THE VISION OF THE DEPARTMENT OF MANUFACTURING ENGINEERING:

To be outstanding institute where students can gain acumen and to brew them so that they unswervingly meet the needs of the society.

THE MISSION OF THE DEPARTMENT OF MANUFACTURING ENGINEERING:

- To foster the growth of its members and develop them in new vistas promoting them to their fullest cognition.
- To be nationally recognized as the leader of Manufacturing Engineering in education and research.
- Bring augmentation to the Department, College and University.
- Discern the potential of its members.
- Have its members vivaciously conscripted nationally by employers and graduate programs.
- To evoke new ideas in the minds of its members and infuse nascent technology to modern era of manufacturing.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

To qualify as Manufacturing Engineering Graduates, the candidates are expected to meet the following Program Educational Objectives (PEOs) within 5 years after graduation:

I. To be employed in jobs related manufacturing sectors at National and Global levels.
II. To be engaged in life-long learning, certification from professional organizations and active participation in professional societies/activities.
III. To be successful in their carrier and take up leadership role in their professional life.
IV. To become an experts and provide solutions to the industrial problems in the manufacturing sectors.
V. Become an entrepreneur/ startups and to establish an industry to provide job to others.
**PROGRAMME OUTCOMES (POs):**

The Programme Outcomes (POs) of the Manufacturing Engineering graduates are given below:

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<th>PO</th>
<th>Graduate Attribute</th>
<th>Programme Outcome</th>
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<tbody>
<tr>
<td>1</td>
<td>Engineering knowledge</td>
<td>Engineering/Fundamental knowledge in mathematics, engineering, sciences, computer</td>
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<td></td>
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<td>science, humanities, and social science</td>
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<td>2</td>
<td>Problem analysis</td>
<td>Identify, formulate and solve industrial problems with the knowledge gained.</td>
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<td>3</td>
<td>Design/development of solutions</td>
<td>Design a component or system and provide solutions by understanding its current</td>
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<td>status to improve its performance and satisfying its constraints.</td>
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<td>Conduct investigations of complex</td>
<td>Conduct experimentation and collect, analyze as well as interpret the data in a</td>
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<td>problems</td>
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<td>Modern tool usage</td>
<td>Ability to apply various modern tools and techniques to improve the efficiency of</td>
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<td>6</td>
<td>The Engineer and society</td>
<td>Conduct themselves to uphold the professional and social obligations.</td>
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<td>7</td>
<td>Environment and sustainability</td>
<td>Design and develop the systems with environment consciousness and sustainable</td>
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<td>8</td>
<td>Ethics</td>
<td>Behave and practice ethically in the professional carrier.</td>
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<td>9</td>
<td>Individual and team work</td>
<td>Demonstrate leadership skills and also be able to function as a team player.</td>
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<td>Communication</td>
<td>Communicate professionally in both oral and written forms.</td>
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<td>Project management and finance</td>
<td>Ability to manage through effective economic planning and control.</td>
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<td>12</td>
<td>Life-long learning</td>
<td>Creating interest in the lifelong learning attitude.</td>
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**PROGRAM SPECIFIC OUTCOMES (PSOs):**

On successful completion of Manufacturing Engineering degree program, the graduate shall have the following Program Specific Outcomes (PSOs).

1. Ability to apply the knowledge gained in the fundamentals of manufacturing engineering in a systematic manner with ethics and sustainability.
2. Ability to understand, devise methodologies to solve problems and come out with best possible solutions in manufacturing engineering as an individual and as a team.
3. Ability to apply fundamental aspects of manufacturing engineering to innovate and to create new products and processes with sustainable manufacturing.
## PEO / PO MAPPING:

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<th>PROGRAMME EDUCATIONAL OBJECTIVES</th>
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## MAPPING OF COURSE OUTCOME AND PROGRAMME OUTCOME

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# ANNA UNIVERSITY, CHENNAI
## UNIVERSITY DEPARTMENTS
### B.E. MANUFACTURING ENGINEERING
#### REGULATIONS – 2019
#### CHOICE BASED CREDIT SYSTEM
#### CURRICULA AND SYLLABI FOR I TO VIII SEMESTERS
(Applicable to students admitted from the Academic Year 2022 – 2023 onwards)

## SEMESTER I

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*Audit Course is optional.

* Students will have to undergo industrial training / Internship during previous vacation period.

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<td>23.</td>
<td>ME5761</td>
<td>Mechatronics Laboratory</td>
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**PROFESSIONAL ELECTIVE COURSES**

**SEMESTER V, ELECTIVE I**

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<tbody>
<tr>
<td>1.</td>
<td>MF5071</td>
<td>Processing of Plastics</td>
<td>PEC</td>
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<td>2.</td>
<td>PR5072</td>
<td>Production of Automotive Components</td>
<td>PEC</td>
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<td>3.</td>
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<td>Automobile Engineering</td>
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<td>4.</td>
<td>ME5074</td>
<td>Design of Jigs, Fixtures and Press Tools</td>
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<td>5.</td>
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<td>Processing of Plastics and Polymers</td>
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<td>6.</td>
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<td>Professional Ethics in Engineering</td>
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**SEMESTER VI, ELECTIVE II**

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<td>1.</td>
<td>MF5001</td>
<td>Non Destructive Testing: Theory and Practice</td>
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<td>Engineering Quality Control</td>
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<td>4.</td>
<td>IE5653</td>
<td>Reliability Engineering</td>
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<td>5.</td>
<td>ME5081</td>
<td>Process Planning and Cost Estimation</td>
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<td>6.</td>
<td>GE5552</td>
<td>Engineering Management</td>
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<td>Product Life Cycle</td>
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<td>Product Design and</td>
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<td>New and Renewable Sources of Energy</td>
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<td>MF5006</td>
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<td>Operations Research</td>
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<td>Materials Procurement Management</td>
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## SEMESTER VIII, ELECTIVE VII

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<td>Machine Learning Algorithms</td>
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<td>Principles of Computer Integrated Manufacturing Systems</td>
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<td>Decision Support and Intelligent Systems</td>
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### EMPLOYABILITY ENHANCEMENT COURSES (EEC)

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### AUDIT COURSES (AC)

Registration for any of these courses is optional to students

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<th>Sl. No</th>
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<td>AD5098</td>
<td>Sanga Tamil Literature Appreciation</td>
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OBJECTIVES

- To build lexical competency and accuracy that will help learners to use language effectively.
- To learn various reading strategies that will enable learners to comprehend the different modes of reading materials of varied levels of complexity.
- To comprehend the linguistic aspects of various rhetorical structures and functions of Technical English and use them effectively in writing.

UNIT I  INTRODUCING ONESELF  9
Theory:
Reading: Descriptive passages (From Newspapers / Magazines) – Writing: Writing a coherent paragraph (Native Place, School Life) – Grammar: Simple present tense, Present continuous tense – Vocabulary development: One word substitution.

UNIT II  DIALOGUE WRITING  9
Theory:
Reading: Reading a print interview (Comprehension and inference questions) - Writing: Writing a checklist - Dialogue writing – Grammar: Simple past tense – Question formation (Wh-Questions, ‘Yes’ or ‘No’ Questions, Tag Questions) – Vocabulary Development: Lexical items relevant to the theme of the given unit.

UNIT III  FORMAL LETTER WRITING  9
Theory:

UNIT IV  WRITING LETTERS OF COMPLAINT  9
Theory:

UNIT V  WRITING DEFINITIONS AND PRODUCT DESCRIPTION  9
Theory:

TOTAL : 45 PERIODS

LEARNING OUTCOMES:
On completion of the course, the students will be able to:

- Use appropriate language structures and lexical items in authentic contexts.
- Read both general and technical texts and comprehend their denotative and connotative meanings.
- Write different kinds of formal documents with grammatical and lexical appropriacy.

Assessment Pattern

- Two written internal assessments to test learner’s progress in grammar, vocabulary, reading and writing skills.
- End Semester exam to be tested in two parts: Theory exam for three hours and listening and speaking skills for two hours.
COURSE OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT I  MATRICES  12

UNIT II  DIFFERENTIAL CALCULUS  12

UNIT III  FUNCTIONS OF SEVERAL VARIABLES  12

UNIT IV  INTEGRAL CALCULUS  12
Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT V  MULTIPLE INTEGRALS  12

TOTAL :60 PERIODS

COURSE OUTCOMES:
At the end of the course the students will be able to

- Use the matrix algebra methods for solving practical problems.
- Apply differential calculus tools in solving various application problems.
- Able to use differential calculus ideas on several variable functions.
- Apply different methods of integration in solving practical problems.
- Apply multiple integral ideas in solving areas, volumes and other practical problems.

TEXT BOOKS:
REFERENCES:


PH5151 ENGINEERING PHYSICS
(Common to all branches of B.E / B.Tech programmes) 3 0 0 3

COURSE OBJECTIVES:
- To make the students in understanding the importance of mechanics.
- To equip the students on the knowledge of electromagnetic waves.
- To introduce the basics of oscillations, optics and lasers.
- To enable the students in understanding the importance of quantum physics.
- To elucidate the application of quantum mechanics towards the formation of energy bands in crystalline materials.

UNIT I MECHANICS

UNIT II ELECTROMAGNETIC WAVES

UNIT III OSCILLATIONS, OPTICS AND LASERS

UNIT IV BASIC QUANTUM MECHANICS
Photons and light waves - Electrons and matter waves - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization - Particle in a infinite potential well - Normalization, probabilities and the correspondence principle.

UNIT V APPLIED QUANTUM MECHANICS
The harmonic oscillator - Barrier penetration and quantum tunneling - Tunneling microscope - Resonant diode - Finite potential wells - particle in a three dimensional box - Bloch’s theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands.
COURSE OUTCOMES:
After completion of this course, the students should able to
- Understanding the importance of mechanics.
- Express the knowledge of electromagnetic waves.
- Know the basics of oscillations, optics and lasers.
- Understanding the importance of quantum physics.
- Apply quantum mechanical principles towards the formation of energy bands in crystalline materials.

TEXT BOOKS

REFERENCES

CY5151 ENGINEERING CHEMISTRY (COMMON TO ALL BRANCHES) 3 0 0 3

COURSE OBJECTIVES:
- To introduce the basic concepts of polymers, their properties and some of the important applications.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To facilitate the understanding of the laws of photochemistry, photoprocesses and instrumentation & applications of spectroscopic techniques.
- To familiarize the operating principles and applications of energy conversion, its processes and storage devices.
- To inculcate sound understanding of water quality parameters and water treatment techniques.

UNIT I POLYMER CHEMISTRY

UNIT II NANO CHEMISTRY
UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY


UNIT IV ENERGY CONversions AND STORAGE

Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant – fast breeder reactor. Solar energy conversion - solar cells. Wind energy. Batteries - types of batteries – primary battery (dry cell), secondary battery (lead acid, nickel-cadmium and lithium-ion-battery). Fuel cells – H₂-O₂ and microbial fuel cell. Explosives – classification, examples: TNT, RDX, Dynamite; Rocket fuels and propellants – definition and uses.

UNIT V WATER TECHNOLOGY


TOTAL: 45 PERIODS

COURSE OUTCOMES:

- To recognize and apply basic knowledge on different types of polymeric materials, their general preparation methods and applications to futuristic material fabrication needs.
- To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
- To identify and apply suitable spectroscopic technique for material analysis and study different forms of photochemical reactions.
- To recognize different forms of energy resources and apply them for suitable applications in energy sectors.
- To demonstrate the knowledge of water and their quality in using at different industries.

TEXT BOOKS:


REFERENCES:

COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Drawing free hand sketches of basic geometrical shapes and multiple views of objects.
2. Drawing orthographic projections of lines and planes.
3. Drawing orthographic projections of solids.
4. Drawing development of the surfaces of objects.
5. Drawing isometric and perspective views of simple solids.

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION)
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HANDSKETCHING
Basic Geometrical constructions, Curves used in engineering practices-Conics – Construction of ellipse, parabola and hyperbola by different methods – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three-Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES
Orthographic projection- principles-Principle planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes- Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both the principal planes by rotating object method and auxiliary plane method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES
Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS
Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms pyramids and cylinders by visual ray method and vanishing point method.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY)
Introduction to drafting packages and demonstration of their use

TOTAL (L: 15 + P: 60)=75 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Draw free hand sketching of basic geometrical shapes and multiple views of objects.
2. Draw orthographic projections of lines and planes
3. Draw orthographic projections of solids
4. Draw development of the surfaces of objects
5. Draw isometric and perspective views of simple solids.
TEXT BOOKS:

REFERENCES:

Publication of Bureau of Indian Standards:

Special points applicable to University Examinations on Engineering Graphics:
1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only.
4. The students will be permitted to use appropriate scale to fit solution within A3 size.
5. The examination will be conducted in appropriate sessions on the same day.

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BS5161 BASIC SCIENCES LABORATORY
(Common to all branches of B.E / B.Tech Programmes)

PHYSICS LABORATORY: (Any Seven Experiments)

COURSE OBJECTIVES:
- To inculcate experimental skills to test basic understanding of physics of materials including properties of matter, thermal and optical properties.
- To induce the students to familiarize with experimental determination of velocity of ultrasonic waves and band gap determination.

LIST OF EXPERIMENTS:
1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of Young’s modulus
3. Uniform bending – Determination of Young’s modulus
4. Lee’s disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. a) Optical fibre - Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
10. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
11. Post office box - Determination of Band gap of a semiconductor.
13. Photoelectric effect
14. Michelson Interferometer.
16. Melde’s string experiment

TOTAL: 30 PERIODS

COURSE OUTCOMES:
Upon completion of the course, the students will be able
- To determine various moduli of elasticity and also various thermal and optical properties of materials.
- To determine the velocity of ultrasonic waves, band gap determination and viscosity of liquids

CHEMISTRY LABORATORY: (Minimum of 8 experiments to be conducted)

COURSE OBJECTIVES:
- To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.
- To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
- To demonstrate the analysis of metals and polymers by spectroscopy and viscometry methods.

LIST OF EXPERIMENTS:
1. Estimation of HCl using Na$_2$CO$_3$ as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler’s method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
12. Pseudo first order kinetics-ester hydrolysis.
14. Phase change in a solid.

TOTAL: 30 PERIODS

COURSE OUTCOMES:
- To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.
- To determine the amount of metal ions through volumetric and spectroscopic techniques
- To determine the molecular weight of polymers by viscometric method.
- To quantitatively analyse the impurities in solution by electroanalytical techniques
- To design and analyse the kinetics of reactions and corrosion of metals

TEXT BOOKS:
அணு I புத்தகங்களின் இறக்குமதி

3. புத்தகங்களின் இறக்குமதி - குடியியலும் தமிழ்களின் - தமிழ் மகாஹாராணன் - தமிழ் மகாகாலவாழ்த்துக்கள் - குடியியலும் தமிழ்களின் - தமிழ் மகாஹாராணன் - தமிழ் மகாகாலவாழ்த்துக்கள் - குடியியலும் தமிழ்களின் - தமிழ் மகாஹாராணன் - தமிழ் மகாகாலவாழ்த்துக்கள் - குடியியலும் தமிழ்களின் - தமிழ் மகாஹாராணன் - தமிழ் மகாகாலவாழ்த்துக்கள் - குடியியலும் தமிழ்களின் - தமிழ் மகாஹாராணன்.

அணு II மாவு - பால்வேளா இறக்குமதியின் தமிழ் தமிழகான வல்ல - குறிப்பிட்டு:


அணு III மாவு - பால்வேளா இறக்குமதியின் தமிழ்களின் வரலைப்புகள்:


அணு IV மாவு - பால்வேளா இறக்குமதியின் தமிழ்களின் வரலைப்புகள்:


அணு V மாவு - பால்வேளா இறக்குமதியின் தமிழ்களின் வரலைப்புகள்:


TEXT-CUM-REFERENCE BOOKS
1. சுயமரியொமத - கிளாஸிசல் பள்ளிப்பு (சுப்போரி: சுயமரியொமத - கிளாஸிசல் பள்ளிப்பு சுயமரியொமத துமிரு).
2. சுயமரியொமத - பள்ளிவகை (சுப்போரி: சுயமரியொமத - பள்ளிவகை).
3. சுயமரியொமத - பள்ளிவகை (சுப்போரி: சுயமரியொமத - பள்ளிவகை).
4. பால்வேளா - பால்வேளா தொன்மை (சுப்போரி: சுயமரியொமத - பால்வேளா தொன்மை).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL - (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu)
GE5154

HERITAGE OF TAMILS

UNIT I  LANGUAGE AND LITERATURE


UNIT II  HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III  FOLK AND MARTIAL ARTS

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV  THINAI CONCEPT OF TAMILS

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V  CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. கணினித் தமிழ் (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2. கணினித் தமிழ் (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
3. கணினித் தமிழ் (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
4. கணினித் தமிழ் (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.S.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
GE5162       WORKSHOP PRACTICES LABORATORY
(Common to all Branches of B.E. / B.Tech. Programmes)       0 0 4 2

COURSE OBJECTIVES:

The main learning objective of this course is to provide hands on training to the students in:

1. Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.
2. Wiring various electrical joints in common household electrical wire work.
3. Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
4. Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & ELECTRICAL)

PART I CIVIL ENGINEERING PRACTICES 15

PLUMBING WORK:
   a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
   b) Preparing plumbing line sketches.
   c) Laying pipe connection to the suction side of a pump.
   d) Laying pipe connection to the delivery side of a pump.
   e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK:
   a) Sawing,
   b) Planing and
   c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

Wood Work Study:
   a) Studying joints in door panels and wooden furniture
   b) Studying common industrial trusses using models.

PART II ELECTRICAL ENGINEERING PRACTICES 15

WIRING WORK:
   a) Wiring Switches, Fuse, Indicator and Lamp etc. such as in basic household,
   b) Wiring Stair case light.
   c) Wiring tube – light.
d) Preparing wiring diagrams for a given situation.

Wiring Study:
   a) Studying an Iron-Box wiring.
   b) Studying a Fan Regulator wiring.
   c) Studying an Emergency Lamp wiring.

GROUP – B (MECHANICAL AND ELECTRONICS)

PART III  MECHANICAL ENGINEERING PRACTICES  15

WELDING WORK:
   a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
   b) Practicing gas welding.

BASIC MACHINING WORK:
   a) (simple)Turning.
   b) (simple)Drilling.
   c) (simple)Tapping.

ASSEMBLY WORK:
   a) Assembling a centrifugal pump.
   b) Assembling a household mixer.
   c) Assembling an air conditioner.

SHEET METAL WORK:
   a) Making of a square tray

FOUNDRY WORK:
   a) Demonstrating basic foundry operations.

PART IV  ELECTRONIC ENGINEERING PRACTICES  15

SOLDERING WORK:
   a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:
   a) Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY:
   a) Studying a FM radio.
   b) Studying an electronic telephone.

TOTAL (P: 60) = 60 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.
2. Wire various electrical joints in common household electrical wire work.
3. Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.
4. Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.
OBJECTIVES:
- To improve the communicative competence of learners
- To help learners use language effectively in academic/work contexts
- To develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc.
- To build on students’ English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts.
- To use language efficiently in expressing their opinions via various media.

UNIT I INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 6
Listening for general information-specific details- conversation; Introduction to classmates - Audio / video (formal & informal); Telephone conversation; Listening to voicemail & messages; Listening and filling a form. Speaking - making telephone calls-Self Introduction; Introducing a friend; - politeness strategies- making polite requests, making polite offers, replying to polite requests and offers- understanding basic instructions( filling out a bank application for example).

UNIT II NARRATION AND SUMMATION 6
Listening - Listening to podcasts, anecdotes / stories / event narration; documentaries and interviews with celebrities. Speaking - Narrating personal experiences / events-Talking about current and temporary situations & permanent and regular situations* - describing experiences and feelings- engaging in small talk- describing requirements and abilities.

UNIT III DESCRIPTION OF A PROCESS / PRODUCT 6
Listening - Listen to product and process descriptions; a classroom lecture; and advertisements about products. Speaking – Picture description- describing locations in workplaces- Giving instruction to use the product- explaining uses and purposes- Presenting a product- describing shapes and sizes and weights- talking about quantities(large & small)-talking about precautions.

UNIT IV CLASSIFICATION AND RECOMMENDATIONS 6
Listening – Listening to TED Talks; Listening to lectures - and educational videos. Speaking – Small Talk; discussing and making plans-talking about tasks-talking about progress- talking about positions and directions of movement-talking about travel preparations- talking about transportation-

UNIT V EXPRESSION 6
Listening – Listening to debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking –making predictions- talking about a given topic-giving opinions-understanding a website-describing processes

LEARNING OUTCOMES:
At the end of the course, learners will be able
- To listen and comprehend complex academic texts
- To speak fluently and accurately in formal and informal communicative contexts
- To express their opinions effectively in both oral and written medium of communication

TOTAL : 30 PERIODS
ASSESSMENT PATTERN

- One online / app based assessment to test listening /speaking
- End Semester ONLY listening and speaking will be conducted online.
- Proficiency certification is given on successful completion of listening and speaking internal test and end semester exam.

HS5251 PROFESSIONAL COMMUNICATION

OBJECTIVES

- To comprehend various reading materials relevant to technical context and understand the main and supporting ideas of the reading materials.
- To write effective job applications along with detailed CV for internship or placements.
- To explore definitions, essay and report writing techniques and practice them in order to develop associated skills.

UNIT I TECHNICAL COMMUNICATION

Theory:
- Reading: Reading the Interview of an Achiever and Completing Exercises (Skimming, Scanning and Predicting) – Writing: Writing a Short Biography of an Achiever Based on Given Hints – Grammar: Asking and Answering Questions, Punctuation in Writing, Prepositional Phrases

UNIT II SUMMARY WRITING

Theory:
- Reading: Reading Technical Essays/ Articles and Answering Comprehension Questions – Writing: Summary Writing – Grammar: Participle Forms, Relative Clauses

UNIT III PROCESS DESCRIPTION

Theory:
- Reading: Reading Instruction Manuals – Writing: Writing Process Descriptions – Writing Instructions – Grammar: Use of Imperatives, Active and Passive Voice, Sequence Words

UNIT IV REPORT WRITING

Theory:
- Reading: Reading and Interpreting Charts/Tables and Diagrams – Writing: Interpreting Charts/Tables and Diagrams, Writing a Report – Grammar: Direct into Indirect Speech, Use of Phrases

UNIT V WRITING JOB APPLICATIONS

Theory:
- Reading: Reading a Job Interview, SOP, Company Profile and Completing Comprehension Exercises – Writing: Job Applications and Resumes And Sops-Grammar: Present Perfect and Continuous Tenses.

TOTAL : 30 PERIODS

LEARNING OUTCOMES

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

- Read and comprehend technical texts effortlessly.
- Write technical reports and job application for internship or placement.
- Learn to use language effectively in a professional context.

Assessment Pattern

- Two written internal assessments to test learner’s progress in grammar, reading and writing skills.
- End Semester exam to be tested in two parts: Theory exam for three hours and listening and speaking skills along with vocabulary for two hours.
COURSE OBJECTIVES:

- To acquaint the students with the concepts of vector calculus which naturally arises in many engineering problems.
- To develop an understanding of the standard techniques of complex variable theory in particular analytic function and its mapping property.
- To familiarize the students with complex integration techniques and contour integration techniques which can be used in real integrals.
- To acquaint the students with Differential Equations which are significantly used in Engineering problems.
- To make the students appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I  VECTOR CALCULUS  12

UNIT II  ANALYTIC FUNCTION  12
Analytic functions – Necessary and sufficient conditions for analyticity – Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping – Mapping by functions – Bilinear transformation \( w = c + z, \ a z, \ 1/z, \ z^2 \).

UNIT III  COMPLEX INTEGRATION  12

UNIT IV  DIFFERENTIAL EQUATIONS  12
Method of variation of parameters – Method of undetermined coefficients – Homogenous equations of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients.

UNIT V  LAPLACE TRANSFORMS  12

TOTAL : 60 PERIODS

COURSE OUTCOMES:
Upon successful completion of the course, students will be able to:

- Calculate grad, div and curl and use Gauss, Stokes and Greens theorems to simplify calculations of integrals.
- Construct analytic functions and use their conformal mapping property in application problems.
- Evaluate real and complex integrals using the Cauchy’s integral formula and residue theorem.
- Apply various methods of solving differential equation which arise in many application problems.
- Apply Laplace transform methods for solving linear differential equations.
TEXT BOOKS:

REFERENCES:

GE5153 PROBLEM SOLVING AND PYTHON PROGRAMMING  L T P C
3 0 0 3

COURSE OBJECTIVES:
- To know the basics of algorithmic problem solving.
- To develop Python programs with conditionals and loops.
- To define Python functions and use function calls.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I INTRODUCTION TO COMPUTING AND PROBLEM SOLVING

SUGGESTED ACTIVITIES:
- Developing Pseudocodes and flowcharts for real life activities such as railway ticket booking using IRCTC, admission process to undergraduate course, academic schedules during a semester etc.
- Developing algorithms for basic mathematical expressions using arithmetic operations.
- Installing Python.
- Simple programs on print statements, arithmetic operations.

SUGGESTED EVALUATION METHODS:
- Assignments on pseudocodes and flowcharts.
- Tutorials on Python programs.

UNIT II CONDITIONALS AND FUNCTIONS
SUGGESTED ACTIVITIES:
- Simple Python program implementation using Operators, Conditionals, Iterative Constructs and Functions.
- Implementation of a simple calculator.
- Developing simple applications like calendar, phone directory, to-do lists etc.
- Flow charts for GCD, Exponent Functions, Fibonacci Series using conditionals and iterative statements.
- External learning - Recursion vs. Iteration.

SUGGESTED EVALUATION METHODS:
- Tutorials on the above activities.
- Group discussion on external learning.

UNIT III  SIMPLE DATA STRUCTURES IN PYTHON  10

SUGGESTED ACTIVITIES:
- Implementing python program using lists, tuples, sets for the following scenario:
  - Simple sorting techniques
  - Student Examination Report
  - Billing Scheme during shopping.
- External learning - List vs. Tuple vs. Set – Implementing any application using all the three data structures.

SUGGESTED EVALUATION METHODS:
- Tutorials on the above activities.
- Group discussion on external learning component.

UNIT IV  STRINGS, DICTIONARIES, MODULES  10

SUGGESTED ACTIVITIES:
- Implementing Python program by importing Time module, Math package etc.
- Creation of any package (student’s choice) and importing into the application.

SUGGESTED EVALUATION METHODS:
- Tutorials on the above activities.

UNIT V  FILE HANDLING AND EXCEPTION HANDLING  7
Introduction to Files – File Path – Opening and Closing Files – Reading and Writing Files – File Position – Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions.

SUGGESTED ACTIVITIES:
- Developing modules using Python to handle files and apply various operations on files.
- Usage of exceptions, multiple except blocks - for applications that use delimiters like age, range of numerals etc.
- Implementing Python program to open a non-existent file using exceptions.

SUGGESTED EVALUATION METHODS:
- Tutorials on the above activities.
- Case Studies.

TOTAL: 45 PERIODS
COURSE OUTCOMES:
On completion of the course, students will be able to:
CO1: Develop algorithmic solutions to simple computational problems.
CO2: Develop and execute simple Python programs.
CO3: Write simple Python programs for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python lists, tuples, dictionaries etc.
CO6: Read and write data from/to files in Python programs.

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TEXT BOOKS:

REFERENCES:

EE5251 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING  L T P C
3 0 0 3

COURSE OBJECTIVES:
- To understand the basic concepts of electric circuits, magnetic circuits and wiring.
- To understand the operation of AC and DC machines.
- To understand the working principle of electronic devices and circuits.

UNIT I BASIC CIRCUITS AND DOMESTIC WIRING 9

UNIT II THREE PHASE CIRCUITS AND MAGNETIC CIRCUITS 9
UNIT III
ELECTRICAL MACHINES
Working principle of DC generator, motor-EMF and Torque equation-Types –Shunt, Series and
Compound-Applications. Working principle of transformer-EMF equation-Operating principles of
three phase and single phase induction motor-Applications. Working principles of alternator-EMF
equation-Operating principles of Synchronous motor, stepper motor-Applications.

UNIT IV
BASICS OF ELECTRONICS
Intrinsic semiconductors, Extrinsic semiconductors – P-type and N-type, P-N junction, VI
Characteristics of PN junction diode, Zener effect, Zener diode, Zener diode Characteristics-
Rectifier circuits-Wave shaping.

UNIT V
CURRENT CONTROLLED AND VOLTAGE CONTROLLED DEVICES
Working principle and characteristics - BJT, SCR, JFET, MOSFET.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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<tr>
<th>CO1</th>
<th>To be able to understand the concepts related with electrical circuits and wiring.</th>
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<tr>
<td>CO2</td>
<td>To be able to study the different three phase connections and the concepts of magnetic</td>
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<td>CO3</td>
<td>Capable of understanding the operating principle of AC and DC machines.</td>
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<td>CO4</td>
<td>To be able to understand the working principle of electronic devices such as diode and</td>
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<td>zener diode.</td>
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<td>CO5</td>
<td>To be able to understand the characteristics and working of current controlled and</td>
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TEXT BOOKS:
   Education, 2014
   Delhi, 1989.

REFERENCES:
   2017
COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:

1. Applying the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.
2. Applying the concept of reaction forces (non-concurrent coplanar and noncoplanar forces) and moment of various support systems with rigid bodies in 2D and 3D in equilibrium. Reducing the force, moment, and couple to an equivalent force - couple system acting on rigid bodies in 2D and 3D.
3. Applying the concepts of locating centroids/center of gravity of various sections / volumes and to find out area moments of inertia for the sections and mass moment of inertia of solids.
4. Applying the concepts of frictional forces at the contact surfaces of various engineering systems.
5. Applying the various methods of evaluating kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

UNIT I  STATICS OF PARTICLES (9+3)

UNIT II  EQUILIBRIUM OF RIGID BODIES (9+3)

UNIT III  DISTRIBUTED FORCES (9+3)
Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus-Guldinus, Distributed Loads on Beams, Centre of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies, Determination of Centroids of Volumes by Integration.
Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration, Polar Moment of Inertia, Radius of Gyration of an Area, Parallel-Axis Theorem, Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates, Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

UNIT IV  FRICTION (9+3)

UNIT V  DYNAMICS OF PARTICLES (9+3)

TOTAL  (L: 45 + T: 15)=60 PERIODS
COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Apply the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.
2. Apply the concept of reaction forces (non-concurrent coplanar and noncoplanar forces) and moment of various support systems with rigid bodies in 2D and 3D in equilibrium. Reducing the force, moment, and couple to an equivalent force - couple system acting on rigid bodies in 2D and 3D.
3. Apply the concepts of locating centroids / center of gravity of various sections / volumes and to find out area moments of inertia for the sections and mass moment of inertia of solids.
4. Apply the concepts of frictional forces at the contact surfaces of various engineering systems.
5. Apply the various methods of evaluating kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

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GE5252 தொழில்நுட்பம்  வினை வாழ்வு பொருட்கள்  கையடைவு கல்வியுரிமை

I. வாழ்வு வினை வாழ்வு பொருட்கள் வினை வாழ்வு பொருட்கள் கையடைவு கல்வியுரிமை:
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II. வாழ்வு வினை வாழ்வு பொருட்கள் வினை வாழ்வு பொருட்கள் கையடைவு கல்வியுரிமை:
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அலகு I வாழ்வு வினை வாழ்வு பொருட்கள் வினை வாழ்வு பொருட்கள் கையடைவு கல்வியுரிமை:
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அலகு II வாழ்வு வினை வாழ்வு பொருட்கள் வினை வாழ்வு பொருட்கள் கையடைவு கல்வியுரிமை:
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34
TEXT-CUM-REFERENCE BOOKS

1. Indian History - Part 1 (in Tamil: இந்தியக் கால்வரலைப்பு - கைித்தமிழ் பாப்பர்) (Published by: International Institute of Tamil Studies).

2. Tamil History - Part 2 (in Tamil: தமிழ் கால்வரலைப்பு - கைித்தமிழ் பாப்பர்) (Published by: International Institute of Tamil Studies).

3. Tamil History - Part 3 (in Tamil: தமிழ் கால்வரலைப்பு - கைித்தமிழ் பாப்பர்) (Published by: International Institute of Tamil Studies).

4. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

5. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).

6. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

7. Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

8. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)

9. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

UNIT I
WEAVING AND CERAMIC TECHNOLOGY
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Pottery.

UNIT II
DESIGN AND CONSTRUCTION TECHNOLOGY
Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT III
MANUFACTURING TECHNOLOGY

UNIT IV
AGRICULTURE AND IRRIGATION TECHNOLOGY
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific society.

UNIT V
SCIENTIFIC TAMIL & TAMIL COMPUTING

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS
1. தமிழியல் எளியத்துடன் – மக்கள் முன்னாளிடம் – ஒன்றிய பிரிவு (தமிழியல் கல்வியியல் மற்றும் பள்ளியியல்)
2. கல்வியியல் தமிழ் – முன்னாளிடம் தியா. தொகுப்பு (தமிழ் பிரிவு)
3. சுந்தரம் – எண்ணியல் திகழ்காண்பவை திகழ்த்துக்காண்பவை தாம் தாக்கியே (தமிழியல் தொழில் கல்வியியல்)
4. பாணத்து – தமிழக தர்க்கக்கேத்திய (தமிழியல் தொழில் கல்வியியல்)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
COURSE OBJECTIVES:
- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To articulate where computing strategies support in providing Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

EXPERIMENTS:
1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same.
2. Python programming using simple statements and expressions.
3. Scientific problems using Conditionals and Iterative loops.
4. Implementing real-time/technical applications using Lists, Tuples.
5. Implementing real-time/technical applications using Sets, Dictionaries.
6. Implementing programs using Functions.
7. Implementing programs using Strings.
9. Implementing real-time/technical applications using File handling.
10. Implementing real-time/technical applications using Exception handling.
12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 60 PERIODS

COURSE OUTCOMES:
On completion of the course, students will be able to:
CO1: Develop algorithmic solutions to simple computational problems
CO2: Develop and execute simple Python programs.
CO3: Structure simple Python programs for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python data structures.
CO6: Apply Python features in developing software applications.

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EE5261 ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY

COURSE OBJECTIVES:
1. To impart hands on experience in verification of circuit laws and measurement of circuit parameters
2. To train the students in performing various tests on electrical motors.
3. It also gives practical exposure to the usage of CRO, power sources & function generators
LIST OF EXPERIMENTS
1. Verification of Kirchhoff’s Law.
2. Steady state response of AC and DC circuits (Mesh, Node Analysis)
3. Frequency response of RLC circuits.
5. Regulation of single phase transformer.
6. Performance characteristics of DC shunt generator.
7. Performance characteristics of single phase induction motor.
10. Half wave and full wave Rectifiers.
11. Application of Zener diode as shunt regulator.
12. Characteristics of BJT and JFET.

TOTAL: 60 PERIODS

COURSE OUTCOMES:
1. To become familiar with the basic circuit components and know how to connect them to make a real electrical circuit;
2. Ability to perform speed characteristic of different electrical machines
3. Ability to use logic gates and Flip flops

GE5262 COMMUNICATION LABORATORY

OBJECTIVES
- To identify varied group discussion skills and apply them to take part in effective discussions in a professional context.
- To be able to communicate effectively through writing.

UNIT I
12
Speaking: Role Play Exercises Based on Workplace Contexts, - talking about competition- discussing progress toward goals-talking about experiences- talking about events in life- discussing past events-
Writing: writing emails (formal & semi-formal).

UNIT II
12
Speaking: discussing news stories-talking about frequency-talking about travel problems- discussing travel procedures- talking about travel problems- making arrangements-describing arrangements-discussing plans and decisions- discussing purposes and reasons- understanding common technology terms-
Writing: writing different types of emails.

UNIT III
12
Speaking: discussing predictions-describing the climate-discussing forecasts and scenarios- talking about purchasing-discussing advantages and disadvantages- making comparisons- discussing likes and dislikes- discussing feelings about experiences-discussing imaginary scenarios
Writing: short essays and reports-formal/semi-formal letters.

UNIT IV
12
Speaking: discussing the natural environment-describing systems-describing position and movement-explaining rules-(example- discussing rental arrangements)- understanding technical instructions-
Writing: writing instructions-writing a short article.

UNIT V
12
Speaking: describing things relatively-describing clothing-discussing safety issues( making recommendations) talking about electrical devices-describing controlling actions- Writing: job application( Cover letter + Curriculum vitae)-writing recommendations.

TOTAL: 60 PERIODS
LEARNING OUTCOMES

- Speak effectively in group discussions held in a formal/semi formal contexts.
- Write emails and effective job applications.

Assessment Pattern

- One online / app based assessment to test speaking and writing skills
- Proficiency certification is given on successful completion of speaking and writing.

MA5355 TRANFORM TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS

COURSE OBJECTIVES:

- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes;
- To introduce Fourier series analysis which is central to many applications in engineering;
- To develop the analytic solutions for partial differential equations used in engineering by Fourier series;
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic;
- To develop Z-transform techniques which will perform the same task for discrete time systems as Laplace Transform, a valuable aid in analysis of continuous time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS
Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Lagrange’s Linear equation – Solution of linear equations of higher order with constant coefficients – Linear non-homogeneous partial differential equations.

UNIT II FOURIER SERIES
Dirichlet’s conditions – General Fourier series – Odd and even functions – Half-range Sine and cosine series – Complex form of Fourier series – Parseval’s identity – Harmonic Analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION

UNIT IV FOURIER TRANSFORM

UNIT V Z-TRANSFORM AND DIFFERENCE EQUATIONS

TOTAL : 60 PERIODS

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

- Solve partial differential equations which arise in application problems.
- Analyze the functions as an infinite series involving sine and cosine functions.
- Obtain the solutions of the partial differential equations using Fourier series.
- Obtain Fourier transforms for the functions which are needed for solving application problems.
- Manipulate discrete data sequences using Z transform techniques.
TEXT BOOKS:

REFERENCES:

ML5352 MECHANICS OF MATERIALS

COURSE OBJECTIVES:
The main learning objective of this course is to prepare students for:

1. Applying the principle concepts behind stress, strain and deformation of solids for various engineering applications.
2. Analyzing the transverse loading on beams and stresses in beam for various engineering applications.
3. Analyzing the torsion principles on shafts and springs for various engineering applications.
4. Analyzing the deflection of beams for various engineering applications.
5. Analyzing the thin and thick shells and principal stresses in beam for various engineering applications.

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS
Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants – Volumetric strains

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM

UNIT III TORSION
Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts – Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

UNIT IV DEFORMATION OF BEAMS
Double Integration method – Macaulay’s method – Area moment Theorems for computation of slopes and deflections in beams - Conjugate beam and strain energy – Maxwell’s reciprocal theorems.

UNIT V THICK & THIN SHELLS & PRINCIPAL STRESSES
Stresses in thin cylindrical shell due to internal pressure, circumferential and longitudinal stresses and deformation in thin cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lamé’s theory – Application of theories of failure – Stresses on inclined planes – principal stresses and principal planes – Mohr’s circle of stress.

TOTAL: 45 PERIODS
COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Apply the principle concepts behind stress, strain and deformation of solids for various engineering applications.
2. Analyze the transverse loading on beams and stresses in beam for various engineering applications.
3. Analyze the torsion principles on shafts and springs for various engineering applications.
4. Analyze the deflection of beams for various engineering applications.
5. Analyze the thin and thick shells and principal stresses in beam for various engineering applications.

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ME5351 COMPUTER AIDED DESIGN L T P C 3 0 0 3

COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Applying the fundamental concepts of computer graphics and its tools in a generic framework.
2. Creating and manipulating geometric models using curves, surfaces and solids.
3. Applying concept of CAD systems for 3D modeling and visual realism.
4. Creating and adding geometric tolerances in assembly modeling.
5. Applying CAD standard practices in engineering design.

UNIT I FUNDAMENTALS OF COMPUTER GRAPHICS 9
Product cycle - Design process - Computer Aided Design – Computer graphics – co-ordinate systems- 2D and 3D transformations- homogeneous coordinates - graphic primitives (point, line, circle drawing algorithms) - Clipping- viewing transformation.

UNIT II GEOMETRIC MODELING 9
Representation of curves - Hermite cubic spline curve, Bezier curve, B-spline curves, Surface Modeling – Surface Entities, Representation of Surface, Bezier Surface, B-Spline Surface and Coons Surface. Solid Modeling - Solid Entities, Solid Representation, Boundary Representation (B-Rep), Sweeps Representation, Constructive Solid Geometry (CSG).
UNIT III VISUAL REALISM

UNIT IV PART ASSEMBLY
Mass properties - Assembly modeling – Inference of position and orientation –Geometric Dimensioning and Tolerancing – Functional importance of various types of fits, Geometrical dimensioning and Tolerancing, Tolerance stacking – types and remedies.

UNIT V CAD STANDARDS
Standards for computer graphics- Graphical Kernel System (GKS) - Open Graphics Library (OpenGL) - Data exchange standards - IGES, STEP, ACIS and DXF - communication standards.

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Apply the fundamental concepts of computer graphics and its tools in a generic framework.
2. Create and manipulating geometric models using curves, surfaces and solids.
3. Apply concept of CAD systems for 3D modeling and visual realism.
4. Create and adding geometric tolerances in assembly modeling.
5. Apply standard CAD practices in engineering design.

TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES:
- To impart knowledge on basics of metal cutting.
- To describe the basic principles of machine tools and processes.
- To elaborate abrasive and finishing operations.
- To be acquainted with design principles of jigs and fixtures and its applications.
- To outline basics of automation and structure of machine tools.

UNIT I INTRODUCTION TO MANUFACTURING AND MACHINING
9
Introduction to manufacturing and machining -classification of metal removal processes and machine tools - Mechanics of machining (Metal Cutting) - Geometry of single point cutting tools - Mechanism of chip formation - Orthogonal and oblique cutting - Machining forces and Merchants Circle Diagram and Analytical and experimental determination of cutting forces - Dynamometers for measuring cutting forces - Power - Cutting temperature - causes, effects, assessment and control - cutting fluid application - Machinability and surface finish - Failure of cutting tools and tool life - Cutting tool materials.

UNIT II MACHINE TOOLS AND PROCESSES
9

UNIT III ABRASIVE MACHINING AND FINISHING OPERATIONS
9
Abrasive Processes (Grinding) - Basic principles, Purpose and application of grinding - Selection of wheels and their conditioning - Classification of grinding machines and their uses - Super finishing processes - Honing, lapping and super finishing - Gear and thread Finishing

UNIT IV JIGS AND FIXTURES
9
Work holding devices, tool Holding devices and attachments - Jigs and Fixtures for machine shops - Purposes of jigs and fixtures and their design principles - Application of typical jigs and fixtures - case studies.

UNIT V MACHINE TOOL STRUCTURE TESTING AND AUTOMATION
9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course the students shall be able to:
- CO1: Apply the knowledge in the basics of metal cutting.
- CO2: Apply suitable machining processes based on requirements.
- CO3: To distinguish different finishing operations.
- CO4: Design jigs and fixtures as per requirements.
- CO5: Test the machine tool structure and differentiate various automation.

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TEXT BOOKS:

REFERENCES:

MF5351 THERMODYNAMICS 3 0 0 3

COURSE OBJECTIVES:
- To describe the basic concepts and first law of thermodynamics.
- To analyse the second law of thermodynamics.
- To evaluate the properties of pure substances.
- To gain knowledge on the concepts of conduction, convection and radiation.
- To apply the concepts of thermodynamics in IC engines, boilers, turbines, refrigeration and air-conditioning.

UNIT I BASICS CONCEPTS AND FIRST LAW OF THERMODYNAMICS 9
Basic concepts; Continuum and macroscopic approach; thermodynamic systems (closed and open); thermodynamic properties and equilibrium; state of a system, state postulate for simple compressible substances, paths and processes on state diagrams; concepts of heat and work, different modes of work; zeroth law of thermodynamics; concept of temperature. First Law of Thermodynamics; Concept of energy and various forms of energy; internal energy, enthalpy; specific heats; first law applied to elementary processes, closed systems and control volumes, steady and unsteady flow analysis.

UNIT II SECOND LAW OF THERMODYNAMICS 9
Second law of thermodynamics; Limitations of the first law of thermodynamics, concepts of heat engines and heat pumps/refrigerators, Kelvin-Planck and Clausius statements and their equivalence; reversible and irreversible processes; Carnot cycle and Carnot theorems; thermodynamic temperature scale; Clausius inequality and concept of entropy; the principle of increase of entropy, T-s diagrams; second law analysis of control volume; availability and irreversibility; third law of thermodynamics.

UNIT III PROPERTIES OF PURE SUBSTANCE 9
Thermodynamic properties of pure substances in solid, liquid and vapour phases; P-v-T behaviour of simple compressible substances, thermodynamic property tables and charts, psychrometric charts ideal and real gases : Vander waals equations - Reduced property - Compressibility chart - Properties of mixture of gases - Dalton’s law and Gibbs - Internal energy, Enthalpy and specific heats of gas mixtures.
UNIT IV  HEAT TRANSFER  9

UNIT V  APPLICATIONS  9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course the students shall be able to:
- CO1. Apply first law of thermodynamics to engineering applications.
- CO2. Differentiate first and second law of thermodynamics.
- CO3. Estimate the properties of real and ideal gas mixtures using thermodynamic charts.
- CO4. Evaluate the heat transfer through conduction, convection and radiation
- CO5. Analyse the operation of IC engine, boilers, turbine, refrigerator etc.

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TEXT BOOKS:

REFERENCES:

ME5361  COMPUTER AIDED MACHINE DRAWING  L T P C
0 0 4 2

COURSE OBJECTIVES:
The main learning objective of this course is to provide hands on training to the students in:
1. Applying standard drawing practices using fits and tolerances.
4. Preparing standard drawing layout for modeled parts or assemblies with BoM.
PART I  DRAWING STANDARDS & FITS AND TOLERANCES  4

PART II  2D DRAFTING  56
Drawing, Editing, Dimensioning, Layering, Hatching, Block, Array, Detailing, Detailed Drawing.
1. Bearings – Bush Bearing
3. Couplings – Flange, Oldham’s, Muff, Gear couplings.
5. Engine parts – Piston, Connecting Rod, Crosshead (vertical and horizontal), Stuffing box, Multi-plate clutch.

Total: 20% of classes for theory classes and 80% of classes for practice
Note: 25% of assembly drawings must be done manually and remaining 75% of assembly drawings must be done by using any CAD software. The above tasks can be performed manually and using standard commercial 2D CAD software.

TOTAL (L: 4 + P: 56) = 60 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Apply standard drawing practices using fits and tolerances.
3. Model orthogonal views of assembled components.
4. Prepare standard drawing layout for modeled parts or assemblies with BoM.

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ME5461  MANUFACTURING TECHNOLOGY LABORATORY  L T P C
0 0 4 2

COURSE OBJECTIVES:
The main learning objective of this course is to provide hands on training to the students in:
1. Selecting appropriate tools, equipments and machines to complete a given job.
2. Performing various welding process using GMAW.
3. Performing various machining process such as rolling, drawing, turning, shaping, drilling, milling.
5. Analyzing the defects in the cast and machined components.

LIST OF EXPERIMENTS
1. Fabricating simple structural shapes using Gas Metal Arc Welding machine.
2. Preparing green sand moulds with cast patterns.
3. Casting aluminum parts using stir casting machine.
4. Reducing the thickness of the plates using rolling machine.
5. Reducing the diameter of on circular parts using wire drawing process machine.
6. Taper Turning and Eccentric Turning on circular parts using lathe machine.
7. Knurling, external and internal thread cutting on circular parts using lathe machine.
8. Shaping – Square and Hexagonal Heads on circular parts using shaper machine.
11. Cutting spur and helical gear using milling machine.
15. Broaching components using broaching machine.

TOTAL = 60 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Select appropriate tools, equipments and machines to complete a given job.
2. Perform various welding process using GMAW.
3. Perform various machining process such as rolling, drawing, turning, shaping, drilling, milling.
5. Analyze the defects in the cast and machined components.

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GE5361 PROFESSIONAL DEVELOPMENT

OBJECTIVES:
- To be proficient in important Microsoft Office tools: MS WORD, EXCEL, POWERPOINT.
- To be proficient in using MS WORD to create quality technical documents, by using standard templates, widely acceptable styles and formats, variety of features to enhance the presentability and overall utility value of content.
- To be proficient in using MS EXCEL for all data manipulation tasks including the common statistical, logical, mathematical etc., operations, conversion, analytics, search and explore, visualize,interlink, and utilizing many more critical features offered.
- To be able to create and share quality presentations by using the features of MS PowerPoint, including: organization of content, presentability, aesthetics, using media elements and enhance the overall quality of presentations.

MS WORD:
Create and format a document
Working with tables
Working with Bullets and Lists
Working with styles, shapes, smart art, charts
Inserting objects, charts and importing objects from other office tools
Creating and Using document templates
Inserting equations, symbols and special characters
Working with Table of contents and References, citations
Insert and review comments
Create bookmarks, hyperlinks, endnotes footnote

10 Hours
Viewing document in different modes
Working with document protection and security
Inspect document for accessibility

**MS EXCEL:**
10 Hours
Create worksheets, insert and format data
Work with different types of data: text, currency, date, numeric etc.
Split, validate, consolidate, Convert data
Sort and filter data
Perform calculations and use functions: (Statistical, Logical, Mathematical, date, Time etc.)
Work with Lookup and reference formulae
Create and Work with different types of charts
Use pivot tables to summarize and analyse data
Perform data analysis using own formulae and functions
Combine data from multiple worksheets using own formulae and built-in functions to generate results
Export data and sheets to other file formats
Working with macros
Protecting data and Securing the workbook

**MS POWERPOINT:**
10 Hours
Select slide templates, layout and themes
Formatting slide content and using bullets and numbering
Insert and format images, smart art, tables, charts
Using Slide master, notes and handout master
Working with animation and transitions
Organize and Group slides
Import or create and use media objects: audio, video, animation
Perform slideshow recording and Record narration and create presentable videos

**TOTAL: 30 PERIODS**

**OUTCOMES:**
On successful completion the students will be able to
- Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements
- Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements and visualize data for ease of understanding
- Use MS PowerPoint to create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects.

**GE5251  ENVIRONMENTAL SCIENCES**

**COURSE OBJECTIVES:**
- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and non-renewable resources, causes of their degradation and measures to preserve them.
- To familiarize the influence of societal use of resources on the environment and introduce the legal provisions, National and International laws and conventions for environmental protection.
- To inculcate the effect of population dynamics on human and environmental health and inform about human right, value education and role of technology in monitoring human and environmental issues.
UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY
Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – bio geographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies – Land resources: Land as a resource, land 47 degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

TOTAL: 45 PERIODS

COURSE OUTCOMES:
- To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.
- To identify the causes, effects and environmental pollution and natural disasters and contribute to the preventive measures in the immediate society.
To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.
To recognize different forms of energy and apply them for suitable applications in for technological advancement and societal development.
To demonstrate the knowledge of societal activity on the long and short term environmental issues and abide by the legal provisions, National and International laws and conventions in professional and personal activities and to identify and analyse effect of population dynamics on human value education, consumerism and role of technology in environmental issues.

TEXT BOOKS:

REFERENCES:

CE5251 FLUID MECHANICS AND MACHINERY

COURSE OBJECTIVE:
To introduce the students about properties of the fluids, behaviour of fluids under static conditions and to impart basic knowledge of the dynamics of fluids and to expose to the applications of the conservation laws to a) flow measurements b) flow through pipes (both laminar and turbulent) and c) forces on pipe bends with an exposure to the significance of boundary layer theory and its thicknesses with expose to basic principles of working of hydraulic machineries and to design Pelton wheel, Francis and Kaplan turbine, centrifugal and reciprocating pumps.

UNIT I FLUID PROPERTIES AND FLOW CHARACTERISTICS 10
Properties of fluids- Pressure Measurements-Buoyancy and floatation-Flow characteristics-Eulerian and Lagrangian Principle of fluid flow— concept of control volume and system – Reynold’s transportation theorem- continuity equation, energy equation and momentum equation-Applications.

UNIT II FLOW THROUGH PIPES AND BOUNDARY LAYER 9

UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES 7
Fundamental dimensions - Dimensional homogeneity - Rayleigh’s method and Buckingham Pi theorem - Dimensionless parameters - Similitude and model studies - Distorted and undistorted models.
UNIT IV TURBINES

UNIT V PUMPS
Classification of pumps- Centrifugal pumps– working principle - Heads and efficiencies– Velocity triangles- Work done by the impeller - performance curves - Reciprocating pump working principle – indicator diagram and it’s variations – work saved by fitting air vessels.

COURSE OUTCOMES:
On completion of the course, the student is expected to be able to
CO1 Understand the difference between solid and fluid, its properties and behaviour in static conditions.
CO2 Understand the conservation laws applicable to fluids and its application through fluid kinematics and dynamics.
CO3 Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performances of prototype by model studies.
CO4 Estimate losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel.
CO5 Understand the concept of boundary layer and its application to find the drag force excreted by the fluid on the flat solid surface.

TEXT BOOKS:

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### ME5452 MECHANICS OF MACHINES

**L T P C**  
3 0 0 3

#### COURSE OBJECTIVES:
1. To understand the principles in the formation of mechanisms and their kinematics.
2. To learn the basic concepts of toothed gearing and kinematics of gear trains.
3. To study the effect of friction in different machine elements.
4. To analyze the forces and torque acting on simple mechanical systems.
5. To understand the importance of balancing and vibration.

#### UNIT I KINEMATIC ANALYSIS IN SIMPLE MECHANISMS AND CAMS

#### UNIT II TOOTHED GEARING AND GEAR TRAINS

#### UNIT III FRICTION ASPECTS IN MACHINE COMPONENTS

#### UNIT IV STATIC AND DYNAMIC FORCE ANALYSIS

#### UNIT V BALANCING OF ROTATING MASSES AND VIBRATION

**TOTAL: 45 PERIODS**

#### COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Design the linkages and the cam mechanisms for specified output motions.
2. Determine the gear parameters of toothed gearing and speeds of gear trains in various applications.
3. Evaluate the frictional torque in screw threads, clutches, brakes and belt drives.
4. Determine the forces on members of mechanisms during static and dynamic equilibrium conditions.
5. Determine the balancing masses on rotating machineries and the natural frequencies of free and forced vibratory systems.
TEXT BOOK

REFERENCES

MF5401 CASTING AND WELDING TECHNOLOGY L T P C
3 0 0 3

COURSE OBJECTIVES:
- To impart the basics of casting.
- To introduce various casting processes
- To be acquainted with design of gating system and to obtain defect free castings
- To elaborate various welding methods including advanced techniques, with emphasis on basic principles, limitations and application.
- To outline metallurgical aspects of welding and its defects.

UNIT I BASICS OF CASTING
Metals cast in the foundry- Ingot casting; Continuous casting and Shape casting-Factors determine the selection of a casting alloy-Introduction to shape casting process & steps involved-Patterns: Definition, classification, materials used for pattern, various pattern allowances and their importance—Sand molding: Types of base sand, requirement of base sand-testing-Binder-Additives, need and types- Preparation of sand molds: Molding machines- Jolt type, squeeze type and sand slinger--Cores: Definition, need, types. Method of making cores

UNIT II CASTING PROCESSES
Study of important molding process with advantages & limitations of casting processes.: classification of casting Processes-Sand mould: Green sand- Core sand- Dry sand- Sweep mold- CO2 mold—Casting using metal molds: Gravity die casting, Pressure die casting, Centrifugal casting, squeeze casting, Slush casting, Thixocasting-Precision Moulds: Shell mold, Investment mold, Plaster mold, Cement bonded mold.-

UNIT III GATING SYSTEM SOLIDIFICATION AND CASTING DEFECTS
Concept of gating (Top, bottom, parting line, horn gate) and risering (Open, blind) -Functions and types. -Melting Furnaces-Solidification: definition, nucleation, solidification variables, directional Solidification-Need and methods. Degasification in liquid Metals-Sources of gas, degasification methods. -Fettling and cleaning of castings: Basic steps involved. -Sand casting defects- causes, features and remedies.

UNIT IV WELDING PROCESSES
UNIT V  METALLURGICAL ASPECTS IN WELDING AND ITS DEFECTS

Structure of welds, Formation of different zones during welding, Heat Affected Zone (HAZ), Parameters affecting HAZ. Effect of carbon content on structure and properties of steel, Shrinkage in welds & Residual stresses-Pre and Post Weld Treatments- Welding defects- Detection, causes & remedy.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course the students shall be able to:

- CO1: Gain basic knowledge in casting.
- CO2: Select suitable casting process for application requirement.
- CO3: Apply gating design and mould design knowledge to overcome defects in casting.
- CO4: Select suitable welding process according to the requirements.
- CO5: Apply metallurgical aspects of welding to overcome defects in welding.

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TEXT BOOKS:

REFERENCES:

ML5351  ENGINEERING MATERIALS AND METALLURGY

COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Constructing the phase diagram and using of iron-iron carbide phase diagram for microstructure formation.
2. Selecting and applying various heat treatment processes and its microstructure formation.
3. Applying the different types of ferrous and non-ferrous alloys and their uses in engineering field.
4. Applying the different polymer, ceramics and composites and their uses in engineering field.
5. Applying the various testing procedures and failure mechanism in engineering field.
UNIT I  CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS  9

UNIT II  HEAT TREATMENT  9

UNIT III  FERROUS AND NON-FERROUS METALS  9
Effect of alloying additions on steel (Mn, Si, Cr, Mo, V Ti & W) – stainless and tool steels – HSLA - Maraging steels – Grey, white, malleable, spheroidal – alloy cast irons, Copper and its alloys – Brass, Bronze and Cupronickel – Aluminium and its alloys; Al-Cu – precipitation strengthening treatment – Titanium alloys, Mg-alloys, Ni-based super alloys – shape memory alloys- Properties and Applications

UNIT IV  NON-METALLIC MATERIALS  9

UNIT V  MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS  9

TOTAL = 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Construct the phase diagram and using of iron-iron carbide phase diagram for microstructure formation.
2. Select and applying various heat treatment process and its microstructure formation.
3. Apply the different types of ferrous and non-ferrous alloys and their uses in engineering field.
4. Apply the different polymer, ceramics and composites and their uses in engineering field.
5. Apply the various testing procedures and failure mechanism in engineering field.

TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES:

- To impart practical knowledge of heat treatment processes.
- To elaborate the effect of various parameters on heat treatment process
- To get conversant with the microstructural changes
- To familiarize with hardness evaluation
- To gain practical knowledge on heat treatment of various materials.

LIST OF EXPERIMENTS:
1. Annealing and normalising of hardened steels
2. Spheroidization annealing of high carbon steels
3. Effect of quenching media on hardening of steel
4. Effect of tempering temperature and time on tempering of steel
5. Effect of carbon percentage on the hardness of steel
6. Carburizing – Low carbon steel
7. Case hardness depth measurements
8. Austempering treatment
9. Hardenability test – Jominy End Quench Test
10. Heat treatment of cast iron
11. Heat treatment of Stainless Steels and High speed steels
12. Heat treatment of non-ferrous alloys

TOTAL: 30 PERIODS

COURSE OUTCOMES:
At the end of this course students can able to:

CO1. Demonstrate the various heat treatment processes.
CO2. Evaluate the microstructural changes and hardness during heat treatment.
CO3. Analyse the influence of various parameters on heat treatment process
CO4. Differentiate the heat treatment process of ferrous and non-ferrous alloys.
CO5. Work in R&D activity in the field of materials science
COURSE OBJECTIVES:
1. To study the mechanical properties of materials when subjected to different types of loading.
2. To verify the principles studied in Fluid Mechanics theory by performing experiments in lab.

PART – I STRENGTH OF MATERIALS

LIST OF EXPERIMENTS
1. Tension test on mild steel rod
2. Torsion test on mild steel rod
3. Hardness test on metal beam (Rockwell and Brinell Hardness Tests)
4. Compression test on helical spring
5. Deflection test on carriage spring

PART – II FLUID MECHANICS AND MACHINES LABORATORY

LIST OF EXPERIMENTS

A. FLOW MEASUREMENT
1. Verification of Bernoulli’s theorem
2. Flow through orifice/venturi meter
3. Friction factor for flow through pipes
4. Impact of jet on fixed plate

B. METACENTER
5. Determination of metacentric height

C. PUMPS
6. Characteristics of centrifugal pumps
7. Characteristics of gear pump
8. Characteristics of submersible pump
9. Characteristics of reciprocating pump

D. TURBINES
10. Characteristics of Pelton wheel turbine

TOTAL: 60 PERIODS

COURSE OUTCOMES:
On completion of the course, the student is expected to be able to
1. Perform Tension, Torsion, Hardness, Compression, and Deformation test on Solid materials.
2. Use the measurement equipment’s for flow measurement.
3. Perform test on different fluid machinery.
4. Verify and apply Bernoulli equation for flow measurement like orifice/venturi meter.
5. Measure friction factor in pipes and compare with Moody diagram and verify momentum conservation law.
6. Determine the performance characteristics of rotodynamic pumps.
7. Determine the performance characteristics of positive displacement pumps.
8. Determine the performance characteristics of turbine.

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<td>PSO2 Critical analysis of Civil Engineering problems and innovation</td>
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<td>PSO3 Conceptualization and evaluation of engineering solutions to Civil Engineering issues</td>
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L - Low, M - Medium, H - High

GE5451 TOTAL QUALITY MANAGEMENT L T P C 3 0 0 3

COURSE OBJECTIVES:
- Teach the need for quality, its evolution, basic concepts, contribution of quality gurus, TQM framework, Barriers and Benefits of TQM.
- Explain the TQM Principles for application.
- Define the basics of Six Sigma and apply Traditional tools, New tools, Benchmarking and FMEA.
- Describe Taguchi’s Quality Loss Function, Performance Measures and apply Techniques like QFD, TPM, COQ and BPR.
- Illustrate and apply QMS and EMS in any organization.

UNIT I INTRODUCTION 9
Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality --Definition of TQM-- Basic concepts of TQM - Gurus of TQM (Brief introduction) -- TQM Framework- Barriers to TQM --Benefits of TQM.
UNIT II 

TQM PRINCIPLES

Leadership - Deming Philosophy, Quality Council, Quality statements and Strategic planning - 
Customer Satisfaction –Customer Perception of Quality, Feedback, Customer complaints, Service 
Quality, Kano Model and Customer retention – Employee involvement – Motivation, 
Empowerment, Team and Teamwork, Recognition & Reward and Performance Appraisal-- 
Continuous process improvement –Juran Trilogy, PDSA cycle, 5S and Kaizen - Supplier 
partnership – Partnering, Supplier selection, Supplier Rating and Relationship development.

UNIT III 

TQM TOOLS & TECHNIQUES I

The seven traditional tools of quality - New management tools - Six-sigma Process Capability-
Bench marking - Reasons to benchmark, Benchmarking process, What to Bench Mark, 
Understanding Current Performance, Planning, Studying Others, Learning from the data, Using the 
findings, Pitfalls and Criticisms of Benchmarking - FMEA - Intent , Documentation, Stages: Design 
FMEA and Process FMEA.

UNIT IV 

TQM TOOLS & TECHNIQUES II

Quality circles – Quality Function Deployment (QFD) - Taguchi quality loss function – TPM – 
Concepts, improvement needs – Performance measures - Cost of Quality - BPR.

UNIT V

QUALITY MANAGEMENT SYSTEM

Introduction-Benefits of ISO Registration-ISO 9000 Series of Standards-Sector-Specific Standards - 
AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements-Implementation-Documentation-
Internal Audits-Registration-ENVIRONMENTAL MANAGEMENT SYSTEM: Introduction—ISO 
14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001-Benefits of EMS.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1: Ability to apply TQM concepts in a selected enterprise. 
CO2: Ability to apply TQM principles in a selected enterprise. 
CO3: Ability to understand Six Sigma and apply Traditional tools, New tools, Benchmarking and 
FMEA. 
CO4: Ability to understand Taguchi’s Quality Loss Function, Performance Measures and apply 
QFD, TPM, COQ and BPR. 
CO5: Ability to apply QMS and EMS in any organization.

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TEXT BOOK:

1. Dale H.Besterfield, Carol B.Michna,Glen H. Bester field, Mary B. Sacre, Hemant Urdhwareshe and 
Rashmi Urdhwareshe, “Total Quality Management”, Pearson Education Asia, Revised Third 

REFERENCES:

Heinemann Ltd, 2016.
2003.
2006.
COURSE OBJECTIVES:
- To impart the basics of metrology, measurement concepts and perform measurement tasks accurately.
- To identify the right measurement practices for linear and angular measurements.
- To be familiarized with the right instrument and method of measurement for surface finish and form measurements.
- To describe the various measurement techniques using laser metrology.
- To gain knowledge on computer aided inspection and advances in metrology.

UNIT I BASIC CONCEPTS OF MEASUREMENTS
Important terminologies - Elements of measurements, need for measurement - Factors influencing measurements - Precision and Accuracy - Methods of measurement - Errors in measurements - Causes - Standards and Calibration - Types-Handling of measuring instruments - Do's and Don'ts - Maintenance of Instruments - Clean room.

UNIT II LINEAR AND ANGULAR MEASUREMENTS

UNIT III SURFACE FINISH AND FORM MEASUREMENTS
Measurement of various elements of screw threads and gears - Radius measurement - Surface finish measurement - Straightness, Flatness and roundness- Principles - Application – Computerized form measuring equipments.

UNIT IV LASER METROLOGY

UNIT V COMPUTER AIDED INSPECTION AND ADVANCES IN METROLOGY

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course, the student shall be able to:
- CO1: Recognize the basics of metrology, measurement concepts and perform measurement tasks accurately.
- CO2: Identify the right measurement practices for linear and angular measurements.
- CO3: Identify the right instrument and method of measurement for surface finish and form measurements.
- CO4: Describe various measurement techniques using laser metrology.
- CO5: Recognize the computer aided inspection and advances in metrology.

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TEXT BOOKS:

REFERENCES:

MF5502 METAL AND POWDER FORMING

COURSE OBJECTIVES:
- To describe types of deformations and classification of forming processes.
- To classify and explain bulk forming processes.
- To describe sheet metal forming processes.
- To distinguish differences between conventional forming and special forming processes.
- To elaborate various stages involved in the powder forming processes.

UNIT I INTRODUCTION
Mechanical behavior of materials - Elastic and plastic deformations - Classification of forming processes - Temperature in metal working: Cold, Warm and hot working - Introduction to the theory of plastic deformation.

UNIT II BULK FORMING
Introduction - Plastic deformation in forging, rolling, extrusion, rod/wire, tube drawing and swaging processes and their applications - Effect of friction, calculation of forces, work done, process parameters, equipment’s and defects - Design for manufacturing - Economics of bulk forming.

UNIT III SHEET METAL FORMING

UNIT IV SPECIAL FORMING
Orbital forging - Isothermal forging - Hot and cold Isostatic pressing - High speed extrusion - High speed forming machines - Rubber pad forming - Water hammer forming - Fine blanking - Incremental forming and comparing the above with conventional forming.

UNIT V POWDER FORMING

TOTAL: 45 PERIODS
COURSE OUTCOMES:
At the end of this course the students will be able to:

- CO1: Illustrate deformation types and classification of forming processes.
- CO2: Describe bulk forming processes and their applications.
- CO3: Elaborate different sheet metal forming processes and their applications.
- CO4: Compare and distinguish conventional and special forming processes.
- CO5: Discuss powder forming processes and its applications.

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TEXT BOOKS:

REFERENCES:

ME5553  MACHINE DESIGN  L T P C  3 1 0 4

COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Designing machine members subjected to static loads.
2. Designing shafts, couplings, welded joints, riveted joints and bearings for various applications.
3. Designing helical springs, flywheels, connecting rods and crankshafts for various applications.
4. Designing flexible elements like belt, ropes and chain drives for engineering applications.
5. Designing spur, helical gear drives and multi speed gear box for power transmission.

UNIT I  STEADY STRESSES IN MACHINE MEMBERS  9+3
Introduction to the design process - factor influencing machine design, selection of materials based on mechanical properties - Preferred numbers, fits and tolerances – Direct, Bending and torsional stress equations – Impact and shock loading – calculation of principle stresses for various load combinations, eccentric loading -Factor of safety - theories of failure – Design based on strength and stiffness.
UNIT II SHAFTS, COUPLINGS, JOINTS AND BEARINGS 9+3
Design of solid and hollow shafts based on strength, rigidity and critical speed – Keys, key ways and splines – Rigid and flexible couplings. Threaded fasteners, Welded joints and riveted joints for structures, Sliding contact and rolling contact bearings (Simple problems)

UNIT III ENERGY STORING ELEMENTS AND ENGINE COMPONENTS 9+3
Various types of springs, optimization of helical springs - Flywheels considering stresses in rims and arms for engines and punching machines- Connecting Rods and crank shafts.

UNIT IV DESIGN FOR FLEXIBLE ELEMENTS 9+3
Design of Flat belts and pulleys - Selection of V belts and pulleys – Selection of hoisting wire ropes and pulleys – Design of Transmission chains and Sprockets.

UNIT V SPUR GEARS, HELICAL GEARS AND GEAR BOXES 9+3

TOTAL: 60 PERIODS

Note: (Use of P S G Design Data Book is permitted in the University examination)

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Design machine members subjected to static loads.
2. Design shafts, couplings, welded joints, riveted joints and bearings for various applications.
3. Design helical springs, flywheels, connecting rods and crankshafts for various applications.
4. Design flexible elements like belt, ropes and chain drives for engineering applications.
5. Design spur, helical gear drives and multi speed gear box for power transmission.

TEXT BOOK:

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COURSE OBJECTIVES:
- To gain practical experience in studying gear trains and mechanisms
- To get exposure in determining mass moment of inertia and studying gyroscopes and cams
- To expose the students to different types of governors
- To impart knowledge to determine natural frequency of free and forced vibratory systems

LIST OF EXPERIMENTS
3. Determination of Mass moment of inertia of Fly wheel and Axle system.
4. Determination of Mass Moment of Inertia of axisymmetric bodies using Turn table apparatus.
7. Governor - Determination of range sensitivity and effort for Watts, Porter, Proell, and Hartnell Governors.
8. Cams – Cam profile drawing, Motion curves and study of jump phenomenon
11. Determination of torsional natural frequency of single and double rotor systems - Undamped and Damped Natural frequencies.
12. Vibration of Equivalent Spring mass system – undamped and damped vibration.
15. Forced Vibration of Cantilever beam – Mode shapes and natural frequencies.

TOTAL: 60 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. measure gear parameters and velocity ratios of gear trains
2. determine mass moment of inertia of flywheel and axle system, axisymmetric bodies and pendulum
3. determine gyroscopic couple and various parameters of governors
4. determine natural frequency of free and forced vibratory systems

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**COURSE OBJECTIVES:**

- To familiarize the basic concepts in various methods of engineering measurement techniques and applications.
- To make students familiar with the fundamental principles of measuring techniques by practicing exercises on various measuring instruments.
- To gain knowledge on metallographic study of the given samples and heat treatment study of steel.
- To familiarize the importance of measurement and inspection in manufacturing industries.
- To train the students with advanced metrological devices.

**LIST OF EXPERIMENTS - METROLOGY LAB:**

1. Checking the straightness of component using Autocollimator.
3. Tool Makers microscope-Element measurement of components.
5. Exercises in Microhite.
9. Study Exercises in Video measuring system and CMMs.
10. Study Exercises on 3D Roughness measurement - Non Contact.

**COURSE OUTCOMES:**

At the end of this course the student will be able to:

CO1: Recognize the importance of various technical terms and perform measurement tasks accurately.

CO2: Identify the right instrument and method of measurement for a particular application.

CO3: Follow the right procedure for measurement of various components depending upon the applications.

CO4: Describe the microstructure features of specimens and correlate with their macroscopic behaviour.

CO5: Recognize the fundamental concepts of measurement, standards, calibration, maintenance of laboratory facilities and handling of equipments

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COURSE OBJECTIVES:
- To familiarize students with real life situations in industrial organizations
- To accelerate the learning process
- To train the students in utilizing their knowledge in a realistic way
- To gain practical knowledge on organization structure
- To experience and understand real life situations

DURATION:
The students have to undergo practical industrial training for four weeks (During Fourth Semester holidays) in recognized industrial establishments.

I. At the end of the training they have to submit a report with following information:
   1. Profile of the Industry,
   2. Product range,
   3. Organization structure,
   4. Plant layout,
   5. Processes/Machines/Equipment/devices,
   6. Personnel welfare schemes,
   7. Details of the training undergone,
   8. Projects undertaken during the training, if any
   9. Learning points.

II. End Semester examination will be a Viva-Voce Examination during Fifth Semester

COURSE OUTCOMES:
At the end of the course the student will be able to
- Recognize the different forms of organization
- Realize the functions of management
- Foresee group dynamics
- Discuss the modern concepts in industrial management.
- Develop skills to read, write and comprehend

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COURSE OBJECTIVES:
- To classify non-traditional machining processes and describe mechanical energy based non-traditional machining processes.
- To differentiate chemical and electro chemical energy based processes.
- To describe thermo-electric energy based processes.
- To explain nano finishing processes.
- To introduce hybrid non-traditional machining processes and differentiate hybrid non-traditional machining processes.

UNIT I  INTRODUCTION AND MECHANICAL ENERGY BASED PROCESSES  9
Introduction - Need for non-traditional machining processes - Classification of non-traditional machining processes - Applications, advantages and limitations of non-traditional machining processes - Abrasive jet machining, Abrasive water jet machining, Ultrasonic machining their principles, equipment, effect of process parameters, applications, advantages and limitations.

UNIT II  CHEMICAL AND ELECTRO CHEMICAL ENERGY BASED PROCESSES  9
Principles, equipments, effect of process parameters, applications, advantages and limitations of Chemical machining, Electro-chemical machining, Electro-chemical honing, Electro-chemical grinding, Electro chemical deburring.

UNIT III  THERMO-ELECTRIC ENERGY BASED PROCESSES  9
Principles, equipments, effect of process parameters, applications, advantages and limitations of Electric discharge machining, Wire electric discharge machining, Laser beam machining, Plasma arc machining, Electron beam machining, Ion beam machining.

UNIT IV  NANO FINISHING PROCESSES  9
Principles, equipments, effect of process parameters, applications, advantages and limitations of Abrasive flow machining – Chemo mechanical polishing, Magnetic abrasive finishing, Magnetorheological finishing, Magneto rheological abrasive flow finishing.

UNIT V  HYBRID NON-TRADITIONAL MACHINING PROCESSES  9
Introduction - Various hybrid non-traditional machining processes, their working principles, equipments, effect of process parameters, applications, advantages and limitations. Selection and comparison of different non-traditional machining processes.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course the students shall be able to:
- CO1: Formulate different types of non-traditional machining processes and evaluate mechanical energy based non-traditional machining processes.
- CO2: Illustrate chemical and electro chemical energy based processes.
- CO3: Evaluate thermo-electric energy based processes.
- CO4: Interpret nano finishing processes.
- CO5: Analyse hybrid non-traditional machining processes and differentiate non-traditional machining processes.

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TEXT BOOKS:

REFERENCES:

MF652 ADDITIVE MANUFACTURING L T P C 3 0 0 3

COURSE OBJECTIVES:
- To introduce the development of Additive Manufacturing (AM), various business opportunities and applications
- To familiarize various software tools, processes and techniques to create physical objects that satisfy product development / prototyping requirements, using AM.
- To be acquainted with vat polymerization and material extrusion processes.
- To be familiar with powder bed fusion and direct energy deposition.
- To gain knowledge on applications of binder jetting, material jetting and laminated object manufacturing processes

UNIT I INTRODUCTION 9

UNIT II DESIGN FOR ADDITIVE MANUFACTURING (DFAM) 9

UNIT III VAT POLYMERIZATION AND MATERIAL EXTRUSION 9

UNIT IV POWDER BED FUSION AND DIRECT ENERGY DEPOSITION 9
UNIT V OTHER ADDITIVE MANUFACTURING PROCESSES


COURSE OUTCOMES:
At the end of this course students shall be able to:

- CO1: Recognize the development of AM technology and how AM technology propagated into various businesses and developing opportunities.
- CO2: Acquire knowledge on process of transforming a concept into the final product in AM technology.
- CO3: Elaborate the vat polymerization and material extrusion processes and its applications.
- CO4: Acquire knowledge on process and applications of powder bed fusion and direct energy deposition.
- CO5: Evaluate the advantages, limitations, applications of binder jetting, material jetting and laminated object manufacturing processes.

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TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES:
- To introduce the evolution, types and principles of CNC machine tools
- To familiarize the students with constructional features of CNC machine tools
- To acquaint the students with various drives and axis measuring systems used in CNC machine tools
- To gain knowledge on manual part program and generation of CNC part program using CAM packages
- To familiarize the students with various tooling and work holding devices used in CNC machine tools

UNIT I  INTRODUCTION TO CNC MACHINE TOOLS  9
Evolution of CNC Technology - principles - features - advantages - applications - CNC and DNC concept - CNC controllers - characteristics - interpolators - types of CNC Machines - construction / operation, machine specification of turning centre - machining centre (3 and higher axes) - grinding machine - vertical turret lathe - turn-mill centre – multitask machines

UNIT II  STRUCTURE OF CNC MACHINE TOOL  9
CNC Machine building - structural details - configuration and design - guide ways – Friction, Anti friction and other types of guide ways - elements used to convert the rotary motion to a linear motion - Screw and nut - recirculating ball screw - spindle assembly - torque transmission elements - gears - timing belts - flexible couplings - Bearings.

UNIT III  DRIVES AND CONTROLS  9

UNIT IV  CNC PROGRAMMING  9
Coordinate system - structure of a CNC part program - G & M Codes - tool length compensation - cutter radius and tool nose radius compensation - mirror image - canned cycles- programming for machining centre and turning centre for well known controllers - generation of CNC codes from CAM packages.

UNIT V  TOOLING AND WORK HOLDING DEVICES  9
Cutting tool materials for CNC machine tools- hard metal insert tooling- inserts and tool holder classification - qualified - semi qualified and preset tooling - ATC - APC - tooling for machining and turning centre - silent tool - work holding devices for rotating and fixed work parts- use of probes in CNC machines - economics of CNC - maintenance of CNC machines.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course, the students shall be able to:
- CO1: Recognize the evolution, types and principle of CNC machine tools
- CO2: Acquire knowledge on constructional features of CNC machine tools
- CO3: Identify drives and axis measuring system used in CNC machine tools
- CO4: Demonstrate competency in manual part program and generation of CNC part program using CAM packages
- CO5: Elaborate various tooling and work holding devices used in CNC machine tools

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REFERENCES:

MF5611 COMPUTER AIDED MANUFACTURING AND ENGINEERING LABORATORY L T P C
0 0 4 2

COURSE OBJECTIVES:
- To familiarize students with manual CNC part programming for milling and turning machines
- To generate part programs using CNC programming and simulation s/w for CNC Lathe, CNC Milling
- To get hands on experience by machining the parts on actual machines like CNC Lathe, CNC milling machine and CNC Wire EDM
- To introduce robot programming method
- To present the concept of printing parts using additive manufacturing

LIST OF EXPERIMENTS:
1. Study of different CNC control systems and CNC codes.
2. Programming and simulation for turning, taper turning, circular interpolation, thread cutting, facing and parting operations.
4. Programming and simulation for machining of internal surfaces in CNC Lathe.
5. Programming and simulation for 3D profile milling, drilling, rigid tapping, boring operation.
6. Programming and simulation for circular and rectangular pocket milling.
8. CNC code generation using machine simulation / CAM software packages – CNC Lathe.
9. CNC code generation using simulation / CAM software packages - CNC Milling machine / Machining centre.
10. Programming for CNC Wire cut EDM.
11. Robot programming for Material handling applications.
12. Understanding assembly, polishing and palletizing for different types of robots using software.
13. Experiment on extrusion based 3D printing machine

TOTAL: 60 PERIODS

COURSE OUTCOMES:
At the end of this course, the students shall be able to:
- CO1: Display competency in manual CNC part programming for milling and turning machines
- CO2: Exhibit generation of part programs using CNC programming and simulation s/w for CNC Lathe, CNC Milling
- CO3: Demonstrate machining the parts on actual machines CNC Lathe, CNC Milling Machine and CNC Wire EDM.
- CO4: Describe the Robot programming methods
- CO5: Acquire knowledge on printing parts using additive manufacturing
LIST OF EQUIPMENTS REQUIRED:
2. CNC programming and machine simulation software for turning and milling.
3. CAM software for turning and for milling - for automatic code generation of Lathe, Mill and Wire cut EDM.
4. CNC Production type turning centre.
5. CNC Machining centre-3 axes.
6. CNC Wire Cut EDM.
7. 3D scanner with s/w.

MF5612 ADVANCED MANUFACTURING LABORATORY L T P C 0 0 4 2

COURSE OBJECTIVES:
- To familiarize the students with advanced machine tools.
- To familiarize the students with extrusion based additive manufacturing.
- To acquaint the students with traditional and nontraditional machining process.
- To introduce the manufacture of polymer composites.
- To introduce the concepts of Thin film based deposition process.

Simple exercises using the following machines:
1. CNC Turning Centre
2. CNC Wire cut EDM
3. 5 Axis CNC Machining Centre
4. Abrasive Waterjet Machine (AWJM)
5. Extrusion based additive manufacturing
6. Micro machining of 3D parts using mechanical micro machining system
7. Electro Chemical Micro Machine (ECMM)
8. Resin Transfer Moulding System
9. Physical Vapor Deposition Unit (PVD)

TOTAL : 60 PERIODS

COURSE OUTCOMES:
At the end of this course, the students shall be able to:
- CO1: Acquire knowledge on advanced machine tools.
- CO2: Demonstrate extrusion based additive manufacturing.
- CO3: Discuss traditional and nontraditional machining process.
- CO4: Demonstrate the manufacture of polymer composites.
- CO5: Value thin film based deposition process.
MF5701 MANUFACTURING MANAGEMENT SYSTEMS L T P C 3 0 0 3

COURSE OBJECTIVES:
- To introduce Students to the latest trends in manufacturing planning and control System
- To gain knowledge on design of forecasting systems and different forecasting methods
- To impart the basic concepts of resource requirements
- To outline the need and approaches to computer aided process planning
- To familiarize the functions of shop floor control and associated systems.

UNIT I MANUFACTURING PLANNING AND CONTROL 9

UNIT II FORECASTING 9

UNIT III RESOURCE PLANNING 9

UNIT IV COMPUTER AIDED PROCESS PLANNING 9

UNIT V SHOP FLOOR CONTROL 9

TOTAL: 45 PERIODS
COURSE OUTCOMES:
At the end of this course, the students shall be able to:
- CO1: Be familiarized with the latest trends in manufacturing planning and control System
- CO2: Perceive design of forecasting systems and different forecasting methods
- CO3: Be acquainted with the basic concepts of resource requirements
- CO4: Recognize the need and approaches of computer aided process planning
- CO5: Evaluate the functions of shop floor control and associated systems.

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ONLINE COURSE MATERIALS
1. Course Material from NPTEL: http://nptel.ac.in/courses/112102101/

ME5752 MECHATRONICS L T P C
3 0 0 3

COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Selecting sensors to develop mechatronics systems.
2. Explaining the architecture and timing diagram of microprocessor, and also interpret and develop programs.
3. Designing appropriate interfacing circuits to connect I/O devices with microprocessor.
4. Applying PLC as a controller in mechatronics system.
5. Designing and develop the apt mechatronics system for an application.
UNIT I  INTRODUCTION AND SENSORS

UNIT II  8085 MICROPROCESSOR

UNIT III  PROGRAMMABLE PERIPHERAL INTERFACE

UNIT IV  PROGRAMMABLE LOGIC CONTROLLER
Introduction – Architecture – Input / Output Processing – Programming with Timers, Counters and Internal relays – Data Handling – Selection of PLC.

UNIT V  ACTUATORS AND MECHATRONICS SYSTEM DESIGN

TOTAL  = 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Select sensors to develop mechatronics systems.
2. Explain the architecture and timing diagram of microprocessor, and also interpret and develop programs.
3. Design appropriate interfacing circuits to connect I/O devices with microprocessor.
4. Apply PLC as a controller in mechatronics system.
5. Design and develop the apt mechatronics system for an application.

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COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Applying the working principles of fluid power systems and hydraulic pumps.
2. Applying the working principles of hydraulic actuators and control components.
3. Designing and developing hydraulic circuits and systems.
4. Applying the working principles of pneumatic power system and its components.
5. Solving problems and troubles in fluid power systems.

UNIT I  FLUID POWER PRINCIPLES AND HYDRAULIC PUMPS
Introduction to Fluid power – Advantages and Applications – Fluid power systems – Types of fluids
- Properties of fluids and selection – Basics of Hydraulics – Pascal’s Law – Principles of flow -
Friction loss – Work, Power and Torque- Problems, Sources of Hydraulic power : Pumping Theory–
Pump Classification – Construction, Working, Design, Advantages, Disadvantages, Performance,
Selection criteria of pumps – Fixed and Variable displacement pumps – Problems

UNIT II  HYDRAULIC ACTUATORS AND CONTROL COMPONENTS
Hydraulic Actuators: Cylinders – Types and construction, Application, Hydraulic cushioning –
Rotary actuators-Hydraulic motors - Control Components : Direction Control, Flow control and
pressure control valves – Types, Construction and Operation – Accessories : Reservoirs, Pressure
Switches – Filters –types and selection- Applications – Fluid Power ANSI Symbols – Problems

UNIT III  HYDRAULIC CIRCUITS AND SYSTEMS
Accumulators, Intensifiers, Industrial hydraulic circuits – Regenerative, Pump Unloading, Double-
Pump, Pressure Intensifier, Air-over oil, Sequence, Reciprocation, Synchronization, Fail-Safe,
Speed Control, Deceleration circuits ,Sizing of hydraulic systems, Hydrostatic transmission, Electro
hydraulic circuits,–Servo and Proportional valves – Applications- Mechanical ,hydraulic servo
systems.

UNIT IV  PNEUMATIC AND ELECTRO PNEUMATIC SYSTEMS
Properties of air –Air preparation and distribution – Filters, Regulator, Lubricator, Muffler, Air
control Valves, Quick Exhaust Valves, Pneumatic actuators, Design of Pneumatic circuit –
classification- single cylinder and multi cylinder circuits-Cascade method –Integration of fringe
circuits ,Electro Pneumatic System – Elements – Ladder diagram – timer circuits-Problems,
Introduction to fluidics and pneumatic logic circuits

UNIT V  TROUBLE SHOOTING AND APPLICATIONS
Installation, Selection, Maintenance, Trouble Shooting and Remedies in Hydraulic and Pneumatic
systems, Conditioning of hydraulic fluids Design of hydraulic circuits for Drilling, Planning, Shaping,
Surface grinding, Press and Forklift applications. Design of Pneumatic circuits for metal working,
handling, clamping counter and timer circuits. – Low cost Automation – Hydraulic and Pneumatic
power packs.

TOTAL = 45 PERIODS

Note: (Use of standard Design Data Book is permitted in the University examination)

COURSE OUTCOMES: Upon completion of this course, the students will be able to:
1. Apply the working principles of fluid power systems and hydraulic pumps.
2. Apply the working principles of hydraulic actuators and control components.
3. Design and develop hydraulic circuits and systems.
4. Apply the working principles of pneumatic power system and its components.
5. Solve problems and troubles in fluid power systems.

TEXT BOOKS:
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ME5761  MECHATRONICS LABORATORY  L T P C
0 0 4 2

COURSE OBJECTIVES:
The main learning objective of this course is to provide hands on training to the students in:
1. Measuring of physical quantity such as displacement, force and temperature, and also the
   operation of signal conditioning circuits.
2. Applying a suitable sensor and image processing technique for Mechatronics Systems.
3. Designing appropriate circuits to automate and control the Hydraulic, Pneumatic, and
   Electric actuators.
4. Applying PLC, PID and microcontroller as a control unit in the Mechatronics System.
5. Developing a model of robot by using simulation software, and also execute real-time
   control over a Robot by IoT.

LIST OF EXPERIEMENTS:
1. Design of Signal Conditioning Circuits and Analog Controller: V to I Converter – I to V
   Converter – Integrator – Differentiator – Instrumentation Amplifier – PID.
2. Experiments on the application of Sensors – LDR, Optocoupler, Ultrasonic, Infrared, Hall
   effect and MEMS Accelerometer.
3. Measurement of Displacement, Force and Temperature using Transducers and Data
   Acquisition System (DAQ).
4. Modeling and Analysis of basic Hydraulic, Pneumatic, Electro-Pneumatic, Electrical and
   Electronic Circuits by using simulation software.
5. Actuation of double acting cylinder by using Hydraulic, Pneumatic and Electro-Pneumatic
   circuits.
7. PLC Automation with Timers and Counters – Cylinder Sequencing – Sorting of Objects on
   Conveyor Belt.
8. DC Drives – Speed and Direction Control by using Microcontroller.
9. AC Drives – Speed and Direction Control by using Microcontroller.
10. Stepper Motor – Position, Speed and Direction Control.
12. Automatic Temperature Control System – Interfacing of temperature sensor, cooling system
    (Fan), LCD Display with Microcontroller.
15. Actuation and control of Robot by using Internet of Things (IoT).
    Vision System.

TOTAL  = 60 PERIODS
COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Measure of physical quantity such as displacement, force and temperature, and also the operation of signal conditioning circuits.
2. Apply a suitable sensor and image processing technique for Mechatronics Systems.
3. Design appropriate circuits to automate and control the Hydraulic, Pneumatic, and Electric actuators.
4. Apply PLC, PID and microcontroller as a control unit in the Mechatronics System.
5. Develop a model of robot by using simulation software, and also execute real-time control over a Robot by IoT.

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COURSE OBJECTIVES:
- To apply the knowledge of science and engineering fundamentals for the solution of complex engineering problems.
- To identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using engineering science.
- To design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.
- To identify the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.
- To demonstrate knowledge while understanding the engineering principles, and apply them to one’s own work, as a member and as a leader in a team; manage the projects in multidisciplinary environments.

Each and every student may choose a nagging workplace problem, research problems and socially relevant problems that have been difficult for them to solve. At the end of the semester, they have to submit a report for evaluation.

The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated jointly by external and internal examiners constituted by the Head of the Department based on oral presentation and the project report.

TOTAL: 60 PERIODS

COURSE OUTCOMES:
At the end of this course, the students shall be able to:
- CO1: Explore the variables that affect creativity and innovation.
- CO2: Identify the concepts to relevant research problems or practical applications
- CO3: Design and fabricate the creative and innovative ideas into working model using principles of engineering science
- CO4: Enhance professional skills to communicate in both oral and written forms and be proficient in working in diverse teams of individuals
- CO5: Recognize the importance of leadership skills.
COURSE OBJECTIVES:

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.
- To train the students in preparing project reports and to face reviews and viva voce examination.
- To develop good communication skills and team work.
- To familiarize students with real life situations
- To accelerate learning process

A project topic must be selected by the students in consultation with their guides. The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and fabrication of a device for a specific application, a research project with a focus on an application needed by the industry/society, a computer project, a management project or a design project.

The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated jointly by external and internal examiners constituted by the Head of the Department based on oral presentation and the project report.

TOTAL: 300 PERIODS

COURSE OUTCOMES:

At the end of this course, the students should be able to:

- CO1: Manage the selection and initiation of individual projects and of portfolios of projects in the enterprise.
- CO2: Demonstrate a strong working knowledge of ethics and professional responsibility.
- CO3: Conduct project planning activities that accurately forecast project costs, timelines, and quality.
- CO4: Implement processes for successful resource, communication, and risk and change management.
- CO5: Demonstrate effective organizational leadership and change management skills for projects and project teams.
COURSE OBJECTIVES:
- To introduce types of plastics and properties
- To equip the students with the knowledge of processes utilized in developing materials or making components using plastics
- To introduce joining and machining of plastics
- To impart knowledge in preparation of polymer composites.
- To develop the competence in major industrially practiced plastic processing techniques with sustainability.

UNIT I  INTRODUCTION TO PLASTICS

UNIT II  PROCESSING OF THERMOPLASTICS AND THERMOSETS
Principle, advantages, disadvantages and applications- Processing of thermoplastics :Extrusion, Injection Molding, Blow moulding, Rotational Molding, Calendaring, Film Blowing thermoforming, Foaming- Processing of thermosets: Compression Molding, Transfer Molding, Injection Molding, Jet Moulding, Liquid Resin Molding, Resin Transfer Molding(RTM), Reaction Injection Molding (RIM), Rotational Molding (Rotomolding), Laminated plastics-Casting-Powder coating processes.

UNIT III  JOINING AND MACHINING OF PLASTICS

UNIT IV  REINFORCED PLASTICS
Reinforced plastics (Composites) - Hand layup – Sprayup- Vaccum and Pressure bag moulding- Matched die molding- Continuous laminating- Pultrusion- Injection molding- Filament winding- Prepregs -Sheet molding compound -Bulk molding compound- - principle, advantages, disadvantages and applications.

UNIT V  SUSTAINABLE PLASTICS

TOTAL: 45 PERIODS

COURSE OUTCOMES:
The students shall be able to
- CO1: Identify various processing methods used for different types of plastics and their useful properties in daily life.
- CO2: Select suitable process for application requirements.
- CO3: Select various machining variables used for joining and machining plastic components.
- CO4: Select suitable process for polymer matrix composites.
- CO5: Be concerned with sustainable practice and its requirement

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**PR5072 PRODUCTION OF AUTOMOTIVE COMPONENTS**

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**COURSE OBJECTIVES:**

- To impart knowledge in various manufacturing methods in developing automotive components.
- To study the concepts of automobile engineering.
- To impart the knowledge in various parts of automotive engine.
- To understand the concepts of fuel and transmission system.
- To learn the recent developments in automobile industries.

**UNIT I ENGINE**

Working principle of two strokes, four stroke and wankel engines – wet and dry liners – Piston and Piston rings – types – classification. Production of Cylinder block, Cylinder head, liners, oil pan, piston and piston rings and testing.

**UNIT II ENGINE COMPONENTS**

Working principle of crank shaft – Cam shaft – valve operating mechanisms – carburetors - spark plug– connecting rod - Production of Connecting rod , Crankshaft , push rod and rocker arm ,valves, tappets , carburetors and spark plugs.

**UNIT III FUEL AND TRANSMISSION SYSTEM**


**UNIT IV CHASSIS AND SUSPENSION SYSTEM**

Working principle of – Suspension system – leaf spring and shock absorbers – wheel housing – design concepts of chassis (aerodynamics and cross worthiness) - Production of Brake shoes, leaf spring, wheel disc, wheel rim –usage of non-metallic materials for chassis components.
UNIT V	RECENT ADVANCEMENTS

Application of sensors and actuators – Emission control system – catalytic converter – Hydro forming of exhaust manifold and lamp housing – stretch forming of Auto body panels – MMC liners – thermal barrier coating of Engine head and valves – Selection of materials for Auto components – sensors and actuators- exhaust gas recycler (EGR)

TOTAL: 45 PERIODS

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

- CO1: Acquire knowledge of production of various automotive components.
- CO2: Learn the working principles of engines.
- CO3: Get knowledge about various engine components.
- CO4: Learn working of Fuel and Transmission System and its types.
- CO5: Acquire knowledge of recent development in automobile industries.

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ME5071	AUTOMOBILE ENGINEERING	L T P C
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COURSE OBJECTIVES: The main learning objective of this course is to prepare the students for:
1. Explaining various types of automobiles, their power packs and types of vehicle bodies.
2. Analyzing the various types of power train and fuel supply and management systems.
3. Analyzing the various types of transmission systems for a vehicle.
4. Analyzing the working parameters of various braking and suspension system in a vehicle.
5. Analyzing the working parameters of various electrical and electronic devices in a vehicle

UNIT I	INTRODUCTION TO AUTOMOBILE AND TYPES
An overview of different types of automobiles and their power sources. Specifications, Performance Parameters, Types of power delivery, Safety standards, Trends in automobile design. Two and Types, Regulations, Car body construction. Bus Body Details, General consideration relating to chassis layout. Introduction to MV Act, Pollution Norms,
UNIT II  
POWERTRAIN AND FUEL MANAGEMENT SYSTEMS  
Reciprocating Engine systems, Hybrid systems. Pollutant emissions and their control; Catalytic converter systems, Electronic Engine Management systems for SI and CI engines. Liquid and gaseous alternate fuels - Alcohol, LPG, CNG, and Hydrogen.

UNIT III  
CLUTCH AND TRANSMISSION SYSTEMS  
Clutch system and types, Gear box and types - manual, automatic, and AMT, propeller shafting, Differential, Axles - function, and types, Wheels, Tyres - types, construction and specification, suspension system - types and functioning.

UNIT IV  
BRAKING AND SUSPENSION SYSTEMS  
Braking system - requirements and types, Steering system - working, types and steering geometry parameters. Wheel balancing & Alignment Wind Tunnel testing, Servicing of Vehicles.

UNIT V  
ELECTRICAL AND ELECTRONIC SYSTEMS  
Introduction to Battery, Alternator, and Starter Motor systems, working principle, and circuitry, Safety systems - seat belts, air-bag, ABS, Modern electronic features in vehicles like tyre pressure monitoring, ESP, EBD, Automatic headlamp ON, Rain sensing wipers, speed sensing auto locking, OBD. HVAC system.

TOTAL  = 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Explain various types of automobiles, their power packs and types of vehicle bodies.
2. Analyze the various types of power train and fuel supply and management systems.
3. Analyze the various types of transmission systems for a vehicle.
4. Analyze the working parameters of various braking and suspension system in a vehicle.
5. Analyze the working parameters of various electrical and electronic devices in a vehicle.

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COURSE OBJECTIVES: The main learning objective of this course is to prepare the students for:

1. Applying the principles of locating and clamping in Jigs and fixtures and various components related to Press tools.
2. Designing various types of Jigs for given components and draw multiple views of the same with dimensions and parts List.
3. Designing various types of Fixtures for given components and draw multiple views of the same with dimensions and parts List.
4. Designing various parts of cutting dies and draw the standard dimensioned views.
5. Designing various parts of forming dies and draw the standard dimensioned views.

UNIT I PRINCIPLES OF JIGS, FIXTURES AND PRESS WORKING

UNIT II JIGS
Design and development of jigs for given component - Types of Jigs – Post, Turnover, Channel, latch, box, pot, angular post jigs – Indexing jigs

UNIT III FIXTURES
Design and development of fixtures for given component- General principles of milling, Lathe, boring, broaching and grinding fixtures – Assembly, Inspection and Welding fixtures – Modular fixturing systems- Quick change fixtures

UNIT IV DESIGN OF CUTTING DIES
Complete design and preparation of standard views of simple blanking, piercing, compound and progressive dies -fine Blanking dies

UNIT V DESIGN OF BENDING, FORMING, DRAWING AND MISCELLANEOUS DIES
Difference between bending forming and drawing – Blank development for above operations – Types of Bending dies – Press capacity – Spring back– Variables affecting Metal flow in drawing operations – draw die inserts – draw beads- ironing – Design and development of bending, forming, drawing, reverse redrawing and combination dies – Blank development for axisymmetric, rectangular and elliptic parts – Single and double action dies

TOTAL = 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Apply the principles of locating and clamping in Jigs and fixtures and various components related to Press tools.
2. Design various types of Jigs for given components and draw multiple views of the same with dimensions and parts List.
3. Design various types of Fixtures for given components and draw multiple views of the same with dimensions and parts List.
4. Design various parts of cutting dies and draw the standard dimensioned views.
5. Design various parts of forming dies and draw the standard dimensioned views.
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PR5071 PROCESSING OF PLASTICS AND POLYMERS L T P C 3 0 0 3

COURSE OBJECTIVES:
- To expose the students to the basics of plastics and their applications.
- To expose the students to the basics of polymers and their applications.
- To impart knowledge about various plastic and polymer processing techniques.
- To enlighten the students about the various polymer mixing and blending techniques.
- To impart knowledge about various properties of polymers and its testing methods.

UNIT I INTRODUCTION TO PLASTICS

UNIT II INTRODUCTION TO POLYMERS
Chemistry and Classification of Polymers – Glass transition temperature, thermal expansion and its effects, molecular weight, stress strain behaviour. Types of polymers - plastics and rubbers . Applications of various types of polymers.

UNIT III PROCESSING OF PLASTICS AND POLYMERS

UNIT IV POLYMER MIXING AND BLENDING
UNIT V POLYMER TESTING
Mechanical-static and dynamic: tensile, flexural, compressive, abrasion, endurance, fatigue, hardness, tears, resilience, impact, toughness. Conductivity-thermal and electrical, dielectric constant, dissipation factor, power factor, electric resistance, Surface resistivity, volume resistivity, swelling, ageing resistance, environmental stress, Cracking resistance.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
   CO1: acquire knowledge of plastics and their applications are well known to the students.
   CO2: acquire knowledge of polymers and their applications are well known to the students.
   CO3: acquire knowledge of uses and techniques of plastics and polymer processing are well known to the students.
   CO4: expose about various polymer mixing and blending techniques is well known to the students.
   CO5: collect Information of various properties of polymers and its testing methods are well known to the students.

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GE5076 PROFESSIONAL ETHICS IN ENGINEERING

COURSE OBJECTIVES:
- Identify the core values that shape the ethical behavior of an engineer.
- Utilize opportunities to explore one’s own values in ethical issues.
- Become aware of ethical concerns and conflicts.
- Enhance familiarity with codes of conduct.
- Increase the ability to recognize and resolve ethical dilemmas.

UNIT I ENGINEERING ETHICS
UNIT II  ENGINEERING AS SOCIAL EXPERIMENTATION  9
Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics -
Codes of Ethics - Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study

UNIT III  ENGINEER’S RESPONSIBILITY FOR SAFETY  9
Safety and Risk – Assessment of Safety and Risk – Risk Analysis – Reducing Risk – The
Government Regulator’s Approach to Risk - I Case Studies Chernobyl and Bhopal

UNIT IV  RESPONSIBILITIES AND RIGHTS  9
Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts
Rights (IPR) - Discrimination

UNIT V  GLOBAL ISSUES  9
Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in
Technological Development – Weapons Development – Engineers as Managers –Consulting
Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample
Code of Conduct

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course, the students should be able to:
CO1: Use ethical theories in the professional life
CO2: Do social experimentation with engineering approaches
CO3: Follow safety norms in the engineering practices
CO4: Confidence in their approaches and claim their rights
CO5: Take moral leadership with the knowledge in global practices

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TEXT BOOKS
   ISBN-10: 0-495-50279-0.

REFERENCES
2. David Ermann and Michele S Shauf, “Computers, Ethics and Society”, Oxford University
3. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and
   0195134889, ISBN-10: 0195134885
5. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, “Business Ethics – An Indian Perspective”,
COURSE OBJECTIVES:
- To acquaint the students with the overview of NDT
- To elaborate the concept and procedure for liquid and magnetic penetrant testing and evaluate through practical study
- To introduce the concept and procedure for radiograph testing methods and evaluate through practical study
- To brief the concepts and procedures for Ultrasonic testing methods and their applications
- To impart knowledge in other methods of NDT and electrical method with case study

UNIT I OVERVIEW OF NDT
NDT Vs Mechanical testing- Need for NDT- Factors influencing the reliability of NDE – Materials and characterization – Discontinuities in manufacturing processes - visual inspection: Basics, Optical aids - Direct and Indirect VT – Inspection objectives, inspection checkpoints, sampling plan, inspection pattern – classification of indications for acceptance criteria - Codes, Standards and Specifications (ASME,ASTM,AWS etc.)-case study.

UNIT II LIQUID PENETRANT & MAGNETIC INSPECTION

UNIT III RADIOGRAPHIC METHODS

UNIT IV ULTRASONIC TESTING
Ultrasonic testing: principle – Advantages – disadvantages – Applications - Generation of Ultrasonic waves - general characteristics of ultrasonic waves: methods and instruments for ultrasonic materials testing- Time of Flight Diffraction-case study

UNIT V ELECTRICAL AND OTHER METHODS
Electrical methods: Eddy current methods: potential - drop methods, applications- Advanced Methods: Acoustic emission inspection -Leak detection-Thermal inspection- Strain measurement and analysis-case study.

COURSE OUTCOMES:
At the end of this course, the students should be able to:
- CO1: Discuss the basics of NDT and its industrial standards
- CO2: Acquire knowledge on the concept and procedure for liquid and magnetic penetrant testing.
- CO3: Interpret the given mechanical components to inspect using radiograph testing methods techniques
- CO4: Apply ultrasonic techniques based on materials and its application.
- CO5: Describe the applications of electrical and other NDT methods.

TOTAL: 45 PERIODS
TEXT BOOKS:

REFERENCES:

UNIT I
FUNDAMENTALS OF ROBOT
- Robot - Definition - Laws of Robot- Robot Anatomy –Manipulators, Coordinate Systems, Work Envelope, Types and Classification-Specifications - Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load - Robot Parts and their Functions - Need for Robots-Different Applications - Material Handling, Processing and Assembly

UNIT II
END EFFECTOR
- Robot Drive systems-End Effectors - Grippers - Mechanical Grippers, Pneumatic and Hydraulic - Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations-End effector commands -Design of end effector.

UNIT III
SENSORS AND ROBOT MACHINE VISION
- Requirements of a sensor, Principles and Applications of various types of sensors - contact sensors - touch sensors, position & displacement sensors - potentiometers, encoders, LVDT, pneumatic sensors, force & torque sensors, wrist sensors, joint sensors, tactile array sensors, slip sensors for robot grippers, Proximity & Range sensors, optical sensors, Electro-optical imaging sensors –Advanced sensors for robot-Sensor commands-Robot Machine vision- Training of vision system-Case study
UNIT IV  ROBOT KINEMATICS AND DYNAMICS  9
Forward Kinematics and Inverse Kinematics, Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 & 3 Dimension)- D-H Parameters Co-ordinate reference frame, Velocity and Forces - Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design - Derivations and problems.

UNIT V  ROBOT INTELLIGENCE & ECONOMIC ANALYSIS  9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course, the students should be able to:
• CO1: Describe the basic concepts in a robotic system
• CO2: Design an end effector considering the selection and design criteria
• CO3: Recognize the use of sensors and machine vision for robots
• CO4: Acquire knowledge on robot kinematic and dynamic system
• CO5: Discuss the applications of robot intelligence

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TEXT BOOKS:

REFERENCES:
IE5551  ENGINEERING QUALITY CONTROL  L T P C  3 0 0 3

COURSE OBJECTIVES:
- Developing the basic concepts of quality control procedures.
- Impart knowledge to design and implement Statistical Process control in any industry.
- Design and implement acceptance sampling inspection methods in industry.
- Study the process and machine capability.
- Develop the applications of various charts.

UNIT I  QUALITY FUNDAMENTALS  9
Importance of quality- evolution of quality- definitions of quality- dimensions of quality- quality control- quality assurance- areas of quality- quality planning- quality objectives and policies- quality costs- economics of quality- Quality loss function- quality Vs productivity- Quality Vs reliability.

UNIT II  CONTROL CHARTS FOR VARIABLES  9
Process variation- preliminary decisions- control limits and their computation- construction and application of X bar, R and S charts - warning and modified control limits- process adjustment for trend- Comparison of process variation with specification limits- O.C. curve for X bar chart.

UNIT III  STATISTICAL PROCESS CONTROL  9
Process stability- process capability study using control charts- capability indices- Cp, Cpk and Cpm – capability analysis using histogram and normal probability plot- machine capability study- gauge capability study- setting statistical tolerances for components and assemblies- individual measurement charts- X-chart, moving average and moving range chart, multi-vari chart.

UNIT IV  CONTROL CHARTS FOR ATTRIBUTES  9
Limitations of variable control charts- Control charts for fraction non-conforming- p and np charts, variable sample size, operating characteristic function, run length- Control chart for nonconformities (defects)- c, u, ku charts, demerits control chart- applications.

UNIT V  ACCEPTANCE SAMPLING  9
Need- economics of sampling- sampling procedure- single and double sampling- O.C. curves- Average outgoing quality- Average sample number- Average total inspection- Multiple and sequential sampling- Standard sampling plans- MIL Standards, Dodge-Roming, IS 2500.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: Students will become familiar with details of quality costs, economies and planning.
CO2: Control the quality of processes using control charts for variables in manufacturing/service industries.
CO3: Good understanding and in depth knowledge has been imparted in the process capability study.
CO4: Control the occurrence of defects in product or services industries.
CO5: Determination of acceptance sampling procedures are practiced.

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TEXT BOOKS:
REFERENCES:

IE5653 RELIABILITY ENGINEERING

COURSE OBJECTIVES:
- Describe reliability concepts.
- Teach the students in filling the life data into theoretical distribution.
- Teach the students in reliability evaluation of various configuration.
- Describe knowledge in reliability monitoring methods.
- Appraise effectively various techniques to improve reliability of the system.

UNIT I RELIABILITY CONCEPT
9
Reliability definition –Reliability parameters- f(t), F(t) and R(t) functions- Measures of central tendency – Bath tub curve – A priori and posteriori probabilities of failure – Component mortality - Useful life.

UNIT II LIFE DATA ANALYSIS
9

UNIT III RELIABILITY ESTIMATION
9
Series parallel configurations – Parallel redundancy – m/n system – Complex systems: RBD approach – Baye's method – Minimal path and cut sets - Fault Tree analysis – Standby system.

UNIT IV RELIABILITY MANAGEMENT
9

UNIT V RELIABILITY IMPROVEMENT
9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: Students will be able to conduct failure data analysis.
CO2: Students will be able to estimate reliability of standard systems as well as complex systems.
CO3: Students will be able to explore reliability management tools and techniques.
CO4: Students will be able to contribute in maintainability and availability demonstration programs.
CO5: Students will be able to take decisions on inspection and replacement.

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REFERENCE:

ME5081  PROCESS PLANNING AND COST ESTIMATION  L T P C
3 0 0 3

COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Creating a process plan for a given Product.
2. Preparing cost elements for a given product.
3. Allocating overhead to different departments.
5. Analyzing the costs for machining a product.

UNIT I  PROCESS PLANNING
Defining process planning – Drawing interpretation – Material selection process and methods –
Selection of Production Processes from Tables – Selection of Process Parameters from Tables –
Factors to be considered in selecting: Processes; Process Sequencing; Operation Sequencing;
Equipment & Tool Selection; Tool Holding Devices; Measuring Instruments – Computer Aided
Process Planning – Retrieval / Variance CAPP and Generative CAPP - Case Study in Process
Planning.

UNIT II  FUNDAMENTAL OF ESTIMATING AND ELEMENTS OF COST
Concept and Purpose of Estimating, Functions of Estimating Department, Concept of Costing,
Costing versus Estimating, Types of Estimates, Importance of Estimates, Estimating Procedure,
Cost Estimators and their Qualifications, Principal Constituents in a Cost Estimate – Elements of

UNIT III  OVERHEADS AND DEPRECIATION
Overheads, Allocation or Distribution of Overhead Cost, Depreciation and Methods to Calculate it,
Interest on Capital, Idleness Costs, Repair and Maintenance Cost

UNIT IV  ESTIMATION OF CASTING, FORGING & WELDING COSTS
Estimation of cost for Casting processes, Welding processes and Forging processes.

UNIT V  ESTIMATION OF MACHINING TIME AND COST
Estimation of Machining Time and Cost – Lathe operations, Drilling, Milling, Shaping, Planing, and
Grinding operations.

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Create a Process Plan for a given Product.
2. Prepare Cost elements for a given Product.
3. Allocate Overhead to different departments.
5. Analyze the costs for machining a product.

TEXT BOOKS:
1. Adithan, M, Process Planning and Cost Estimation, New Age International Publishers,
   2007.
REFERENCES:

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GE5552  ENGINEERING MANAGEMENT  L T P C
3 0 0 3

COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Explaining basic concepts of management; approaches to management; contributors to management studies; various forms of business organization and trade unions function in professional organizations.
2. Applying various functions of management in professional organization.
3. Applying organizational theory in professional organization.
4. Applying the principles of productivity and operations management in professional organization.
5. Applying modern concepts and marketing in management in professional organization.

UNIT I  INTRODUCTION TO MANAGEMENT  9
Definition and functions of Management - Approaches to the study of Management – Mintzberg's Ten Managerial Roles – Principles of Taylor; Fayol; Weber; Parker – Forms of Organization: Sole Proprietorship; Partnership; Company (Private and Public); Cooperative – Public Sector Vs Corporate Organization – Business Environment: Economic; Social; Political; Legal – Trade Union: Definition; Functions; Pros and cons.

UNIT II  FUNCTIONS OF MANAGEMENT  9
Planning: Characteristics; Nature; Importance; Steps; Limitation – Organizing: Features; Process; Principles; Types – Departmentalization: Functional – Divisional (Product; Customer; Geographic) – Staffing: Systems Approach; Recruiting and Selection Process – Directing (Leading): Traits; Style; Managerial Grid (Blake-Mounton, Reddin) – Communication: Purpose; Model; Barriers – Controlling: Types; Audit (External, Internal, Merits) – Decision Making: Elements; Characteristics; Process; Classification – Controlling techniques.

UNIT III  ORGANIZATION THEORY  9
Human Resource Development (HRD): Goals – Organizational Conflict: Positive Aspects; Individual; Role; Interpersonal; Intra Group; Inter Group; Conflict Management – Need and Motivation Theories: Maslow’s Hierarchy of Needs Theory; Herzberg’s Motivation-Hygiene Theory; McClelland’s Needs Theory of Motivation – Change Management: Concept of Change; Lewin’s Process of Change Model; Sources of Resistance; Overcoming Resistance; Guidelines to managing Conflict.
UNIT IV  PRODUCTIVITY AND OPERATIONS MANAGEMENT  9
Productivity: Concept; Measurements; Affecting Factors; Methods to Improve – Operations Management Tools: (Simple problems in) Transportation Model (Balanced); Assignment Model (Hungarian); Network Model (Shortest path); Critical Path Method; Decision Trees.

UNIT V  MODERN CONCEPTS AND MARKETING MANAGEMENT  9
Concept, features, merits and demerits of: SWOT Analysis; Business Process Re-engineering (BPR); Supply Chain Management (SCM) – Marketing: Concept; Functions; Importance; Segmentation; Mix; Problems of Marketing in Small Enterprise; Competitive Analysis and Advantage – E-marketing.

TOTAL = 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Explain basic concepts of management; approaches to management; contributors to management studies; various forms of business organization and trade unions function in professional organizations.
2. Apply various functions of management in professional organization.
3. Apply organizational theory in professional organization.
4. Apply the principles of productivity and operations management in professional organization.
5. Apply modern concepts and marketing in management in professional organization.

TEXT BOOKS:

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MF5003  PRECISION ENGINEERING  L T P C  3 0 0 3

COURSE OBJECTIVES:
- To introduce various technologies with respect to its precision and accuracy.
- To operate high precision machineries with ease.
- To explore new areas in error control of cutting tools.
- To elaborate the influence and effects of using precision technologies.
- To outline the applications and exploitation of MEMS in various fields.
UNIT I  ELEMENTS OF PRECISION ENGINEERING  9
Introduction - Precision, Accuracy & Smoothness - Need - Development of overall machining precision - Classes of achievable machining Accuracy - Precision machining - High precision Machining - Ultra precision Machining - application of precision machining - Materials for tools and machine elements - carbides - ceramic, CBN & diamond - Tool and work material compatibility.

UNIT II  PRECISION MACHINE COMPONENTS  9

UNIT III  ERROR CONTROL  9
Error - Sources - Static stiffness - Variation of the cutting force - total compliance - Different machining methods - Thermal effects - heat source - heat dissipation - Stabilization - decreasing thermal effects - forced vibration on accuracy - clamping & setting errors - Control - errors due to locations - principle of constant location surfaces.

UNIT IV  PRECISION MANUFACTURING  9

UNIT V  MEMS  9
Introduction - MEMS - characteristics - principle - Design - Application: automobile, defence, healthcare, Industrial, aerospace etc.

TOTAL : 45 PERIODS

COURSE OUTCOMES:
At the end of this course the student shall be able to:
- CO1: Gain knowledge on elements of precision engineering.
- CO2: Be familiarized with precision machine components.
- CO3: Describe the concept of error control.
- CO4: Apply the concepts of precision manufacturing.
- CO5: Be acquainted with MEMS and its applications.

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TEXT BOOKS:

REFERENCES:

MF5004 SYSTEM SIMULATION

UNIT I INTRODUCTION 9

UNIT II RANDOM NUMBERS/VARIATES 9
Generation of Random numbers - Applications - Pseudo random numbers - methods of generating random variates - random variates for uniform, normal, binominal, Poisson, exponential distributions. Test for random numbers such as Kolmogorov smirnov, chi square, Autocorrelation - Poker's test.

UNIT III DESIGN OF SIMULATION EXPERIMENTS 9
Problem formulation – data collection and reduction – logic developments – initial conditions – run length, tabular method of simulation –Introduction to simulation model building for queuing, production, inventory and maintenance using higher level languages.

UNIT IV DISCRETE SYSTEM SIMULATION LANGUAGES 9
Need for simulation language - Comparison of various simulation languages and simulation packages.

UNIT V QUEUING POLICIES, ALGORITHMS AND CASE STUDIES 9

TOTAL : 45 PERIODS

COURSE OUTCOMES:
At the end of this course, the students should be able to:
- CO1: Identify the problem and build an appropriate simulation model.
- CO2: Recognize the type of model to be built suiting to the industrial situation and choose right measures of performances for evaluation and analysis.
• CO3: Discuss the findings with statistical analysis and successfully compromise the management in implementing their proposed ideas to produce superior results.
• CO4: Locate the simulation models developed in other simulation software and involve in expert suggestions to improvise the same.
• CO5: Discuss simulation situations through their own models and show the effects of altering them.

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WEB REFERENCE BOOKS: http://www.bcnn.net.

ME5073 DESIGN FOR MANUFACTURING L T P C 3 0 0 3

COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Applying economic process selection principles and general design principles for manufacturability in the development and design of products for various engineering applications. Also, apply design consideration principles of casting in the design of cast products.
2. Applying design consideration principles of forming in the design of extruded, stamped, and forged products.
3. Applying design consideration principles of machining in the design of turned, drilled, milled, planed, shaped, slotted, and ground products.
4. Applying design consideration principles of welding in the design of welded products.
5. Applying design consideration principles of assembly in the design of assembled products.

UNIT I INTRODUCTION AND CASTING 9
Introduction - Economics of process selection - General design principles for manufacturability; Design considerations for: Sand cast – Die cast – Permanent mold cast parts.

UNIT II FORMING 9
Design considerations for: Metal extruded parts – Impact/Cold extruded parts – Stamped parts – Forged parts.
UNIT III MACHINING 9
Design considerations for: Turned parts – Drilled parts – Milled, planed, shaped and slotted parts– Ground parts.

UNIT IV WELDING 9

UNIT V ASSEMBLY 9

TOTAL = 45 PERIODS

COURSE OUTCOMES: Upon completion of this course, the students will be able to:
1. Apply economic process selection principles and general design principles for manufacturability in the development and design of products for various engineering applications. Also, apply design consideration principles of casting in the design of cast products.
2. Apply design consideration principles of forming in the design of extruded, stamped, and forged products.
3. Apply design consideration principles of machining in the design of turned, drilled, milled, planed, shaped, slotted, and ground products.
4. Apply design consideration principles of welding in the design of welded products.
5. Apply design consideration principles of assembly in the design of assembled products.

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COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Explaining the history, concepts and terminology of PLM.
2. Applying the functions and features of PLM/PDM.
3. Applying different modules offered in commercial PLM/PDM tools.
4. Implementing PLM/PDM approaches for industrial applications.
5. Integrating PLM/PDM with legacy data bases, CAx & ERP systems.

UNIT I INTRODUCTION TO PLM 9
Introduction to PLM, Need for PLM, opportunities of PLM, Different views of PLM - Engineering Data Management (EDM), Product Data Management (PDM), Collaborative Product Definition Management (CPDM), Collaborative Product Commerce (CPC), Product Lifecycle Management (PLM). PLM/PDM Infrastructure – Network and Communications, Data Management, Heterogeneous data sources and applications.

UNIT II PLM/PDM FUNCTIONS AND FEATURES 9

UNIT III DETAILS OF MODULES IN A PDM/PLM SOFTWARE 9
Case studies based on top few commercial PLM/PDM tools – Teamcenter, Windchill, ENOVIA, Aras PLM, SAP PLM, Arena, Oracle Agile PLM and Autodesk Vault.

UNIT IV ROLE OF PLM IN INDUSTRIES 9
Case studies on PLM selection and implementation (like auto, aero, electronic) - other possible sectors, PLM visioning, PLM strategy, PLM feasibility study, change management for PLM, financial justification of PLM, barriers to PLM implementation, ten step approach to PLM, benefits of PLM for—business, organization, users, product or service, process performance

UNIT V BASICS ON CUSTOMISATION/INTEGRATION OF PDM/PLM SOFTWARE 9
PLM Customization, use of EAI technology (Middleware), Integration with legacy data base, CAD, SLM and ERP

TOTAL  = 45 PERIODS

COURSE OUTCOMES: Upon completion of this course, the students will be able to:
1. Explain the history, concepts and terminology of PLM
2. Apply the functions and features of PLM/PDM
3. Apply different modules offered in commercial PLM/PDM tools.
4. Implement PLM/PDM approaches for industrial applications.
5. Integrate PLM/PDM with legacy data bases, CAx & ERP systems

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ME5082 PRODUCT DESIGN AND DEVELOPMENT  

COURSE OBJECTIVES:  
The main learning objective of this course is to prepare the students for:
1. Applying the principles of generic development process; conducting customer need analysis; and setting product specification for new product design and development.
2. Generating, selecting, screening, and testing concepts for new product design and development.
3. Applying the principles of product architecture and industrial design to design and develop new products.
4. Applying the principles of DFMA and Prototyping to design and develop new product.
5. Applying the concepts of economics principles; project management practices in the development of new product.

UNIT I INTRODUCTION TO PRODUCT DEVELOPMENT, CUSTOMER NEED ANALYSIS, PRODUCT SPECIFICATION  

UNIT II CONCEPT GENERATION, SELECTION, AND TESTING  
Concept Generation: The Activity of Concept Generation - Concept Selection: Concept Screening; Concept Scoring – Concept Testing.

UNIT III PRODUCT ARCHITECTURE AND INDUSTRIAL DESIGN  
Product Architecture: Implications of the Architecture; Establishing the Architecture; Delayed Differentiation; Platform Planning; Related System-Level Design Issues – Industrial Design: Assessing the Need for Industrial Design; Impact of Industrial Design; The Industrial Design Process; Management of the Industrial Design Process; Assessing the Quality of Industrial Design.

UNIT IV DFM AND PROTOTYPING  
Design for Manufacturing: Estimate the Manufacturing Costs; Reduce the Costs of Components; Reduce the Costs of Assembly; Reduce the Costs of Supporting Production; Consider the Impact of DFMA– Prototyping: Type; Uses; Principles; Technologies; Planning for Prototypes.

UNIT V PRODUCT DEVELOPMENT ECONOMICS AND MANAGING PROJECTS  
Product Development Economics: Elements of Economic Analysis; Economic Analysis Process - Managing Projects: Understanding and Representing Tasks; Baseline Project Planning; Accelerating Projects; Project Execution.

TOTAL = 45 PERIODS
COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Apply the principles of generic development process; conduct customer need analysis; and set product specification for new product design and development.
2. Generate, select, screen, and test concepts for new product design and development.
3. Apply the principles of product architecture and industrial design to design and develop new products.
4. Apply the principles of DFMA and Prototyping to design and develop new product.
5. Apply the concepts of economics principles; project management practices in the development of new product.

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MF5072 SUSTAINABLE MANUFACTURING

COURSE OBJECTIVES:
- To impart knowledge on sustainable manufacturing polices
- To introduce the best practices for sustainable manufacturing,
- To introduce lean manufacturing practices
- To be acquainted with selection of sustainable machinery with lower energy consumption.
- To provide knowledge in hazardous management and recyclability.

UNIT I SUSTAINABLE MANUFACTURING AND POLICIES

UNIT II SUSTAINABILITY MANUFACTURING BEST PRACTICES
Introduction to best practices of sustainability manufacturing – Manufacturability issues in sustainable product design - Environmentally conscious design/manufacturing processes - Societal impact - Product functionality, serviceability, maintainability, upgradability - Innovative product/process designs for sustainability - Preservation of sustainable development.
UNIT III  LEAN MANUFACTURING AND GREEN ENERGY  9
Introduction to lean Manufacturing - Lean manufacturing tools - Comparison of conventional manufacturing and lean Manufacturing - Advantages and Limitations of lean Manufacturing. Introduction to green energy concepts - Green house effect - Global warming - Climate change - Environmental degradation– Environmental pollution – Pollution due to manufacturing industries - Remedies.

UNIT IV  SUSTAINABLE MACHINERY AND ENERGY CONSUMPTION  9
Selection of appropriate machine, materials, energy, resource utilisation for sustainability manufacturing – Performance evaluation of different machinery and its components in terms of energy consumption - Causes for inefficient operations of machinery – Scope for energy conservation - World energy consumption - Determination of power demand and consumption - Comparison of power generation cost using renewable and non- renewable sources.

UNIT V  HAZARDOUS MANAGEMENT AND RECYCLABILITY  9

TOTAL : 45 PERIODS

COURSE OUTCOMES:
At the end of this course the student shall be able to:
- CO1: Identify the best practices for sustainable manufacturing in industries,
- CO2: Describe the various policies for sustainability manufacturing.
- CO3: Implement lean principles to reduce industrial wastes
- CO4: look for selection of sustainable machinery with lower energy consumption.
- CO5: Recognize hazardous management techniques and safe practices.

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TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES:
- To impart knowledge on wafer preparation and PCB fabrication
- To introduce Through Hole Technology (THT) and Surface Mount Technology (SMT) with various types of electronic components
- To elaborate various steps in Surface Mount Technology (SMT)
- To be acquainted with various testing and inspection methods of populated PCBs
- To outline repair, rework and quality aspects of Electronic assemblies.

UNIT I  INTRODUCTION TO ELECTRONICS MANUFACTURING
History, definition, wafer preparation by growing, machining, and polishing, diffusion, microlithography, etching and cleaning, Printed circuit board fabrication, types, single sided, double sided, multi-layer and flexible printed circuit board

UNIT II  COMPONENTS AND PACKAGING
Introduction to packaging, types-Through hole technology(THT) and Surface mount technology (SMT), Through hole components – axial, radial, multi leaded, odd form Surface-mount components- active, passive. Interconnections - chip to lead interconnection, die bonding, wire bonding, TAB, flip chip, chip on board, multi chip module, direct chip array module, leaded, leadless, area array and embedded packaging, miniaturization and trends.

UNIT III  SURFACE MOUNT TECHNOLOGY
SMT Process, SMT equipment and material handling systems, handling of components and assemblies - moisture sensitivity and ESD, safety and precautions needed, IPC and other standards, stencil printing process - solder paste material, storage and handling, stencils and squeegees, process parameters, quality control. Component placement- equipment type, flexibility, accuracy of placement, throughput, packaging of components for automated assembly, soldering- wave soldering, reflow process, process parameters, profile generation and control, adhesive, underfill and encapsulation process

UNIT IV  INSPECTION AND TESTING
Inspection techniques, equipment and principle- AOI, X-ray. Defects and Corrective action - stencil printing process, component placement process, reflow soldering process, electrical testing of PCB assemblies- In circuit test, functional testing, fixtures and jigs.

UNIT V  REPAIR, REWORK, QUALITY AND RELIABILITY OF ELECTRONICS ASSEMBLIES
Repair and rework of PCB- Coating removal, base board repair, conductor repair, thermo-mechanical effects and thermal management, Reliability fundamentals, reliability testing, failure analysis, design for manufacturability, assembly, reworkability, testing, reliability, and environment.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course, the students should be able to:
- CO1: Perceive wafer preparation and PCB fabrication
- CO2: Recognize the importance of Through Hole Technology (THT) and Surface Mount Technology (SMT)
- CO3: Demonstrate various steps in Surface Mount Technology (SMT)
- CO4: Identify various testing and inspection methods of populated PCBs
- CO5: Discuss various techniques in repair, rework, quality and reliability of electronics Assemblies

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REFERENCES:

IE5073 LEAN SIX SIGMA

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COURSE OBJECTIVES:
• Explain the basics of Lean and Six Sigma.
• Teach the need and the process of integrating Lean and Six sigma.
• Summarize to identify and select the resources required for LSS Projects and selection of projects including Team building.
• Teach the DMAIC process and study the various tools for undertaking LSS projects.
• Illustrate to institutionalize the LSS efforts.

UNIT I INTRODUCTION TO LEAN AND SIX SIGMA
9
Introduction to Lean- Definition, Purpose, Features of Lean ; Top seven wastes, Need for Lean management, The philosophy of lean management, Creating a lean enterprise, Elements of Lean, Lean principles, the lean metric, Hidden time traps. Introduction to quality, Definition of six sigma, origin of six sigma, Six sigma concept and Critical success factors for six sigma.

UNIT II INTEGRATION OF LEAN AND SIX SIGMA
9
Evolution of lean six sigma, the synergy of Lean and six sigma, Definition of lean six sigma, the principles of lean six sigma, Scope for lean six sigma, Features of lean six sigma. The laws of lean six sigma, Key elements of LSS, the LSS model and the benefits of lean six sigma. Initiation - Top management commitment – Infrastructure and deployment planning, Process focus, organizational structures, Measures – Rewards and recognition, Infrastructure tools, structure of transforming event and Launch preparation.

UNIT III PROJECT SELECTION AND TEAM BUILDING
9
Resource and project selection, Selection of Black belts, Training of Black belts and Champions, Identification of potential projects, top down (Balanced score card) and Bottom up approach – Methods of selecting projects – Benefit/Effort graph. Process mapping, value stream mapping, Predicting and improving team performance, Nine team roles and Team leadership.

UNIT IV THE DMAIC PROCESS AND TOOLS
9
The DMAIC process – Toll gate reviews; The DMAIC tools; Define tools – Project definition form, SIPOC diagram; Measure tools – Process mapping, Lead time/cycle time, Cause and Effect matrix, Idea – generating and organizing tools – Brainstorming, Nominal group technique and Multi-voting; Data collection and accuracy tools- Check sheet, Gauge R&R; Understanding and eliminating variation- run charts; Analyze tools - Scatter plots, ANOVA, Regression analysis, Time trap analysis; Improve tools – Mistake proofing, Set up time reduction (SMED) and the pull system; Control tools – statistical process control.
UNIT V  INSTITUTIONALIZING AND DESIGN FOR LSS

Institutionalizing lean six sigma – improving design velocity, creating cycle time base line, valuing projects, gating the projects, reducing product line complexity, Design for lean six sigma, QFD, Theory of Inventive Problem solving (TRIZ), Robust design; Case study presentations.

TOTAL: 45 PERIODS

COURSE OUTCOMES
CO1: The students will be able to understand what is Lean and Six sigma and their importance in the globalized competitive world.
CO2: The students will be able to understand the importance of integrating Lean and Six sigma and also the process of their integration.
CO3: The students will be able to plan the Resources required to undertake the LSS projects and also acquire how to select the suitable projects and the teams.
CO4: The students will be able apply DMAIC methodology to execute LSS projects and in this regard they will be acquainted with various LSS tools.
CO5: The students will be able to understand the process of institutionalizing the LSS effort and also understand the Design for LSS.

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REFERENCES:

ME5079  NEW AND RENEWABLE SOURCES OF ENERGY

COURSE OBJECTIVES: The main learning objective of this course is to prepare the students for:
1. Describing the current energy scenario in terms of conventional renewable energy and future plan.
2. Applying the principle of various solar energy generating devices.
3. Applying the principle of various wind energy devices.
4. Applying the principle of various bio energy devices.
5. Applying the principle of various ocean and geothermal energy devices.

UNIT I  ENERGY SCENARIO
Indian energy scenario in various sectors – domestic, industrial, commercial, agriculture, transportation and others – Present conventional energy status – Present renewable energy status-Potential of various renewable energy sources-Global energy status-Per capita energy consumption in various countries - Future energy plans

UNIT II  SOLAR ENERGY
UNIT III WIND ENERGY

UNIT IV BIO-ENERGY

UNIT V OCEAN AND GEOTHERMAL ENERGY

TOTAL = 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Describe the current energy scenario in terms of conventional renewable energy and future plan.
2. Apply the principle of various solar energy generating devices.
3. Apply the principle of various wind energy devices.
4. Apply the principle of various bio energy devices.
5. Apply the principle of various ocean and geothermal energy devices.

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COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:

1. Selecting suitable material for MEMS and Microsystems, and explain the scaling laws involved in miniaturization.
2. Explaining the various micro-manufacturing processes.
3. Applying the working principle of electrostatic and thermal based MEMS sensors and actuators in the design of MEMS devices.
4. Applying the working principle of piezo-resistive, piezo-electric and magnetic effect in the design of MEMS devices.
5. Designing the elements of Micro-fluidic systems, and select suitable MEMS devices for Industrial applications.

UNIT I BASIC ENGINEERING FOR MEMS

UNIT II MICROMANUFACTURING TECHNIQUES
Photolithography, Ion Implantation, Diffusion, Oxidation, Chemical Vapour Deposition, Physical Vapour Deposition-Sputtering, Deposition by Epitaxy, Etching, Bulk Micromanufacturing, Micromachining Processes, LIGA Process, Microsystem Assembly and Testing.

UNIT III ELECTROSTATIC AND THERMAL BASED MEMS

UNIT IV PIEZO-RESISTIVE / ELECTRIC AND MAGNETIC BASED MEMS

UNIT V MICROFLUIDICS AND APPLICATIONS OF MEMS
Microfluidics - Fluid Mechanics Concepts, Design and Fabrication of Channels, Valves, Pumps, Case Studies - Accelerometer, Gyros, RF MEMS and MOEMS.

TOTAL = 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:

1. Select suitable material for MEMS and Microsystems, and explain the scaling laws involved in miniaturization.
2. Explain the various micro-manufacturing processes.
3. Apply the working principle of electrostatic and thermal based MEMS sensors and actuators in the design of MEMS devices.
4. Apply the working principle of piezo-resistive, piezo-electric and magnetic effect in the design of MEMS devices.
5. Design the elements of Micro-fluidic systems, and select suitable MEMS devices for Industrial applications.

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MF5006 INDUSTRIAL INSPECTION MAINTENANCE AND SAFETY

COURSE OBJECTIVES:
- To detect defects and defectives and to improve the quality of the products.
- To involve in sampling technique practices to eliminate defects and ensure high quality products.
- To introduce new inspection techniques and equipment’s in industry.
- To impart knowledge on safety engineering practices.
- To familiarize various techniques in preventive and predictive maintenance of machines.

UNIT I FUNDAMENTALS OF INSPECTION
Inspection-Introduction, Need for inspection, Inspection types, Types of Defects, Modes of Inspection

UNIT II SAMPLING TECHNIQUES
Probability sampling: Simple Random Sampling (SRS), Stratified Sampling, Cluster Sampling, Systematic Sampling, Multistage Sampling (in which some of the methods above are combined in stages)
Non Probability sampling: volunteer samples, haphazard (convenience) samples
Quality and risk decisions: Single sampling plan, Double sampling plans, Multi sampling plan, OC curves - Problems on sampling

UNIT III STAGES IN INDUSTRIAL INSPECTION
Inspection of raw materials, inline inspection, Off line Inspection, Industrial Inspection System, Industrial Plant Inspection, Inspection and Test Plan, Shop Inspection, Vendor Inspection, Industrial Quality Control, Factory Acceptance Test, Inspection scope, Industrial Test Systems, Industrial Test Calibration

UNIT IV MAINTENANCE TECHNIQUES
UNIT V  
INSPECTION OF EQUIPMENTS AND SAFETY PRACTICES

Development of policies, Preparation of Inspection guidelines, Condition monitoring, Maintenance programme, Service and Repair, Safe work practices, Safety and condition assessing check list, Equipment installation and servicing procedures, Accident prevention programs, Risk analysis, Hazard analysis, safety at work place-Indoor and outdoor

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course, the students shall be able to:

- CO1: Recognize the fundamental concepts of inspection, the need, types and importance.
- CO2: Identify various random sampling plans and apply them in industrial cases.
- CO3: Discuss various types of inspections and various ways of using them.
- CO4: Describe various inspection techniques.
- CO5: Recognize various industrial inspection, maintenance and safety policies.


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TEXT BOOKS:

REFERENCES:

PR5074  MATERIALS PROCUREMENT MANAGEMENT  L T P C

COURSE OBJECTIVES:
- To introduce the various aspects of Purchasing.
- To introduce concepts of stores management.
- To familiarize the students about basic inventory management
- To introduce MRP, aggregate planning, JIT concepts.
- To illustrate the usefulness of quantitative techniques in materials management.

UNIT I  PURCHASING MANAGEMENT
Introduction to materials management – objectives – organization — value analysis – make or buy decisions-Purchasing and procedures – Selection of sources of supply – Vendor development – Vendor evaluation and rating – Vendor rating methods- Imports – Buyer and Seller relationship.
UNIT II  STORES MANAGEMENT  

UNIT III  BASIC INVENTORY MANAGEMENT  
Basic EOQ Models- Assumptions- Quantity discount model- Q system- P system- Reorder level-ABC analysis- Deterministic and Probabilistic models- Finite Production

UNIT IV  ADVANCED INVENTORY MANAGEMENT  

UNIT V  O .R TECHNIQUES IN MATERIAL MANAGEMENT  

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
- CO1: Identify a suitable vendor for a given requirement.
- CO2: Design stores layout, select materials handling equipment.
- CO3: Select a suitable inventory system for a given requirement.
- CO4: Develop suitable aggregate planning strategies.
- CO5: Identify suitable quantitative technique for a given situation.

TEXT BOOKS:

WEB REFERENCE:
https://www.inspection-for-industry.com/

MF5007  TOTAL PRODUCTIVE MAINTENANCE  L T P C
3 0 0 3

COURSE OBJECTIVES:
- To familiarize students with the major concepts on maintenance
- To introduce the models used in maintenance
- To train students with the concept of total productive maintenance
- To introduce some of the methods used in maintenance management
- To familiarize the students with some of the inspection and monitoring methods used

UNIT I  MAINTENANCE CONCEPTS  
Introduction - TPM pillars -Objectives and functions –Productivity, Quality, Reliability and Maintainability (PQRM) - Terotechnology - Reliability Centered Maintenance - Predictive Maintenance - Condition Based Maintenance - maintainability prediction - availability and system effectiveness-maintenance costs - maintenance organization.

UNIT II  MAINTENANCE MODELS  
Minimal repair - As Good As New policy - maintenance types - balancing PM and breakdown maintenance - PM schedules: deviations on both sides of target values - PM schedules: functional characteristics - replacement models.
UNIT III  TOTAL PRODUCTIVE MAINTENANCE  9
Zero breakdowns - Zero Defects and TPM - maximizing equipment effectiveness – Autonomous
maintenance program - five pillars of TPM - TPM small group activities - TPM organization -
Management Decision - Educational campaign - Creation of Organizations - Establishment of basic
policies and goals - Formation of master plan - TPM implementation.

UNIT IV  MAINTENANCE LOGISTICS  9
Human factors in maintenance - maintenance manuals - maintenance staffing methods - queuing
applications - simulation - spare parts management - maintenance planning and scheduling.

UNIT V  ONLINE MONITORING  9
Condition monitoring - Infrared Thermography, Oil Analysis, acoustic emissions testing, Motor
Current Analysis, Vibration Measurement and Analysis, Wear Debris Monitoring, Visual checks -
corrosion control - Maintenance Management Information System - Expert system applications.

COURSE OUTCOMES:
At the end of this course, the students shall be able to:
• CO1: Classify the major concepts of maintenance
• CO2: Recognize various models used in maintenance
• CO3: Gain knowledge on total productive maintenance
• CO4: Discuss the methods used in maintenance management
• CO5: Gain knowledge on the inspection and monitoring methods used

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TEXT BOOKS:
   Group, 2011.
   United States.

ME5077  MEASUREMENTS AND CONTROLS  
COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Identify measurement parameters and analyze errors of measurements.
2. Select and apply suitable transducer for a particular measurement.
3. Identify measurement parameters and select the appropriate sensor for it.
4. Explain the working of various types of control systems of apply for specific applications.
5. Apply the principle of automatic control systems to control various parameter(s).
UNIT I  MEASUREMENTS AND ERROR ANALYSIS  9

UNIT II  INSTRUMENTS  9
Transducer, Modifying (intermediate) and Terminal stages – Mechanical and electrical transducers, preamplifiers – charge amplifiers – filters – attenuators – D’ Arsonval – CRO – Oscillographs – recorders – microprocessor based data logging, processing and output

UNIT III  PARAMETERS FOR MEASUREMENT  9

UNIT IV  CONTROL SYSTEMS  9

UNIT V  APPLICATION OF CONTROL SYSTEMS  9
Governing of speed, kinetic and process control – pressure, temperature, fluid level, flow-thrust and flight control – photo electric controls – designing of measurement and control systems for different applications

Total (L: 45) = 45 Periods

COURSE OUTCOMES: Upon completion of this course, the students will be able to:
1. Identify measurement parameters and analyze errors of measurements.
2. Select and apply suitable transducer for a particular measurement.
3. Identify measurement parameters and select the appropriate sensor for it.
4. Explain the working of various types of control systems of apply for specific applications.
5. Apply the principle of automatic control systems to control various parameter(s).

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COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Explaining the basic concepts in marketing.
2. Explaining the various buying behaviour methods.
3. Analyzing the various product pricing concepts.
4. Analyzing the various marketing planning principles and its strategies.
5. Describing the trends of advertising, sales promotion methods.

UNIT I  CONCEPTS IN MARKETING  9

UNIT II  BUYING BEHAVIOUR AND MARKET SEGMENTATION  9
Cultural, Demographic factors, Motives, Types, Buying Decisions, Segmentation factors, Demographic, Psycho graphic and Geographic Segmentation, Process, Patterns. Services marketing and Industrial marketing.

UNIT III  PRODUCT, PRICE AND MARKETING RESEARCH  9

UNIT IV  MARKETING PLANNING AND STRATEGY FORMULATION  9

UNIT V  ADVERTISING, SALES PROMOTION AND DISTRIBUTION  9

TOTAL= 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Explain the basic concepts in marketing.
2. Explain the various buying behaviour methods.
3. Analyze the various product pricing concepts.
4. Analyze the various marketing planning principles and its strategies.
5. Describe the trends of advertising, sales promotion methods.

TEXT BOOKS:

REFERENCES:
ME5751  
FINITE ELEMENT ANALYSIS  
L T P C  
3 0 0 3

COURSE OBJECTIVES: The main learning objective of this course is to prepare the students for:

1. Developing mathematical models for Boundary Value Problems and their numerical solution.
2. Applying concepts of Finite Element Analysis to solve one dimensional problem.
3. Determining field variables for two dimensional scalar variable problems.
4. Determining field variables for two dimensional vector variable problems.
5. Applying the need for Isoparametric transformation and the use of numerical integration.

UNIT I  
INTRODUCTION  
9

UNIT II  
ONE-DIMENSIONAL PROBLEMS  
9

UNIT III  
TWO DIMENSIONAL SCALAR VARIABLE PROBLEMS  
9

UNIT IV  
TWO DIMENSIONAL VECTOR VARIABLE PROBLEMS  
9

UNIT V  
ISOPARAMETRIC FORMULATION AND ADVANCED TOPICS  
9

TOTAL = 45 PERIODS
COURSE OUTCOMES: Upon completion of this course, the students will be able to:

1. Develop mathematical models for Boundary Value Problems and their numerical solution
2. Apply concepts of Finite Element Analysis to solve one dimensional problems
3. Determine field variables for two dimensional scalar variable problems
4. Determine field variables for two dimensional vector variable problems
5. Apply the need for Isoparametric transformation and the use of numerical integration

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MF5008 FLEXIBLE MANUFACTURING SYSTEMS

COURSE OBJECTIVES:

- To introduce the concepts of Flexible Manufacturing Systems
- To gain knowledge on computer control and software for Flexible Manufacturing Systems
- To outline flexible manufacturing system simulation and database
- To familiarize the principles of group technology and justify flexible manufacturing systems
- To implement flexible manufacturing systems in various applications and to impart knowledge on factories of the future.

UNIT I PLANNING AND SCHEDULING OF FLEXIBLE MANUFACTURING SYSTEMS 9

UNIT II COMPUTER CONTROL AND SOFTWARE FOR FLEXIBLE MANUFACTURING SYSTEMS 9

UNIT III FLEXIBLE MANUFACTURING SYSTEM SIMULATION AND DATA BASE 9
UNIT IV GROUP TECHNOLOGY AND JUSTIFICATION OF FLEXIBLE MANUFACTURING SYSTEMS

Introduction - Matrix Formulation - Mathematical Programming Formulation - Graph Formulation - Knowledge Based System for Group Technology - Economic Justification of FMS - Application of Possibility Distributions in FMS Systems - Justification.

UNIT V IMPLEMENTATION OF FMS AND FACTORIES OF THE FUTURE


TOTAL: 45 Periods

COURSE OUTCOMES:
At the end of this course, the students shall be able to:

- CO1: Be familiarized with concepts of Flexible Manufacturing Systems
- CO2: Perceive Computer Control and Software for Flexible Manufacturing Systems
- CO3: Be acquainted with Flexible Manufacturing System Simulation and Database
- CO4: Evaluate principles of Group Technology and justify Flexible Manufacturing Systems
- CO5: Describe various flexible manufacturing systems and their applications.

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IE5552 OPERATIONS RESEARCH L T P C
3 0 0 3

COURSE OBJECTIVES:
- Provide knowledge of optimization techniques and approaches.
- Formulate a real-world problem as a mathematical programming model.
- Enable the students apply mathematical, computational and communication skills needed for the practical utility of Operations Research.
- Knowledge to solve networking problems.
- Knowledge to solve various inventory problems.
- Gain knowledge on solving different waiting line models.
UNIT I  LINEAR PROGRAMMING

UNIT II  ADVANCES IN LINEAR PROGRAMMING

UNIT III  NETWORK ANALYSIS

UNIT IV  INVENTORY MODELS
Purchase model with no shortages – Manufacturing model with no shortages - Model with price breaks - Reorder point model - Probabilistic inventory model

UNIT V  QUEUING THEORY
Queuing theory terminology – Single server, multi server- limited and unlimited queue capacity-limited and unlimited population –limited and infinite queue length. TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: Learned to translate a real-world problem, given in words, into a mathematical Formulation.
CO2: An understanding of the role of algorithmic thinking in the solution of operations research problems.
CO3: Be able to build and solve Transportation Models and Assignment Models, maximal flow problem, minimum spanning tree and shortest path problem.
CO4: Able to handle issues in various Inventory models.
CO5: The students acquire capability in applying and using of queuing models for day today problem

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COURSE OBJECTIVES:
- Define automation and justification in manufacturing.
- Explain the control technologies in automation.
- Explain the concept of fixed automation using transfer lines.
- Describe the programmable automation such as CNC and industrial robotics.
- Use of automated material handling, storage and data capture.

UNIT I MANUFACTURING OPERATIONS
Automation in production systems, principles and strategies, Product/production relationships, Production concepts and mathematical models, manufacturing economics.

UNIT II CONTROL TECHNOLOGIES
Automated systems – elements, functions, levels, Continuous Vs discrete control, Computer process control, Sensors, Actuators, ADC, DAC, Programmable logic controllers – ladder logic diagrams.

UNIT III TRANSFER LINES
Automated production lines – applications, Analysis – with and without buffers, automated assembly systems, line unbalancing concept.

UNIT IV NUMERICAL CONTROL AND ROBOTICS

UNIT V AUTOMATED HANDLING AND STORAGE
Automated guided vehicle systems, AS/RS, Carousel storage, Automatic data capture - Bar code technology.

COURSE OUTCOMES:
CO1: Selection of automated equipment with cost justification.
CO2: Ability to understand control technologies.
CO3: Selection of buffer size and location in transfer lines.
CO4: Ability to prepare a simple CNC program, select a robot configuration for given application.
CO5: Recommend an appropriate automated material handling, storage and data capture method.

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TEXT BOOK:

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IE5072 ENTERPRISE RESOURCE PLANNING  

COURSE OBJECTIVES:  
• Describe an idea about ERP.  
• Grasp the activities of ERP project management cycle.  
• Understanding the emerging trends in ERP developments.  
• Creating awareness of core and extended modules of ERP.  
• Understand the ERP trending concepts.  

UNIT I INTRODUCTION  
Overview of enterprise systems – Evolution - Risks and benefits - Fundamental technology - Issues to be consider in planning design and implementation of cross functional integrated ERP systems.  

UNIT II ERP SOLUTIONS AND FUNCTIONAL MODULES  
Overview of ERP software solutions- Small, medium and large enterprise vendor solutions, BPR, and best business practices - Business process Management, Functional modules.  

UNIT III ERP IMPLEMENTATION  

UNIT IV POST IMPLEMENTATION  
Maintenance of ERP- Organizational and Industrial impact; Success and Failure factors of ERP Implementation.  

UNIT V EMERGING TRENDS ON ERP  

TOTAL: 45 PERIODS  

COURSE OUTCOMES:  
CO1: Knowledge of ERP implementation cycle.  
CO2: Awareness of core and extended modules of ERP.  
CO3: Able to understand ERP implementation steps.  
CO4: Able to understand post implementation procedure.  
CO5: Able to understand ERP trending concepts.  

TEXT BOOK:  
REFERENCES:

MF5009 DIGITAL TWIN DRIVEN SMART MANUFACTURING  L T P C
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COURSE OBJECTIVES:
- To introduce digital twin concepts and their applications in industry.
- To familiarize with trends in discrete Industry
- To be acquainted with digital twin in process industry.
- To impart knowledge in Industry 4.0
- To elaborate the advantages of digital twin.

UNIT I INTRODUCTION 9
Digital twin - Definition, types of Industry & its key requirements, Importance, Application of Digital Twin in process, product, service industries, History of Digital Twin, DTT role in industry innovation, Technologies/tools enabling Digital Twin

UNIT II DIGITAL TWIN IN A DISCRETE INDUSTRY 9

UNIT III DIGITAL TWIN IN A PROCESS INDUSTRY 9

UNIT V INDUSTRY 4.0 9
Industrial Revolutions, Industry 4.0 – Definition, principles, Application of Industry 4.0 in process & discrete industries, Benefits of Industry 4.0, challenges in Industry 4.0, Smart manufacturing, Internet of Things, Industrial Gateways, Basics of Communication requirements.

UNIT V ADVANTAGES OF DIGITAL TWIN 9
Improvement in product quality, production process, process Safety, identify bottlenecks and improve efficiency, achieve flexibility in production, continuous prediction and tuning of production process through Simulation, reducing the time to market.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course, the students shall be able to:
- CO1: Acquire knowledge on digital twin and its importance.
- CO3: Value digital twin in process industry.
- CO4: Operate Industry 4.0 and Smart Manufacturing in Industry.
- CO5: Discover the advantages of digital twin.

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REFERENCES:

ME5075 ENTREPRENEURSHIP DEVELOPMENT

COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Explaining the types, characteristics of entrepreneurship and its role in economic development.
2. Applying the theories of achievement motivation and the principles of entrepreneurship development program to enterprise.
3. Selecting the appropriate form of business ownership in setting up an enterprise.
4. Applying the fundamental concepts of finance and accounting to enterprise.
5. Identifying sickness in industry, selecting the appropriate corrective measures, and identifying the growth strategies in enterprise.

UNIT I ENTREPRENEURSHIP

UNIT II MOTIVATION

UNIT III BUSINESS

UNIT IV FINANCING AND ACCOUNTING
UNIT V  SUPPORT TO ENTREPRENEURS


TOTAL = 45 PERIODS

COURSE OUTCOMES: Upon completion of this course, the students will be able to:
1. Explain the types, characteristics of entrepreneurship and its role in economic development.
2. Apply the theories of achievement motivation and the principles of entrepreneurship development program.
3. Select the appropriate form of business ownership in setting up an enterprise.
4. Apply the fundamental concepts of finance and accounting to enterprise.
5. Identify sickness in industry, select the appropriate corrective measures, and identify the growth strategies in enterprise.

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IE5074  MACHINE LEARNING ALGORITHMS

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COURSE OBJECTIVES:
- To understand basic concepts of learning.
- To understand decision tree learning.
- To evaluate hypotheses.
- To understand Bayesian learning.
- To understand computational learning theory.

UNIT I  CONCEPT LEARNING

A Concept Learning Task: Notation, The Inductive Learning Hypothesis, Concept Learning as Search, FIND-S: Algorithm for finding a Maximally Specific Hypothesis: Version Spaces and the CANDIDATE-ELIMINATION Algorithm; Convergence of CANDIDATE-ELIMINATION Algorithm to the correct Hypothesis; Appropriate Training Examples for learning; Applying Partially Learned Concept, Inductive Bias: A Biased Hypothesis Space; An Unbiased Learner; The Futility of Bias-Free Learning.
UNIT II  DECISION TREE LEARNING
Decision Tree Representation, Appropriate problems for decision tree learning, The basic decision
tree Learning Algorithm, Hypothesis Space Search in decision tree learning, Inductive Bias in
Decision Tree Learning, Issues in Decision Tree Learning: Over fitting the Data; Incorporating
Continuous-Valued Attributes; Alternative Measures for Selecting Attributes; Handling Training
Examples with Missing Attribute Values; Handling Attributes with differing Costs.

UNIT III  EVALUATING HYPOTHESES
Estimating Hypothesis Accuracy: Sample Error and True Error; Confidence Intervals for Discrete-
Proportions; the Binomial Distribution; Mean and Variance; Estimators, Bias; and Variance;
Confidence Intervals; Two-sided and one-sided bounds. A General approach for deriving
confidence intervals: Central Limit Theorem. Difference in Error of two hypotheses; Hypothesis

UNIT IV  BAYESIAN LEARNING
Bayes Theorem, Bayes Theorem and Concept Learning, Maximum Likelihood and Least-Squared
Error Hypotheses, Maximum Likelihood Hypotheses for predicting probabilities: Gradient search to
maximize likelihood in a neural net. Minimum description length principle, Bayes Optimal
Classifier, Gibbs Algorithm, Naive Bayes Classifier, Bayesian Belief Networks: Conditional
Independence; Representation; Inference; Learning Bayesian Belief Networks; Gradient Ascent
Training of Bayesian Networks; Learning the structure of Bayesian Networks; The EM Algorithm:
Estimating Means of k Guassians; General Statement of EM Algorithm; Derivation of the k Means
Algorithm.

UNIT V  COMPUTATIONAL LEARNING THEORY
Introduction, probably learning an approximately correct hypothesis: The Problem Setting; Error of
a Hypothesis; Learnability. Sample Complexity for Finite Hypothesis Spaces: Agnostic Learning
and Inconsistent Hypotheses; Conjunctions of Boolean earnability of Other Concept Classes.
Sample Complexity for infinite hypothesis spaces: Shattering a set of Instances; The Vapnik-
Chervonenkis Dimension; Sample Complexity and the VC Dimension. The mistake bound model of
learning; Mistake bound for the FIND-S Algorithm; Mistake bound for the HALVING Algorithm;
Optimal Mistake Bounds; WEIGHTED-MAJORITY Algorithm.

COURSE OUTCOMES:
CO1: Ability to understand basic concepts of learning.
CO2: Ability to understand decision tree learning.
CO3: Ability to evaluate hypotheses.
CO4: Ability to understand Bayesian learning.
CO5: Ability to understand computational learning theory.

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TEXT BOOK:
COURSE OBJECTIVES:
- Define flexible automation and describe its components.
- Explain the process of computer aided design.
- Relate the enablers of CAD and CAM integration and business function.
- Tell the fundamentals of integrated management systems.
- Correlate CIM with DBMS.

UNIT I GT AND FMS
Part families, production flow analysis, cellular manufacturing, ROC, Flexible manufacturing systems - components, FMS applications, FMS analysis – Bottleneck model.

UNIT II COMPUTER-AIDED DESIGN
Fundamentals of CAD – design process, manufacturing database – Computer graphics –functions, constructing the geometry, transformation, wire frame Vs solid modelling.

UNIT III MANUFACTURING SUPPORT SYSTEMS
Product design and CAD, CAD/CAM and CIM, Computer aided process planning- Variant and generative approaches, Concurrent engineering and design for manufacture, Lean production, Agile manufacturing.

UNIT IV FUNDAMENTALS OF COMMUNICATIONS
Information, Communications matrix, Computer communications, Network architecture, Tools and techniques.

UNIT V DATABASE AND CIM MANAGEMENT
Manufacturing data, database technology, Database management, Management of CIM – role, cost justification, expert systems

COURSE OUTCOMES:
CO1: Analyze a cellular and flexible manufacturing system for its performance measures.
CO2: Gain knowledge in the basics of computer aided design.
CO3: Make competitive manufacturing systems with the use of appropriate tools and techniques.
CO4: Develop integrated manufacturing system with the required network structure and manufacturing database.
CO5: Able to understand DBMS concepts.

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TEXT BOOK:

REFERENCE:
COURSE OBJECTIVES:
- Explain the fundamental terms, concepts and theories associated with the phases of Decision Support Systems.
- Describe the uses of various mathematical models, data warehousing and mining.
- Discuss and develop skills in the analysis, design and implementation of group support systems and knowledge management systems.
- Illustrate expert system as a subsystem of DSS.
- Track the knowledge representation methods.

UNIT I INTRODUCTION
Managerial decision making, system modeling and support - preview of the modeling process-phases of decision making process.

UNIT II ANALYSIS
DSS components- Data warehousing, access, analysis, mining and visualization-modeling and analysis-DSS development.

UNIT III TECHNOLOGIES
Group support systems- Enterprise DSS- supply chain and DSS - Knowledge management methods, technologies and tools.

UNIT IV EXPERT SYSTEMS
Artificial intelligence and expert systems - Concepts, structure, types - Knowledge acquisition and validation - Difficulties, methods, selection.

UNIT V SEMANTIC NETWORKS
Representation in logic and schemas, semantic networks, production rules and frames, inference techniques, intelligent system development, implementation and integration of management support systems.

COURSE OUTCOMES:
CO1: Make decisions in the semi structured and unstructured problem situations.
CO2: Able to apply data warehousing and data mining principles in basic applications.
CO3: Develop knowledge management system with simple tools and techniques.
CO4: Develop intelligent based DSS.
CO5: Able to use logical and analytical thinking

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TEXT BOOK:

REFERENCES:
COURSE OBJECTIVES:

- Teach history and philosophy of Indian Constitution.
- Describe the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- Summarize powers and functions of Indian government.
- Explain emergency rule.
- Explain structure and functions of local administration.

UNIT I  INTRODUCTION
History of Making of the Indian Constitution-Drafting Committee- (Composition & Working) - Philosophy of the Indian Constitution-Preamble-Salient Features

UNIT II  CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES

UNIT III  ORGANS OF GOVERNANCE
Parliament-Composition-Qualifications and Disqualifications-Powers and Functions-Executive President-Governor-Council of Ministers-Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions

UNIT IV  EMERGENCY PROVISIONS

UNIT V  LOCAL ADMINISTRATION
District’s Administration head- Role and Importance-Municipalities- Introduction- Mayor and role of Elected Representative-CEO of Municipal Corporation-Pachayati raj- Introduction- PRI- Zila Pachayat-Elected officials and their roles- CEO ZilaPachayat- Position and role-Block level-Organizational Hierarchy (Different departments)-Village level- Role of Elected and Appointed officials-Importance of grass root democracy

COURSE OUTCOMES:

CO1: Able to understand history and philosophy of Indian Constitution.
CO2: Able to understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
CO3: Able to understand powers and functions of Indian government.
CO4: Able to understand emergency rule.
CO5: Able to understand structure and functions of local administration.

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TEXT BOOKS:

4. The Constitution of India (Bare Act), Government Publication, 1950
AD5092  VALUE EDUCATION  

COURSE OBJECTIVES:
- Develop knowledge of self-development
- Explain the importance of Human values
- Develop the overall personality through value education
- Overcome the self destructive habits with value education
- Interpret social empowerment with value education

UNIT I  INTRODUCTION TO VALUE EDUCATION  
Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non- moral valuation, Standards and principles, Value judgements

UNIT II  IMPORTANCE OF VALUES  
Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness. Honesty, Humanity, Power of faith, National Unity, Patriotism, Love for nature, Discipline

UNIT III  INFLUENCE OF VALUE EDUCATION  
Personality and Behaviour development - Soul and Scientific attitude. Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship Happiness Vs suffering, love for truth.

UNIT IV  REINCARNATION THROUGH VALUE EDUCATION  

UNIT V  VALUE EDUCATION IN SOCIAL EMPOWERMENT  
Equality, Non violence, Humility, Role of Women, All religions and same message, Mind your Mind, Self-control, Honesty, Studying effectively

TOTAL: 45PERIODS

COURSE OUTCOMES:
CO1 – Gain knowledge of self-development
CO2 – Learn the importance of Human values
CO3 – Develop the overall personality through value education
CO4 – Overcome the self destructive habits with value education
CO5 – Interpret social empowerment with value education

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REFERENCES:
COURSE OBJECTIVES:

- Understand the methodology of pedagogy.
- Compare pedagogical practices used by teachers in formal and informal classrooms in developing countries.
- Infer how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.
- Illustrate the factors necessary for professional development.
- Identify the Research gaps in pedagogy.

UNIT I INTRODUCTION AND METHODOLOGY: 9
Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions - Overview of methodology and Searching.

UNIT II THEMATIC OVERVIEW 9
Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.

UNIT III EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES 9
Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers’ attitudes and beliefs and Pedagogic strategies.

UNIT IV PROFESSIONAL DEVELOPMENT 9
Professional development: alignment with classroom practices and follow up support - Peer support - Support from the head teacher and the community - Curriculum and assessment - Barriers to learning: limited resources and large class sizes

UNIT V RESEARCH GAPS AND FUTURE DIRECTIONS 9
Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.

COURSE OUTCOMES:

- Understand the methodology of pedagogy.
- Understand Pedagogical practices used by teachers in formal and informal classrooms in developing countries.
- Find how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.
- Know the factors necessary for professional development.
- Identify the Research gaps in pedagogy.

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REFERENCES:
AD5094 STRESS MANAGEMENT BY YOGA

COURSE OBJECTIVES:
- Develop healthy mind in a healthy body thus improving social health also improve efficiency
- Invent Do's and Don't's in life through Yam
- Categorize Do's and Don’t’s in life through Niyam
- Develop a healthy mind and body through Yog Asans
- Invent breathing techniques through Pranayam

UNIT I INTRODUCTION TO YOGA
Definitions of Eight parts of yog. (Ashtanga)

UNIT II YAM
Do`s and Don’t’s in life.
Shaucha, santosh, tapa, swadhyay, ishvarpranidhan

UNIT III NIYAM
Do`s and Don’t’s in life.
Ahinsa, satya, astheya, bramhacharya and aparigraha

UNIT IV ASAN
Various yog poses and their benefits for mind & body

UNIT V PRANAYAM
Regularization of breathing techniques and its effects-Types of pranayam

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1 – Develop healthy mind in a healthy body thus improving social health also improve efficiency
CO2 – Learn Do’s and Don’t’s in life through Yam
CO3 – Learn Do’s and Don’t’s in life through Niyam
CO4 – Develop a healthy mind and body through Yog Asans
CO5 – Learn breathing techniques through Pranayam

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REFERENCES:
1. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata
2. ‘Yogic Asanas for Group Tarining-Part-I” : Janardan Swami Yogabhyasi Mandal, Nagpur
COURSE OBJECTIVES:
- Develop basic personality skills holistically
- Develop deep personality skills holistically to achieve happy goals
- Rewrite the responsibilities
- Reframe a person with stable mind, pleasing personality and determination
- Discover wisdom in students

UNIT I NEETISATAKAM-HOLISTIC DEVELOPMENT OF PERSONALITY - I 9
Verses- 19, 20, 21, 22 (wisdom) - Verses- 29,31,32 (pride & heroism) – Verses- 26,28,63,65 (virtue)

UNIT II NEETISATAKAM-HOLISTIC DEVELOPMENT OF PERSONALITY - II 9
Verses- 52, 53, 59 (dont's) - Verses- 71,73,75,78 (do's)

UNIT III APPROACH TO DAY TO DAY WORK AND DUTIES 9
Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48 - Chapter 3-Verses 13, 21, 27, 35 Chapter 6-Verses 5,13,17,23, 35 - Chapter 18-Verses 45, 46, 48

UNIT IV STATEMENTS OF BASIC KNOWLEDGE – I 9
Statements of basic knowledge - Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12-Verses 13, 14, 15, 16,17, 18

UNIT V PERSONALITY OF ROLE MODEL - SHRIMAD BHAGWADGEETA 9
Chapter2-Verses 17, Chapter 3-Verses 36,37,42 - Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: To develop basic personality skills holistically
CO2: To develop deep personality skills holistically to achieve happy goals
CO3: To rewrite the responsibilities
CO4: To reframe a person with stable mind, pleasing personality and determination
CO5: To awaken wisdom in students

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REFERENCES:
1. Gopinath, Rashtriya Sanskrit Sansthanam P, Bhartrihari’s ThreeSatakam , Niti-sringar-vairagya, New Delhi,2010
2. Swami Swarupananda , Srimad Bhagavad Gita, Advaita Ashram,Publication Department, Kolkata,2016
COURSE OBJECTIVES
The course will introduce the students to

- get a knowledge about Indian Culture
- Know Indian Languages and Literature religion and philosophy and the fine arts in India
- Explore the Science and Scientists of Ancient, Medieval and Modern India
- Understand education systems in India

UNIT I  INTRODUCTION TO CULTURE  9
Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India.

UNIT II  INDIAN LANGUAGES AND LITERATURE  9
Indian Languages and Literature – I: Languages and Literature of South India, – Indian Languages and Literature – II: Northern Indian Languages & Literature

UNIT III  RELIGION AND PHILOSOPHY  9
Major religions practiced in India and Understanding their Philosophy – religious movements in Modern India (Selected movements only)

UNIT IV  FINE ARTS IN INDIA (ART, TECHNOLOGY & ENGINEERING)  9
Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India

UNIT V  EDUCATION SYSTEM IN INDIA  9
Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India

TOTAL: 45 PERIODS

COURSE OUTCOMES
After successful completion of the course the students will be able to

- Understand philosophy of Indian culture.
- Distinguish the Indian languages and literature.
- Learn the philosophy of ancient, medieval and modern India.
- Acquire the information about the fine arts in India.
- Know the contribution of scientists of different eras.
- Understand education systems in India

REFERENCES:
5. Satya Prakash, “Founders of Sciences in Ancient India”, Vijay Kumar Publisher, 1989
COURSE OBJECTIVES:
The main learning objective of this course is to make the students an appreciation for:
1. Introduction to Sanga Tamil Literature.
2. ‘Agathina’ and ‘Purathinai’ in Sanga Tamil Literature.
3. ‘Attruppadai’ in Sanga Tamil Literature.
4. ‘Puranaanuru’ in Sanga Tamil Literature.
5. ‘Pathirupaththu’ in Sanga Tamil Literature.

UNIT I  SANGA TAMIL LITERATURE AN INTRODUCTION  9
Introduction to Tamil Sangam – History of Tamil Three Sangams – Introduction to Tamil Sangam Literature – Special Branches in Tamil Sangam Literature - Tamil Sangam Literature’s Grammar - Tamil Sangam Literature’s parables.

UNIT II  ‘AGATHINAI’ AND ‘PURATHINAI’  9

UNIT III  ‘ATTRUPPADAI’.  9

UNIT IV  ‘PURANAANURU’  9
Puranaanuru on Good Administration, Ruler and Subjects – Emotion & its Effect in Puranaanuru.

UNIT V  ‘PATHIRUPATHTHU’  9
Pathirupaththu in ‘Etthogai’ – Pathirupaththu’s Parables – Tamil dynasty: Valor, Administration, Charity in Pathirupaththu - Message to Society from Pathirupaththu.

TOTAL (L: 45) = 45 PERIODS

COURSE OUTCOMES: Upon completion of this course, the students will be able to:
1. Appreciate and apply the messages in Sanga Tamil Literature in their life.
2. Differentiate ‘Agathinai’ and ‘Purathinai’ in their personal and societal life.
3. Appreciate and apply the messages in ‘Attruppadai’ in their personal and societal life.
4. Appreciate and apply the messages in ‘Puranaanuru’ in their personal and societal life.
5. Appreciate and apply the messages in ‘Pathirupaththu’ in their personal and societal life.

REFERENCES:
HSMC– ELECTIVES – HUMANITIES I (ODD SEMESTER)

HU5171 LANGUAGE AND COMMUNICATION 3 0 0 3

COURSE DESCRIPTION
This course offers an introduction to language and communication. The primary goal of this course is to familiarize students with key ideas related to communication using language as well as non-verbal means. Ideas related to the use of language and the underlying power structures are also examined. The course also examines the role of media in communication and in the dissemination of ideas as well as opinions.

OBJECTIVES
✓ To familiarize students with the concept of communication using linguistic and non-linguistic resources.
✓ To help students ask critical questions regarding facts and opinions.
✓ To provide students with the material to discuss issues such as language and power structures.
✓ To help students think critically about false propaganda and fake news.

LEARNING OUTCOMES
➢ Students will be able to use linguistic and non-linguistic resources of language in an integrated manner for communication.
➢ Students will be able to analyse communication in terms of facts and opinions.
➢ Students will be able to discuss, analyse and argue about issues related to language and power.

UNIT I LINGUISTIC AND NON-LINGUISTIC RESOURCE OF COMMUNICATION: 9
a) Writing and Speech
b) Distinction between language structure and language use, form and function, acceptability and grammaticality
c) Gestures and Body language, pictures and symbols, cultural appropriacy
d) Communicative Competency, context and situation, combination of linguistic and non-linguistic elements of communication

UNIT II STRUCTURE OF WRITING/CONVERSATION: 9
a) Language skills and the communication cycle; speaking and listening, writing and reading
b) Initiating and closing conversations, intervention, turn taking
c) Writing for target reader, rhetorical devices and strategies
d) Coherence and Cohesion in speech and writing

UNIT III POWER STRUCTURE AND LANGUAGE USE: 9
a) Gender and language use
b) Politeness expressions and their use
c) Ethical dimensions of language use
d) Language rights as part of human rights

UNIT IV MEDIA COMMUNICATION: 9
a) Print media, electronic media, social media
b) Power of media
c) Manufacturing of opinion, fake news and hidden agendas

UNIT V PERSUASIVE COMMUNICATION AND MISCOMMUNICATION: 9
a) Fundamentals of persuasive communication
b) Persuasive strategies
c) Communication barriers

TOTAL : 45 PERIODS
TEXT BOOKS:

HU5172 VALUES AND ETHICS

OBJECTIVES:
- Teach definition and classification of values.
- Explain Purusartha.
- Describe Sarvodaya idea.
- Summarize sustenance of life.
- Conclude views of hierarchy of values.

UNIT I DEFINITION AND CLASSIFICATION OF VALUES
Extrinsic values- Universal and Situational values- Physical- Environmental-Sensuous- Economic-Social-Aesthetic-Moral and Religious values

UNIT II CONCEPTS RELATED TO VALUES
Purusartha-Virtue- Right- duty- justice- Equality- Love and Good

UNIT III IDEOLOGY OF SARVODAYA
Egoism- Altruism and universalism- The Ideal of Sarvodaya and Vasudhaiva Kutumbakam

UNIT IV SUSTENANCE OF LIFE
The Problem of Sustenance of value in the process of Social, Political and Technological Changes

UNIT V VIEWS ON HIERARCHY OF VALUES
The Problem of hierarchy of values and their choice, The views of Pt. Madan Mohan Malviya and Mahatma Gandhi

TOTAL: 45 PERIODS

OUTCOMES:
- CO1: Able to understand definition and classification of values.
- CO2: Able to understand purusartha.
- CO3: Able to understand sarvodaya idea.
- CO4: Able to understand sustenance of life.
- CO5: Able to understand views of hierarchy of values.
TEXTBOOKS:
2. Little, William: An Introduction of Ethics (Allied Publisher, Indian Reprint 1955)

HU5173
HUMAN RELATIONS AT WORK
L T P C 3 0 0 3

OBJECTIVES:
• Illustrate human relations at work its relationship with self.
• Explain the importance of interacting with people at work to develop teamwork.
• Infer the importance of physical health in maintaining human relations at work.
• Describe the importance of staying psychologically healthy.
• Identify the essential qualities for progressing in career.

UNIT I UNDERSTANDING AND MANAGING YOURSELF 9
Human Relations and You: Self-Esteem and Self-Confidence: Self-Motivation and Goal Setting; Emotional Intelligence, Attitudes, and Happiness; Values and Ethics and Problem Solving and Creativity.

UNIT II DEALING EFFECTIVELY WITH PEOPLE 9
Communication in the Workplace; Specialized Tactics for Getting Along with Others in the Workplace; Managing Conflict; Becoming an Effective Leader; Motivating Others and Developing Teamwork; Diversity and Cross-Cultural Competence.

UNIT III STAYING PHYSICALLY HEALTHY 9
Yoga, Pranayam and Exercise: Aerobic and anaerobic.

UNIT IV STAYING PSYCHOLOGICALLY HEALTHY 9
Managing Stress and Personal Problems, Meditation.

UNIT V DEVELOPING CAREER THRUST 9

TOTAL: 45 PERIODS

OUTCOMES:
Students will be able to
CO1: Understand the importance of self-management.
CO2: Know how to deal with people to develop teamwork.
CO3: Know the importance of staying healthy.
CO4: Know how to manage stress and personal problems.
CO5: Develop the personal qualities essential for career growth.
TEXT BOOK:

REFERENCES:

HU5174 PSYCHOLOGICAL PROCESSES

COURSE DESCRIPTION
Psychological Processes course is designed for students to be aware of the basic principles of psychology for the better understanding of people’s psyche and behaviour around them. This course enables learners to use the optimal use of different forms of thinking skills and thereby results in effective communication in diverse situations. Every unit of the syllabus highlights the psychological process of people, the most powerful and constructive use of perceptions.

OBJECTIVES
The major objectives of this course is
- To develop students’ awareness – on psychology, learning behavior and usage of perception effectively.
- To learn to use the various kinds of thinking in a formal context.
- To critically evaluate content and comprehend the message on the bases of perception, personality and intelligence.

UNIT I INTRODUCTION

UNIT II SENSORY & PERCEPTUAL PROCESSES
Some general properties of Senses: Visual system – the eye, colour vision – Auditory system – Hearing, listening, Sounds - Other senses - Selective attention; physiological correlates of attention; Internal influences on perception learning – set - motivation & emotion - cognitive styles; External influences on perception figure and ground separation – movement – organization – illusion; Internal- external interactions: Constancy - Depth Perception- Binocular & Monocular Perception; Perceptual defense & Perceptual vigilance; Sensory deprivation -Sensory bombardment; ESP - Social Perception.

UNIT III COGNITION & AFFECT

UNIT IV THINKING, PROBLEM-SOLVING & DECISION MAKING
UNIT V   PERSONALITY & INTELLIGENCE
Psychological phenomena & Attributes of humans - cognition, motivation, and behavior - thoughts, feelings, perceptions, and actions – personality dimensions, traits, patterns - Specialized knowledge, performance accomplishments, automaticity or ease of functioning, skilled performance under challenge - generative flexibility, and speed of learning or behavior change.

REFERENCES
UNIT IV EDUCATIONAL TECHNOLOGY
Technological implications on Education – Teaching, Learning & Testing with Technology - Advantages and drawbacks – Critical analysis on the use of technology

UNIT V ETHICAL IMPLICATIONS
Plagiarism – Online Copyright issues – Ethical and value implications of education and technology on individual and society.

TOTAL: 45 PERIODS

TEACHING METHODS
Teaching modes include guest lectures, discussion groups, presentations, visual media, and a practicum style of learning.

EVALUATION
As this is course is not a content based course, it focuses more on the ethical use of technology in education and society, and so, evaluation can be based on assignments and discussions. So there is no need for an end semester examination. Internals marks can be taken for the total marks.

INTERNAL (100 % WEIGHTAGE)
(a) Written Test (40 marks)
(b) Assignment: Write a real time report of the technology use in any school / college (15 marks)
(c) Presentation: Students choose any one of the technological tools and present its relevance to education and society (15 marks)
(d) Group discussion: Students discuss in groups on case studies relating to various challenges in education and technology use in society (20 marks)
(e) Blog entry: Making weekly blog posts in Class Blog on the topics related to the course posted by the instructor and commenting on others’ posts. (10 marks)

REFERENCES
1) Education and Social order by Bertrand Russel
2) Theories of learning by Bower and Hilgard
3) Technology and Society by Jan L Harrington

HU5176 PHILOSOPHY

OBJECTIVES
- To create a new understanding by teaching philosophy through a comparison of Indian and Western traditions.
- To Foster critical thinking and imagination by dealing with inter-related concepts in literature and science.
- To bridge the gap between the sciences and humanities through introspective analyses.
- To nurture an understanding of the self and elucidates ways to progress towards a higher understanding of one’s self and others.

UNIT I KNOWLEDGE

UNIT II ORIGIN
Between Teacher And Student – The Knowledge Of Combinations, Body And Speech – Siksha Valli – Taittriya Upanishad.

UNIT III       WORD

UNIT IV       KNOWLEDGE AS POWER/OPPRESSION

UNIT V       SELF KNOWLEDGE/BRAHMAN

TOTAL : 45 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Think sceptically, ask questions and to arrive at deductions.
2. Connect and relate different branches of thought.
3. Comprehends the relation between language, thought and action.
4. Arrive at a better understanding of self and others and forms a new outlook.

REFERENCES:
7. Bacon, Francis: Power as Knowledge
UNIT V  PSYCHOLOGY AND SOCIAL BEHAVIOUR
Group, group dynamics, teambuilding, Prejudice and stereotypes; Effective Communication, conflict and negotiation.

TOTAL: 45 PERIODS

TEXTBOOKS

HSMC– ELECTIVES – HUMANITIES II (EVEN SEMESTER)

HU5271  GENDER, CULTURE AND DEVELOPMENT  L T P C
3 0 0 3

COURSE DESCRIPTION
This course offers an introduction to Gender Studies that asks critical questions about the meanings of sex and gender in Indian society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary drawing from Indian literature and media studies, to examine cultural assumptions about sex, gender, and sexuality. This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with class, caste and other social identities. This course also seeks to build an understanding of the concepts of gender, gender-based violence, sexuality, and rights and their impact on development through a number of discussions, exercises and reflective activities.

OBJECTIVES
✓ To familiarize students with the concepts of sex and gender through literary and media texts.
✓ To help students ask critical questions regarding gender roles in society.
✓ To provide students with the material to discuss gender issues such as gender based discrimination, violence and development.
✓ To help students think critically about gender based problems and solutions.

LEARNING OUTCOMES
➢ Students will be able to critically read literary and media texts and understand the underlying gender perspectives in them.
➢ Students will be able to analyse current social events in the light of gender perspectives.
➢ Students will be able to discuss, analyse and argue about issues related to gender and their impact on society, culture and development.

UNIT I  INTRODUCTION TO GENDER
• Definition of Gender
• Basic Gender Concepts and Terminology
• Exploring Attitudes towards Gender
• Social Construction of Gender

Texts:
1. Sukhu and Dukhu (Amar Chitra Katha)
2. The Cat who Became a Queen (Folk tale, J. Hinton Knowles, Folk-Tales of Kashmir. London: Kegan Paul, Trench, Trübner, and Company, 1893, pp. 8-10.)
UNIT II  GENDER ROLES AND RELATIONS
- Types of Gender Roles
- Gender Roles and Relationships Matrix
- Gender-based Division and Valuation of Labour

Texts:
1. Muniyakka (Short Story, Lakshmi Kannan, Nandanvan and Other Stories, Hyderabad: Orient Blackswan, 2011)

UNIT III  GENDER DEVELOPMENT ISSUES
- Identifying Gender Issues
- Gender Sensitive Language
- Gender, Governance and Sustainable Development
- Gender and Human Rights
- Gender and Mainstreaming

Texts:
2. Tell Us Marx (Poem, Mallika Sengupta, Translated by Sanjukta Dasgupta)

UNIT IV  GENDER-BASED VIOLENCE
- The concept of violence
- Types of Gender-based violence
- The relationship between gender, development and violence
- Gender-based violence from a human rights perspective

Texts:
1. Lights Out (Play, Manjula Padmanabhan)
2. Lights Out (Video of play enacted)

UNIT V  GENDER AND CULTURE
- Gender and Film
- Gender, Media and Advertisement

Texts:
1. Mahanagar (Movie: Satyajit Ray)
2. Beti Bachao Beti Padhao Advertisements

READINGS: Relevant additional texts for readings will be announced in the class. Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments.

ASSESSMENT AND GRADING:
Discussion & Classroom Participation: 20%
Project/Assignment: 30%
End Term Exam: 50%
OBJECTIVES:

- To emphasize the meaning and nature of ethics, human values and holistic life for leading a good, successful and happy life through continuous examination of thoughts and conduct in day to day life.
- To understand the status and responsible role of individual in abatement of value crisis in contemporary world in order to develop a civilized and human society. Understanding the process of ethical decision making through critical assessment of incidents/cases of ethical dilemmas in personal, professional and social life.
- To view the place of Ethics and Human Values in the development of individual and society through identification and cross examination of life values and world view of his/her role models in society.

UNIT I  HUMAN LIFE, ITS AIM AND SIGNIFICANCE
The concept of a successful life, happy life and a meaningful life, Ethical and decision making capability and its development: Meaning of Ethical dilemma, sharing real life experiences.

UNIT II  CREATIVE AND LEADERSHIP ABILITY AND THEIR DEVELOPMENT
Intellectual, Emotional, Creative, Ethico - spiritual development, Aesthetic sense, Self-dependency, Activeness, Development of positive attitude.

UNIT III  HARMONY IN PERSONAL AND SOCIAL LIFE:
Concept of personal and group Ethics; Balance between - rights and duties-welfare of self and welfare of all, Creating a value based work culture in hostel, classroom and other places in the campus and society.

UNIT IV  CHARACTER, RIGHTEOUSNESS AND VIRTUES FOR A MEANINGFUL LIFE
Egolessness, Humility, Righteousness, Purity, Truthfulness, Integrity, Self-restraint, Self-control, Sense of responsibility, Empathy, Love, Compassion, Maitri / Comradeship, Cooperation, Tolerance.

UNIT V  DILEMMA BETWEEN MATERIALISTIC DEVELOPMENT AND HUMAN WELFARE

TOTAL: 45 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Enable students to understand the concept of contemporary ethics at different levels: Individual, local and Global and enable them to cross examine the ethical and social consequences of the decisions of their life-view and world view.
2. Develop the ability of students to create a balance between their individual freedom and social responsibilities and enable them to identify the personal, professional and social values and integrate them in their personality after cross examination.
3. Enable students to cross examine their earlier decisions taken in life and understand the meaning of ethical dilemma to overcome the ethical dilemmas and engage in critical reflection.
4. Develop positive habits of thought and conduct and work cohesively with fellow beings who have variety of strengths, experiences, shortcomings and challenges, hence to enable them to handle diverse type of personalities.
5. Enable students to develop a method for making ethically sound decisions for themselves, within hostels, classrooms, university campus and society.
UNIT I  THE LEGAL SYSTEM: SOURCES OF LAW AND THE COURT STRUCTURE  9
Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law- Principles taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign Courtiers. (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court) Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration.

UNIT II  LAWS  9
Basic principles of contract law, sale of goods law, laws relating to industrial pollution, accident, environmental protection, health and safety at work, patent law, constitutional law: the supreme law of the land, Information technology law and cyber crimes.

UNIT III  BUSINESS ORGANISATIONS  9
Sole traders (Business has no separate identity from you, all business property belongs to you). Partnerships: Types of Partnerships - Limited Liability Partnership, General Partnership, Limited Partnerships. Companies: The nature of companies, Classification of companies, Formation of companies, Features of a public company, Carrying on business, Directors- Their Powers and Responsibilities/Liabilities.

UNIT IV  LAW AND SOCIETY  9
Interdisciplinary nature of law, legal ideologies/philosophy/ schools of jurisprudence.

UNIT V  CASE STUDIES  9
Important legal disputes and judicial litigations

TOTAL: 45 PERIODS

HU5274  FILM APPRECIATION  L T P C  3 0 0 3

COURSE DESCRIPTION
This is an intensive course designed to promote comprehensive understanding and insights into the nature of cinema and other related forms and practices. Movies, though at times are used more as escapism, they are also a true art form and expressive tool used by writers, directors and actors. This course will explore the aesthetics of cinema, the concepts behind storytelling and various other elements of a film. It will also explore the impact of movies in our society and in our lives. It also encourages students to use films as a medium to analyse visual texts and read underlying messages.

OBJECTIVES:
- To help learners understand the various movie genres and its types.
- To understand various elements that contributes to film making.
- To make them realize the impact of film in society.
- To analyse the visual media and interpret the underlying messages.

UNIT I  THE COMPONENTS OF FILMS  9
Story, Screenplay & Script – Actors – Director – Crew Members – Mis En Scene – Structure of A Film – Narrative Elements – Linear & Non-Linear – Types of Movie Genres: Mysteries, Romantic Comedies, Horror Etc.

UNIT II  EVOLUTION OF FILM  9

UNIT III  FILMS ACROSS THE WORLD  9
UNIT IV INDIAN FILMS

UNIT V INTERPRETING FILMS
Film Criticism & Appreciation – Censorship in Movies – Cultural Representation in Movies – Television – New Media & Online Media – Films Beyond Entertainment.

TOTAL: 45 PERIODS

OUTCOMES
On completion of the course, the students will be able to:
- Recognize types of films, their impact on society and their roles in our lives.
- Have an understanding of the concepts of storytelling, Mise en Scene, and other elements of film making.
- Interpret the underlying messages in the movies.

TEACHING METHODS
- Each unit consists of reading materials, learning activities videos, websites. Students are expected to watch movies sometimes in class and at times at home and discuss in class.

EVALUATION
- As this is course is critical appreciation course on films, there is no written end semester examination. The course is more on learning how to critically analyse a movie and appreciate its finer elements. Therefore evaluation can be based on assignments and discussions. Internals marks can be taken for the total marks.

INTERNAL (100 % WEIGHTAGE)
- Assignment 1: Write a movie review with critical analysis (20 marks).
- Assignment 2 : Write a script for a scene taken from a short story / novella (20 marks).
- Presentation: Students choose any one topic related to films and present it to the audience. (25 marks)
- Group discussion: Students discuss in groups on the various aspects of movies and its impact on society. (25 marks)
- Blog entry: Making weekly blog posts in Class Blog on the topics related to the course posted by the instructor and commenting on others’ posts. (10 marks)

REFERENCES
1. A Biographical Dictionary of Film by David Thomson, Secker & Warburg, 1975
2. Signs and Meaning in the Cinema by Peter Wollen, Secker & Warburg, 1969
3. The World Viewed by Stanley Cavell 1971
4. Film Style and Technology: History and Analysis by Barry Salt, Starword, 1983

HU5275 FUNDAMENTALS OF LANGUAGE AND LINGUISTICS

OBJECTIVES
- To broadly introduce students to the formal and theoretical aspects of linguistics.
- To enable learners to understand the various practical applications of language and recent findings in the field of applied linguistics.

CONTENTS :-
UNIT I LANGUAGE AND LINGUISTICS: AN OVERVIEW

UNIT II MORPHOLOGY - WORDS OF LANGUAGE

UNIT III SYNTAX- THE SENTENCE PATTERNS OF LANGUAGE AND SEMANTICS-THE MEANING OF LANGUAGE

UNIT IV PHONETICS – THE SOUNDS OF LANGUAGE

UNIT V APPLIED LINGUISTICS - THE PRACTICAL APPLICATIONS OF LANGUAGE
Language learning and teaching (ELT)- lexicography-translation studies-computational linguistics-neurolinguistics (speech pathology and language disorders)- forensic linguistics – sociolinguistics.

TOTAL : 45 PERIODS

TEACHING METHODS :
Lectures, discussion.

EVALUATION INTERNAL AND EXTERNAL :
Internal: 2 written tests + assignments, seminars, project (50+15+15+20).
External: A 3 hour written exam (50 marks)

REFERENCES :

HU5276 UNDERSTANDING SOCIETY AND CULTURE THROUGH LITERATURE

OBJECTIVES
- To internalize the importance of language by understanding its role in the transformation of man.
- To look at language, literature and culture as locus of identity and change.
- To extract meaning from existing literatures and cultures.
- To identify meanings in modern life by reconnecting with lost cultures.

UNIT I INTRODUCTION
Why study literature? Tracing the origin – pictures. Tokens as precursors of writing. Movement from three dimensions to two dimensions- Pictography. From visual to oral -Logography. Reading out literature to young children- Edmund J Farrell.

UNIT II READING CULTURE
Reading culture through language, signs and consumables- Roland Barthes. Culture through poems- Nissim Ezekiel's ‘The night of the Scorpion’ . ‘Nothing’s Changed'- Tatamkhulu Afrika-Apartheid. Ruskin Bond- ‘Night train at Deoli’- How real life is different from movies.
UNIT III IDENTIFYING MEANING
Searching and locating meaning through literature. Looking for order in a chaotic world. The Myth of Sisyphus (Albert Camus) and Adi Shankar’s ‘Jagat Mithya’- the world as an illusion. The Indian version as ‘meaningless meaning’.

UNIT IV POST MODERNISM
‘If on a winter’s night a traveler’- Italo Calvino. The book about the reader- the experience of reading as reading. Metafiction. Selfie Culture. Visual Culture as purpose of modern life.

UNIT V RETURNING TO PICTURES

READING LIST
1. Bond, Ruskin: ‘Night train at Deoli’
2. Ezekiel, Nissim: ‘The Night of the Scorpion’
3. Afrika, Tatamkhulu: ‘Nothing’s Changed’
4. Barthes, Roland: Mythologies
5. Shankarakharya: Viveka Chudamani
6. Camus, Albert- The Myth of Sisyphus
7. Calvino, Italo: If on a winter’s night a traveler

OUTCOMES:
• Can identify the connections among language, literature and culture.
• Is able to relate between seemingly different aspects of life.
• Understands the fractions in modern life and can assimilate meanings.