pvt. Ltd, 2010.
3. Amitab Ghosh and Mallick, "Manufacturing Science", Affiliated East West Press 1985.
5. P.C, Pandey & Shan HS, "Modern Machining Process", Tata McGraw-Hill Education 1980.
6. A. Bhattacraryya, "Metal Cutting Theory and Practice" New Central Book Agency (P) Ltd., Calcutta, 1996

### DEPARTMENT OF MECHANICAL ENGINEERING
### SYLLABUS FOR B.E. 3/4 II-SEMESTER
### HEAT TRANSFER

| Instruction : 4+1T Periods /week | Sem. Exam Marks : 70 | Subject Ref. Code : ME 3100 |
|---|---|---|
| Credits : 3 | Sessional Marks : 30 | Duration of Sem. Exam : 3 Hrs |

| Course Objectives: | Course Outcomes: |
|---|---|
| The objectives of this course are to : <br> 1. **make** the students familiar with basic principles of heat transmission by conduction, convection, and radiation. <br> 2. teach students how to **identify**, **formulate**, and **solve** engineering problems involving conduction, convection, and radiation. <br> 3. teach students how to **apply** energy balances and rate equations to model and **analyze** thermal systems. <br> 4. teach students basic heat exchanger **design** and **evaluation** techniques and principles of boiling and condensation | On completion of the course the student will be able to: <br> 1. **formulate** heat conduction problems in rectangular, cylindrical and spherical coordinate system, by transforming the physical system into a mathematical model. <br> 2. **familiarize** with time dependent heat transfer. <br> 3. **compute** convective heat transfer coefficients in forced convection, natural convection for internal flows & external flows. <br> 4. **understand** radiation heat transfer and can compute radiation heat transfer between black and non-black bodies. <br> 5. **know** the design fundamentals for heat exchangers, which include the LMTD and ε-NTU approaches and to distinguish the mechanisms involved in boiling and condensation. |

## UNIT – I

**INTRODUCTION:** Heat Transfer – Different Modes, governing laws and application to heat transfer: Fourier, Newton, Stefan– Boltzmann. General heat conduction equation: derivation in Cartesian, cylindrical and spherical coordinate systems. Steady state one dimensional heat conduction problems (i) with and without heat generation and (ii) with and without varying thermal conductivity - through slabs, hollow cylinders and spheres. Steady state one dimensional heat transfer through composite slabs, cylinders and spheres, overall heat transfer coefficient. Concept of thermal resistance in series and parallel. Numerical problems concerned to the above. Critical thickness of insulation: concept, derivation and numerical problems. Thermal contact resistance.

## UNIT – II

**Extended surfaces or Fins:** classification and applications, Heat transfer analysis of fin with heat dissipation environment - straight rectangular and circular fins, temperature distribution and heat transfer calculations, fin efficiency and effectiveness. Numerical problems covering all topics. Application of fin theory in temperature measurement.

**Transient (Unsteady state) heat conduction:** definition, negligible internal thermal resistance, negligible surface resistance, comparable internal thermal and surface resistance – lumped body, infinite body and semi-infinite body. Numerical problems.
Use of Grober and Heislercharts: solutions to various one dimensional problems using charts (Infinite slabs, cylinders and spheres).

## UNIT – III

**Convection:** Dimensional analysis-Buckingham theorem: application of dimensional analysis to forced and free convection problems, Physical significance of different dimensionless numbers.
Boundary layer theory concept - velocity and thermal boundary layers, Application of Von– Karman integral equation for the analysis of thermal boundary layer in forced convection of flat plate. Reynold's analogy for flow over plane surfaces. Free and forced convection - Calculation of heat transfer for laminar flows and turbulent flows over plates, cylinders and spheres. Internal flows through tubes using empirical correlations.

## UNIT –IV

**Thermal Radiation (Non participating media):** fundamental principles – Gray, White, Opaque, Transparent and Black bodies, Spectral emissive power, Wien's and Plank's laws, Hemispherical emissive power, Stefan-Boltzmann law for total emissive power of a black body, emissivity and Kirchhoff's laws. Radiation shape factor, shape factor algebra. Total emissive power radiant heat exchange between two gray surfaces. Thermal circuit for radiant heat exchange between infinite parallel plates and between concentric cylinders, enclosures with black and gray surfaces. Numerical problems Radiation shields and re-radiation surfaces. Numerical problems.

## UNIT – V

**Heat Exchangers:** Definition, Classification and applications of heat exchangers in industry. Overall heat transfer coefficient. Fouling factors. Analysis and design of heat exchanger: LMTD method, effectiveness-NTU method.Analytical methods, numerical problems.

Chart solution procedures for solving heat exchanger problems – correction factor charts and effectiveness-NTU charts.

Boiling– pool boiling regimes, nucleate pool boiling, effect of surface wettability on bubble contact angle, Critical heat flux, boiling in forced convection.

Condensation: Film condensation, Drop wise condensation, condensation film thickness, heat transfer coefficient in film condensation.

### Learning Resources:

1. J.P. Holman, Heat transfer, Tata McGraw Hill Publication,New Delhi, 2010.
2. Sachadeva R.C., Fundamentals of Engineering Heat and Mass Transfer, New Age International (P) Ltd Publishers, New Delhi.
3. Rajput R.K., "Heat and Mass Transfer", S. Chand & Company Ltd., New Delhi, 2004.
4. M.Necati Ozisik, Heat transfer – A basic approach, McGraw Hill, New York, 2005.
5. Incropera, F.P. and De Witt D.P.- Fundamentals of Heat and Mass Transfer, John Wiley and sons, New York, 2008.

### Data Book:

1. C. P. Kothandaraman, S. Subramanyan "Heat and Mass Transfer Data Book" New Academic Science, 2012,  ISBN: 1781830045, 9781781830048

### Online Resources:

1. http://nptel.ac.in/courses/112101097/
2. http://freevideolectures.com/Course/2366/Heat-and-Mass-Transfer
3. http://textofvideo.nptel.iitm.ac.in/112101097/
4. http://www.nptelvideos.in/2012/11/heat-transfer.html
5. http://web.mit.edu/lienhard/www/ahtt.html

**DEPARTMENT OF MECHANICAL ENGINEERING**
**SYLLABUS FOR B.E. 3/4 II-SEMESTER**
**HUMAN VALUES AND PROFESSIONAL ETHICS-II**

| Instruction :2 Periods /week | Sem. Exam Marks :70 | Subject Ref. Code:  HS 3140 |
|---|---|---|
| Credits    : 1 | Sessional Marks   :30 | Duration of Sem. Exam :3 Hrs |

| Course objectives | Course Out comes |
|---|---|
| **The course will enable the students to :** | At the end of this course the student will be able to: |
| • Get a holistic perspective of value-based education. | • Gain a world view of the self, the society and the profession. |
| • Grasp the meaning of basic human aspirations vis-a-vis the professional aspirations. | • Make informed decisions. |
| • Understand professionalism in harmony with self and society. | • Start exploring themselves in relation to others and their work –constantly evolving into better human beings and professionals |
| • Develop ethical human conduct and professional competence. | • Inculcate Human values into their profession. |
| • Enrich their interactions with the world around, both professional and personal. | • Validate their aspirations through right understanding of human relationship and see the co-relation between the human values and prevailing problems. |
| | • Strike a balance between physical, mental, emotional and spiritual parts their being. |
| | • Obtain a holistic vision about value-based education and professional ethics. |

### UNIT-I
#### A. DISTINCTION BETWEEN NEED AND GREED
Exercising the wisdom to distinguish need from greed.
#### B. IDEAL SELF-REAL SELF
How to define the ideal-idealism at various levels- is it possible to   reach idealism –Man as a pilgrim on a journey to idealism.

### UNIT-II
#### A.  RIGHTS AND RESPONSIBILITIES
Educating an individual about rights and responsibilities –Safeguards-Stimulants-   Social   Justice-The three catalysts for deciding rights and responsibilities.
#### B. IMBIBING AND INCULCATING CIVIC SENSE AND CIVIC-VIRTUES
The true meaning of Integrity -Honesty, Humility, Openness, Transparency, Dedication, Reliability, Confidentiality, accountability, Collegiality, Sympathy, Trustworthiness, Co-operation, Courage.
   a. The moral dilemma of the Modern world, Respect for Self, Others and Work.
   b. Respect for women at all times especially at the workplace.

## UNIT-III: MANAGING FAILURE

Identifying causes for failure and learning lessons-Using failure to score success-Role of self- confidence and personal ethics in coping with failure.

| | |
|---|---|
| • Anger/ Depression | • Cruelty |
| • Fear | • Jealousy |
| • Agitation | • Desire |
| • Failure | • Cheating |
| • Lethargy | • Pride |
| • Dishonesty | • Greed |
| | • Lying |

## UNIT-IV : STRESS MANAGEMENT

Identifying sources and levels of stress –Tackling stress and its associated Negativity-Positive aspect of coping with stress- Some techniques to manage stress.

## UNIT-V: DEVELOPING EMOTIONAL INTELLIGENCE

Self-Awareness
Handling Emotions
Motivation
Empathy
Social skills

**Learning Resources**

1. B.L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.
2. A.N Tripathy, 2003 Human values, New Age International Publishers.
3. EG Seebauer & Robert L. Berry,2000, Fundamentals of Ethics for Scientists and Engineers, Oxford University Press.
4. Mike Martin and Ronald Schinzinger "Ethics in Engineering "McGraw Hill
5. Charles E Haris, Micheal J Rabins, " Engineering Ethics "Cengage Learning
6. Caroline whitback, Ethics in Engineering Practice and Research, Cambridge University Press
7. Georgs Reynolds, Ethics in Information Technology", Cengage Learning
8. Charles D. Fleddermann, " Engineering Ethics", Pearson Education, New Jersey,2004 (Indian Reprint)

**Online Resources**

1. Value Education website, Http://www.universalhumanvalues.info
2. UPTU webiste, Http://www.uptu.ac.in
3. story of stuff, Http://www.storyofstuff.com
4. AlGore, As Inconvenient Truth, Paramount Classics, USA
5. Charlie Chaplin, Modern Times, United Artists, USA
6. IIT Delhi, Modern Technology-The Untold story
7. Anand Gandhi, Right Here Right Now, Cyclewala production

**DEPARTMENT OF MECHANICAL ENGINEERING**
**SYLLABUS FOR B.E. 3/4 II-SEMESTER**
**Finishing School-IV (Technical Skills-IV)**

| Instruction: 2 Periods / week | Sem Exam Marks : 35 | Subject Ref. Code : IT2180 |
|---|---|---|
| Credits : 1 | Sessional Marks : 15 | Duration of Sem Exam : 1.5 Hours |

| Course Objectives | Course Outcomes |
|---|---|
| The objectives of this course are to learn: | At the end of the course student will be able to: |
| The course will enable the students to acquire necessary skills to design solution for a given problem. | 1. Understand the concepts of basic tokens and evaluation of expressions.<br>2. Acquire knowledge on different operators, selection and repetition syntaxes with examples and implementation of functions.<br>3. learn how to use lists, dictionaries and string manipulation.<br>4. Understand command line arguments, file handling concepts.<br>5. Acquire Knowledge of object oriented concepts like classes, objects, inheritance and composition. |

**Unit – I:**
Introduction to python, comments, variables, operators, mathematical operations, strings and text, format specifiers, printing information.

**Unit – II**
Command line arguments, prompting users, parameters, packing and unpacking of variables, reading and writing files.

**Unit – III**
Functions : passing arguments to functions, returning values from functions, functions and files.

**Unit – IV**
Decision making : if and else if, repetition : while loops, for loops. Lists, iterating a list, operations on list. Dictionaries, operations on dictionaries.

**Unit –V**
Modules, Classes and Objects, is-a relationship: inheritance , has-a relationship : composition. Exceptions, Creating a project skeleton, automated testing.

**Learning Resources:**
1. https://docs.python.org/2/tutorial
2. https://pytho.org

## DEPARTMENT OF MECHANICAL ENGINEERING
## SYLLABUS FOR B.E. 3/4 II-SEMESTER
### FINISHING SCHOOL – IV : SOFT SKILLS

| Instruction: 2 Periods per week | Sessionals: 15Marks | SEM Exam Marks:30 Marks |
|---|---|---|
| Credits:01 | SEM Exam Duration:1.5 Hrs | Subject Ref Code: HS3210 |

| Course Objective: | Course Outcomes |
|---|---|
| This course aims at enhancing the employability skills. Students will be trained in higher order thinking skills including analytical skills, problem solving skills and critical & logical reasoning skills. Students will be trained to work systematically and develop logical and analytical thinking. Students will be trained in the following areas<br>1. Critical and Non verbal reasoning<br>2. Pure Maths<br>3. Verbal ability<br>4. Logical reasoning<br>5. Data Interpretation and Analysis | **At the end of the course students will be able to:**<br>• Understand the fundamentals concepts of Aptitude and verbal skills<br>• Solve questions using short cuts and smart methods<br>• Perform calculations with speed and accuracy<br>• Develop Analytical thinking and problem solving skills |

## UNIT 1  VERBAL ABILITY
- Finding errors
- Vocabulary
- Synonyms
- Antonyms
- Idioms and Phrases
- Fill in the blanks and sentence Jumbles
- Reading comprehension

## UNIT 2 LOGICAL REASONING
- Logical Reasoning
- Assignments
- Puzzles
- Blood relations
- Syllogisms

## UNIT 3 CRITICAL AND NON VERBAL REASONING
- Critical Reasoning
- Non verbal reasoning
- Figure series and completions

## UNIT 4  QUANTITATIVE APTITUDE - PURE MATHS
- Pure maths
- Algebra
- Probability
- Permutations and combinations

## UNIT 5 DATA INTERPRETATION AND ANALYSIS
- Data Interpretation
- Line graph
- Pie chart
- Bar Graph
- Tabulation

**DEPARTMENT OF MECHANICAL ENGINEERING**
**SYLLABUS FOR B.E. 3/4 I-SEMESTER**
**DYNAMICS OF MACHINES LAB**

| Instruction : 3 Periods /week | Sem. Exam Marks : 50 | Subject Ref. Code : ME 3031 |
|---|---|---|
| Credits     : 2 | Sessional Marks:  : 25 | Duration of Sem.Exam : 3 Hrs |

| Course Objectives | Course Outcomes |
|---|---|
| The objectives of this course are to: <br> 1. **understand** motion charecteristics in CAM and followers. <br> 2. **illustrate** static and dynamic balancing. <br> 3. **apply** gyroscopic effect on vehicles. <br> 4. **understand** vibration response characteristics and stability of dynamic systems. | On completion of the course the student will be able to:: <br> 1. **analyze** the profile of CAM suitable for required motion charecteristics. <br> 2. **evaluate** the static and dynamic balancing of masses. <br> 3. **analyze** the gyroscopic effect to stabilize the vehicles. <br> 4. **analyze** the response of dynamic systems under dynamic loading. |

1. To study the motion characteristics of the follower with the given profile of the cam.
2. To study the effect of sleeve mass of dead weight type Porter Governor and controlling force curves.
3. To study the effect of varying the spring initial compression acting on sleeve of spring controlled type Hartnell governor and controlling force curves.
4. To study the gyroscopic effect on a disc subjected to precessional motion.
5. To find the static balancing masses in a rotating mass system.
6. To find the dynamic balancing masses in a rotating mass system.
7. To study the un damped forced vibration system
8. To study the damped forced vibration system
9. To study the torsional vibration response characteristics using single rotor system
10. To study the torsional vibration response characteristics using two rotor system.
11. Determination of critical speed of the given shaft with the given end conditions. (Whirling of Shafts)
12. To study frequency response of spring mass system with and without damping.
13. To study frequency response with random excitations (Seismic response).

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**DEPARTMENT OF MECHANICAL ENGINEERING**
**SYLLABUS FOR B.E. 3/4 I-SEMESTER**
**CAD / CAM LAB**

| Instruction : 3 Periods /week | Sem Exam Marks : 50 | Subject Reference Code:  ME 3041 |
|---|---|---|
| Credits     : 2 | Sessional Marks : 25 | Duration of Sem. Exam : 3 Hours |

| Course Objectives | Course Outcomes |
|---|---|
| The objectives of this course are to: <br> 1. **practice** 2D and 3D modeling. <br> 2. **practice** assembly of various components. <br> 3. **understand** how to write the CNC programming. | On completion of the course the student will be able to: <br> 1. **develop** 3D part models. <br> 2. **develop** assembly of given components. <br> 3. **develop** CNC programming for the given simple turning and milling operations. |

**I. CAD:**

1. Practice in the use of some of the packages like: NX (SIEMENS) / CATIA etc., for geometric modeling of simple parts (sketching).
2. Part modeling simple parts using any of the above packages.
3. Developing Assemblies e.g,
   i. Flange coupling
   ii. Plummer block
   iii. Universal coupling
   iv. Connecting rod

**II. CAM:**

1. Simulation and development of NC code using any CAM software for Facing and turning, step turning, taper turning, contouring on CNC lathe.
2. Simulation and development of NC code using any CAM software for Pocketing and contouring on CNC milling machine.

**DEPARTMENT OF MECHANICAL ENGINEERING**
**SYLLABUS FOR B.E. 3/4 I-SEMESTER**
**MACHINE TOOLS & METAL CUTTING LAB**

| Instruction : 3 Periods /week | Sem. Exam Marks : 50 | Subject Reference Code: ME 3051 |
|---|---|---|
| Credits : 2 | Sessional Marks : 25 | Duration of Sem. Exam : 3 Hrs |

| Course Objectives | Course Outcomes |
|---|---|
| The objectives of this course are to : | On completion of the course the student will be able to: |
| 1. **perform** different jobs on machine tools. | 1. **operate** various machine tools and plan sequence of operations. |
| 2. **conduct** experiments for evaluation of shear angle. | 2. **choose** proper machine to get required dimensions with tolerance. |
| 3. Measurement of cutting forces using dynamometers. | 3. **design** the power requirement for a given machine tool. |
| 4. indexing of components and grind angles on single point cutting tool. | 4. make spur gears **using** milling machine. |
| 5. **understand** the working of EDM. | 5. **analyse** the influence of current on MRR in EDM process. |

1. Exercise with operation of eccentric turning
2. Exercise with operation of thread cutting and boring.
3. Exercise on shaper to make rectangular and 'V' grooves.
4. Cutting spur gear having 20 teeth using simple indexing.
5. Finding shear angle by measuring thickness and length of chips.
6. Measuring the forces by dynamometers and finding friction angle and stress on shear plane and rake plane.
7. Conducting tool life tests and finding the constant and index equation for HSS and carbide tools.
8. Effect of chip-tool by thermocouple method, effect of temprature on cutting speed in turning operation.
9. Grinding of HSS tool using tool and cutter grinder to a given geometry.
10. PCD drilling on radial drilling machine and tapping.
11. Grinding of flat surfaces and measurement of surface finish.
12. Exposure to operations like trepanning, lapping, honing and broaching.
13. Electric Discharge Machining (EDM), experiment to determine MRR Vs Current

**DEPARTMENT OF MECHANICAL ENGINEERING**

**ALMANAC FOR B.E - II & III year - I Semester [all branches]**

| S.No. | Particulars | Date |
|---|---|---|
| 1 | Commencement of Instruction | 11-07-2016 |
| 2 | I Class Test | 29-08-2016 to 01-09-2016 |
| 3 | II Class Test | 26-10-2016 to 29-10-2016 |
| 4 | Last date of Instruction | 29-10-2016 |
| 5 | Preparation holidays & Practical Examinations | 31-10-2016 to 12-11-2016 |
| 6 | Commencement of Theory Examinations | 14-11-2016 |

**ALMANAC FOR B.E - II & III year - II Semester [all branches]**

| S.No. | Particulars | Date |
|---|---|---|
| 1 | Commencement of Instruction | 26-12-2016 |
| 2 | I Class Test | 13-02-2017 to 16-02-2017 |
| 3 | II Class Test | 11-04-2017 to 15-04-2017 |
| 4 | Last date of instruction | 15-04-2017 |
| 5 | Preparation holidays & practical Examinations | 17-04-2017 to 29-04-2017 |
| 6 | Commencement of Theory Examinations | 01-05-2017 |
| 7 | Summer vacation | 01-05-2017 to 08-07-2017 |
| 8 | Commencement of I Semester for the Academic year 2017-2018 | 10-07-2017 |

| E - JOURNALS & E-BOOKS SUBSCRIBED | |
|---|---|
| ASCE | 35 |
| ASME | 27 |
| IEEE ASPP | 155 |
| ACM Digital Library | 1138 |
| Springer Mechanical | 49 |
| Total GIST E-Journals | 1405 |
| DELNET CONSORTIUM (IESTC E-Journals -2016) | 1152 |
| DELNET E-Journals | 817 |
| Total e-journals | 3374 |
| DELNET MEMBERSHIP E-Books | 335 |
| Journals and magazines Print version | 106 |