ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
B.E. PRODUCTION ENGINEERING
REGULATIONS – 2019
CHOICE BASED CREDIT SYSTEM

Vision
To develop educational avenues for the students to emerge as disciplined researchers, technocrats and entrepreneurs making transformative impact on establishing a world class society in the domain of Production Engineering and Automation.

Mission
1. To impart students with knowledge on modern manufacturing and automated systems by incorporating critical thinking, leadership qualities, communication with interpersonal skills.
2. To create a conducive environment for exchange of multidisciplinary ideas towards research, creativity, innovation and entrepreneurship to meet the societal needs with optimal solutions.
3. To follow the values of integrity and honesty through curricular, co-curricular and extracurricular activities.

Programme Educational Objectives (PEOs)
1. Graduates will be competent to effectively design, model, and analyze products and processes, incorporating essential skills required for automated production systems.
2. Graduates will emerge with the necessary confidence and expertise in production engineering, positioning them for successful careers in industry, research organizations, or as entrepreneurs.
3. Graduates will incorporate ethical considerations and a keen awareness of societal and environmental responsibilities into their lifelong learning practices.

Program Outcomes (POs)
1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**Program Specific Outcomes (PSOs)**

1. Graduates will exhibit foundation in production techniques by understanding the behaviour of materials, mechanics and design principles.
2. Graduates will demonstrate management principles, sustainability, quality systems and resource optimization in industry
3. Graduates will apply various production practices to meet industrial, societal and multidisciplinary requirements.

**Mapping of PEOs with POs and PSOs**

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**MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES:**

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[Anna University logo]

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[Centre for Academic Courses logo]
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#### Skill Based Course

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* the students will undergo industrial training / Internship during previous vacation
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### HSMC– ELECTIVES – HUMANITIES I (ODD SEMESTER)

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AUDIT COURSES (AC)

Registration for any of these courses is optional to students

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PROFESSIONAL ELECTIVE COURSES

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### EMPLOYABILITY ENHANCEMENT COURSES (EEC)

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### UG : Production Engineering

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Attested

[Director]
Centre for Academic Courses
Anna University, Chennai-600 025
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
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
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
Theory:

UNIT IV     WRITING LETTERS OF COMPLAINT
Theory:

UNIT V     WRITING DEFINITIONS AND PRODUCT DESCRIPTION
Theory:

TOTAL : 45 PERIODS

LEARNING OUTCOMES:
On completion of the course, the students will be able to:
CO1: Exposure to basic aspects of technical English.
CO2: The confidence to communicate effectively in various academic situations.
CO3: Learnt the use of basic features of Technical English.
CO4: Small group discussions and note making
CO5: Listening to a product description, reading and writing

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


UNIT II DIFFERENTIAL CALCULUS


UNIT III FUNCTIONS OF SEVERAL VARIABLES


UNIT IV INTEGRAL CALCULUS

- 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


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.

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**TEXT BOOKS:**

**REFERENCES:**

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

**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 9

UNIT III OSCILLATIONS, OPTICS AND LASERS 9

UNIT IV BASIC QUANTUM MECHANICS 9
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 9
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.

TOTAL: 45 PERIODS

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.

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TEXT BOOKS
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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, photo processes 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
and carbonate treatment. External conditioning - zeolite (permutit) and ion exchange demineralization. Municipal water treatment process – primary (screening, sedimentation and coagulation), secondary (activated sludge process and trickling filter process) and tertiary (ozonolysis, UV treatment, chlorination, reverse osmosis).

**TOTAL: 45 PERIODS**

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

- 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.

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**TEXT BOOKS:**

**REFERENCES:**

**GE5151 ENGINEERING GRAPHICS**

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

- Drawing free hand sketches of basic geometrical shapes and multiple views of objects.
- Drawing orthographic projections of lines and planes.
- Drawing orthographic projections of solids.
- Drawing development of the surfaces of objects.
- 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  14
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  15
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  15
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  15
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  12
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)  3
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.

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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.

GE5154 

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தமிழர் மரம்
UNIT I  LANGUAGE AND LITERATURE


TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

2. மாணமுருகமுணி - மற்றும் மருத்துவமுணி (சுலாநாயகம்).
3. பெருமாள - கொண்டால் குரல்களுக்கு சாத்தியத்தின் துறவுகள் (நோக்சலியின் வடுத்துறை).
4. பெருமாள - எற்றுப்படுத்தப்பட்டுள்ள (சுலாநாயகம் விளக்கம்).
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) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)

GE5154  HERITAGE OF TAMILS  L  T  P  C
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UNIT II  HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE  3

UNIT III  FOLK AND MARTIAL ARTS  3
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV  THINAI CONCEPT OF TAMILS  3
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  3
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. தமிழகவரலை - மக்களும் பணைப்பொடும் - Dr. K. K. Pillay (தவளியீடு: தமிழ்நொடுபொடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முமனவர் இல.சுந்தரம் (விகடன் பிரசுரம்).
3. கீழடி - மவமகநதிக்கமரில் எங்ககொல்நகரிகம் (ததொல்லியல் துமறதவளியீடு).
4. படைத்தியாடு - ஆராண்மிகத் தருமரிகம் (ததொல்லியல் துமறதவளியீடு).
5. Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
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Attested

DIRECTOR

Centre for Academic Courses
Anna University, Chennai-600 025
BS5161 BASIC SCIENCES LABORATORY (Common to all branches of B.E. / B.Tech Programmes) L T P C 0 0 4 2

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
CO1: To determine various moduli of elasticity.
CO2: To determine the velocity of ultrasonic waves, band gap determination
CO3: To determine various thermal and optical properties of materials.
CO4: To determine the viscosity of liquids
CO5: To determine the estimation of laser parameters

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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:
At the end of the course the students will be able
- 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:

GE5162 WORKSHOP PRACTICES LABORATORY
(Course to all Branches of B.E. / B.Tech. Programmes)

COURSE OBJECTIVES: The main learning objective of this course is to provide hands on training to the students in:
- 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.
- Wiring various electrical joints in common household electrical wire work.
- 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.
- Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.
GROUP – A (CIVIL & ELECTRICAL)

PART I
CIVIL ENGINEERING PRACTICES

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
- 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

WIRING WORK:
- a) Wiring Switches, Fuse, Indicator and Lamp etc. such as in basic household,
- b) Wiring Stair case 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

WELDING WORK:
- 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.
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:

- 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.
- Wire various electrical joints in common household electrical wire work.
- 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.
- Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

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GE5163 \hspace{1cm} ENGLISH LABORATORY \hspace{1cm} L T P C

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 \hspace{1cm} INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION

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

UNIT V  EXPRESSION
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

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.

TOTAL : 30 PERIODS

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  6
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  6
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  6
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.

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MA5252   ENGINEERING MATHEMATICS – II   3 1 0 4
(Common to all branches of B.E. / B.Tech. Programmes in II Semester)

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.

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TEXT BOOKS:

REFERENCES:
GE5153 PROBLEM SOLVING AND PYTHON PROGRAMMING

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


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


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

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:
1. Develop algorithmic solutions to simple computational problems.
2. Develop and execute simple Python programs.
3. Write simple Python programs for solving problems.
4. Decompose a Python program into functions.
5. Represent compound data using Python lists, tuples, dictionaries etc.
6. Read and write data from/to files in Python programs.
### TEXT BOOKS:

### REFERENCES:

### 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
9
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:
1. To be able to understand the concepts related with electrical circuits and wiring.
2. To be able to study the different three phase connections and the concepts of magnetic circuits.
3. Capable of understanding the operating principle of AC and DC machines.
4. To be able to understand the working principle of electronic devices such as diode and zener diode.
5. To be able to understand the characteristics and working of current controlled and voltage controlled devices.

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TEXT BOOKS:

REFERENCES:

GE5152  ENGINEERING MECHANICS
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COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
- Applying the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.
- 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.

- 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.
- Applying the concepts of frictional forces at the contact surfaces of various engineering systems.
- 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)
The Laws of Dry Friction, Coefficients of Friction, Angles of Friction, Wedges, Wheel Friction, Rolling Resistance, Ladder Friction.

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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**TEXT BOOKS:**

**REFERENCES:**

**PH5251 MATERIALS SCIENCE**
(Common to Mechanical, Manufacturing, Industrial, Mining, Aeronautical, Automobile and Production Engineering & Rubber and Plastics Technology)

**COURSE OBJECTIVES:**
- To make the students to understand the basics of crystallography and crystal imperfections.
- To introduce various strengthening methods of materials, and also various mechanical properties and their measurement.
- To impart knowledge on the basics of phase diagrams and their applications.
- To learn about iron-carbon system, and about various ferrous and non-ferrous alloys.
- To introduce the preparation, properties and applications of ceramics, composites and nanomaterials.

**UNIT I CRYSTALLOGRAPHY**

**UNIT II MECHANICAL PROPERTIES**

UNIT III          PHASE DIAGRAMS
Basic concepts - Gibbs phase rule – Unary phase diagram (iron) - Binary phase diagrams: isomorphous systems (Cu-Ni) – determination of phase composition and phase amounts – tie line and lever rule - binary eutectic diagram with no solid solution and limited solid solution (Pb-Sn) – eutectoid and peritectic reactions - other invariant reactions – micro structural development during the slow cooling: eutectic, hypereutectic and hypoeutectic compositions.

UNIT IV         FERROUS AND NONFERROUS ALLOYS

UNIT V          CERAMICS, COMPOSITES AND NANO MATERIALS

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will
1. Understand the basics of crystallography and its importance in materials properties
2. Understand the significance of dislocations, strengthening mechanisms, and tensile, creep, hardness and fracture behavior of materials
3. Gain knowledge on binary phase diagrams, and also will be able to determine the phase composition and phase amount.
4. Understand about the Fe-C system and various microstructures in it, and also about various ferrous and non-ferrous alloys.
5. Get adequate understanding on the preparation, properties and applications of ceramics, composites and nanomaterials.

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REFERENCES
GE5252  

TEXT-CUM-REFERENCE BOOKS


TOTAL : 15 PERIODS
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)


GE5252 TAMILS AND TECHNOLOGY

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**UNIT I WEAVING AND CERAMIC TECHNOLOGY**

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

**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 Thooppu 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. வரலொறு தவளியீடு – மர்க்கு பண்முகம் – க.லோக. பரிகாரம் (தவளியீடு; வரலொறு என்பதன் வழங்கிய வேதியியல் குறிப்பிட்டுக்கொள்ளின).

2. கம்பிகொள்ள கிரு ப்பெயர் – புகழ்பெற்ற வெயில். கருவர். (எரோயியம் பெயர்).

3. விலங்கு – தொன்று தொல்லியல் முறையின் சம்யாக தொல்லியல் (எரோயியம் வெயில் தொல்லியல்).

4. பார்வோ தவளியீடு – பார்வோ தவளியீடு (சிங்ககர் தவளியீடு)

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)

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GE5161    PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY     L T P C
0 0 4 2

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:
1. Develop algorithmic solutions to simple computational problems
2. Develop and execute simple Python programs.
4. Decompose a Python program into functions.
5. Represent compound data using Python data structures.
6. Apply Python features in developing software applications.

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DIRECTOR
Centre for Academic Courses
Anna University, Chennai-600 025
COURSE OBJECTIVES

- To impart hands on experience in verification of circuit laws and measurement of circuit parameters.
- To train the students in performing various tests on electrical motors.
- 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.

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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

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

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

Attested

DIRECTOR

Centre for Academic Courses
Anna University, Chennai-600 025
UNIT III
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
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
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
1. Speak effectively in group discussions held in a formal/semi formal contexts.
2. 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.

MA5353
NUMERICAL METHODS

COURSE OBJECTIVES:
- To provide the mathematical foundations of numerical techniques for solving Eigen value problems and linear system of equations.
- To apply the techniques of interpolation for equal and unequal intervals for the given data.
- To understand and to apply the techniques of numerical integration and differentiation for solving and ODE in applying day today life.
- To familiar in solving initial value problems and ODE for given initial and boundary conditions.
- To demonstrate the utility of Numerical techniques for solving Partial Differential Equations in Heat and Fluid problems.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

UNIT II INTERPOLATION AND APPROXIMATION
Interpolation with unequal intervals - Lagrange interpolation – Newton’s divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton’s forward and backward difference formulae – Least square method - Linear curve fitting.

UNIT III NUMERICAL DIFFERENTATION AND INTEGRATION
UNIT IV  INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS  12

UNIT V  BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS  12
Finite difference methods for solving two-point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

TOTAL: 60 PERIODS

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

1. Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to the algebraic and transcendental equations.
2. Apply numerical methods to obtain approximate solutions to mathematical problems using interpolation.
3. Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
4. Analyse and evaluate the accuracy of common numerical methods in solving ODE of First and Second order equations.
5. Understand various numerical techniques for solving PDE, for given conditions in Heat flow and Wave problems.

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TEXT BOOKS:

AU5352  MECHANICS OF SOLIDS  L T P C  3 0 0 3

COURSE OBJECTIVES:
The objective of this course is

- To know about how a solid (materials, structures) behaves when it is exposed to forces and deformations.
- To apply the fundamental concepts of principle of superposition, equilibrium, compatibility, force deformation, and stress-strain relationships to the solid and structural mechanics problems
- To analyze determinate and indeterminate bars, beams, to determine axial forces, torques, shear forces, and bending moments
- To have physical insight into distribution of stresses and strains in shafts and springs
- To identify the biaxial stresses in acting in a body or an element.
UNIT I  STRESS - STRAIN, AXIAL LOADING  
Stress and strain, elastic limit, Hooke's law, factor of safety, shear stress, shear strain, relationship between elastic constants. Stresses in stepped bars, uniformly varying sections, composite bars due to axial force. Lateral strain, Poisson's ratio, volumetric strain, changes in dimensions and volume. Thermal stresses and impact loading.

UNIT II  STRESSES IN BEAMS  
Beam – Definition, types of end supports, types of beam, types of loading. Shear force diagram and bending moment diagram for cantilever, simply supported and overhanging beams under point load, UDL, UVL and moments. Euler beam theory - Bending equation, section modulus, Bending stress in beams – Shear stress in beams.

UNIT III  DEFLECTION OF BEAMS AND COLUMNS  

UNIT IV  TORSION AND SPRINGS  
Theory of torsion and assumptions - torsion equation, polar modulus, stresses in solid and hollow circular shafts, power transmitted by a shaft, shafts in series and parallel, deflection in shafts fixed at the both ends. Springs – types, Deflection expression for closed coiled helical spring – Stress in springs - design of springs.

UNIT V  BIAXIAL STRESS  
Principal stresses, normal and tangential stresses, maximum shear stress - analytical and graphical method. Stresses in combined loading. Thin walled cylinder under internal pressure – changes in dimensions – volume. Spherical shells subjected to internal pressure – deformation in spherical shells – Lame’s theory.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, the students are expected to
1. Know about how a solid (materials, structures) behaves when it is exposed to forces and deformations
2. Apply the fundamental concepts of principle of superposition, equilibrium, compatibility, force-deformation, and stress strain relationships to the solid and structural mechanics problems
3. Analyze determinate and indeterminate bars, beams, to determine axial forces, torques, shear forces, and bending moments
4. Have physical insight into distribution of stresses and strains in shafts and springs
5. Identify the biaxial stresses in acting in a body or an element

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TEXT BOOKS:
REFERENCES:

AU5351 THERMODYNAMICS AND THERMAL ENGINEERING L T P C
3 1 0 4

COURSE OBJECTIVES:
- To impart knowledge of basic principles of thermodynamics via real world engineering examples
- To analyze and evaluate cardinal air standard cycles
- To analyze and evaluate cardinal Steam power cycles
- Summarize the governing concepts of Refrigeration and Air conditioning
- To introduce various modes of heat transfer, related to real time scenarios of thermodynamics applied in engineering practice

UNIT I BASIC THERMODYNAMICS
Systems, closed, open and isolated. Property, state, path and process, quasi-static process,

UNIT II AIR STANDARD CYCLES AND COMPRESSORS
Cycle, Carnot cycle, Otto, Diesel, Dual combustion and Brayton cycles. Air standard efficiency. Mean effective pressure. Comparison of cycles. Efficiency versus compression ratio. For the same compression ratio and the same heat input Compressors. Classifications of compressors, Single stage and multi stage, Effect of intercooler in multi stage compressor, Perfect and imperfect intercooler, work done by the compressor, Reciprocating, Rotary, Axial, Vane compressors.

UNIT III STEAM AND JET PROPULSION
Formation of steam and its thermodynamic properties, p-v, p-T, T-v, T-s, h-s diagrams. p-v-T surface
Properties of steam, Dryness fraction, Quality of steam by steam tables and Mollier chart – Rankine cycle, Work done, Steam rate – Steam Nozzles, Types of nozzles, Friction in nozzles - Simple jet propulsion system – Thrust rocket motor – Specific impulse.

UNIT IV REFRIGERATION AND AIR-CONDITIONING
Principles of refrigeration. Vapour compression – Types of VCR system with respect to condition of vapour. Problems, Vapour absorption types, comparison - Co-efficient of performance (COP), Properties of refrigerants – Basic Principle, Summer, winter and Year round Air conditioning.

UNIT V HEAT AND MASS TRANSFER

TOTAL: 45 PERIODS
(Use of standard Steam tables with mollier chart and Refrigerant tables are permitted)
COURSE OUTCOMES:
At the end of the course the students will be able to
1. Will demonstrate understanding of the nature of the thermodynamic processes for pure substances of ideal gases
2. Will interpret First Law of Thermodynamics and its application to systems and control volumes
3. Will solve any flow specific problem in an engineering approach based on basic concepts and logic sequences
4. Will compare and contrast between various types of refrigeration cycles
5. Will get exposed to the basics and modes of heat transfer

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TEXT BOOKS:

REFERENCES:

AE5351 FLUID MECHANICS AND FLUID MACHINES  L T P C
3 0 0 3

COURSE OBJECTIVES: Of this course are
- To learn about the basic properties of fluids.
- To introduce the concept of incompressible and viscous flows.
- To have a thorough knowledge on dimensional analysis and model studies.
- To study the applications of conservation laws to flow through pipes and hydraulic machines.
- To learn the basics of water turbines, their classification and working principles

UNIT I BASIC EQUATIONS
Definition of fluid, Newton’s law of viscosity, Units and dimensions-Properties of fluids, mass density, specific volume, specific gravity, viscosity, compressibility and surface tension, Control volume- application of continuity equation and momentum equation, Incompressible flow, Bernoulli’s equation and its applications.

UNIT II INCOMPRESSIBLE VISCOUS FLOW
Exact flow solutions in channels and ducts, Couette and Poisuielle flow, laminar flow through circular conduits and circular annuli- concept of boundary layer – measures of boundary layer
thickness – Darcy Weisbach equation, friction factor, Moody’s diagram.

UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES 9
Need for dimensional analysis–methods of dimension analysis–Similitude–types of similitude
Dimensionless parameters–application of dimensionless parameters–Model analysis.

UNIT IV PUMPS 9
Euler’s equation – Theory of Roto dynamic machines – various efficiencies – velocity components
at entry and exit of the rotor, velocity triangles – Centrifugal pumps, working principle, work done
by the impeller, performance curves – Cavitation in pumps- Reciprocating pump–working principle.

UNIT V TURBINES 9
Classification of water turbines, heads and efficiencies, velocity triangles- Axial, radial and mixed
flow turbines- Pelton wheel, Francis turbine and Kaplan turbines, working principles – draft tube
Specific speed, unit quantities, performance curves for turbines – governing of turbines.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, Students will be able to

1. Exhibit the basic understanding on fluid properties and fluid statics
2. Demonstrate the understanding in fluid kinematics and governing equations
3. Use the governing equations for fluid flow problems and understand the elementary
4. Analyze laminar and turbulent flow problems.
5. Acquire knowledge on the various types of fluid machines

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TEXT BOOKS:
1. Ojha C.S.P, Berndtsson R and Chadramouli P. N., Oxford University Press, 2010

REFERENCES:

PR5311 COMPUTER AIDED DRAFTING AND MACHINING LABORATORY L T P C
0 0 4 2

COURSE OBJECTIVES
- To Understanding the selection of appropriate machining processes for different manufacturing needs.
- To Apply and demonstrate the application of skills in generating part drawings for diverse
To Analyze and break down the process of determining machining times for individual operations through the application of time study techniques.

To Evaluate and assess, judge the process of creating process planning sheets, while determining the most optimal sequence for machining operations.

To Create and construct proficiency in utilizing 2D modeling software to design mechanical components for various purposes.

LIST OF EXPERIMENTS

Machining Exercises
1. Preparation of part drawing to machine a raw material in a lathe – (involving facing, turning, stepped turning, knurling, taper turning, thread cutting and parting)
2. Preparation of part drawing to machine a blank material in a shaper – (involving horizontal, vertical surface machining, V-shape, dove-tail end)
3. Preparation of part drawing to machine the given part in drilling machine – (involving single hole, multi hole, equidistant, equi-pitch, reaming, boring, counter boring, counter sinking).
4. Preparation of part drawing to mill the groove part in a milling machine – (involving key way, slot, spur gear, patched milling, spline, gang milling).
5. Preparation of part drawing to grind the part in a grinding machine-(involving flat surface, cylindrical surface).

Drafting Exercises
1. Any CAD software with 2D modeling to used by students for drafting exercises
2. Practice on Drafting Software using Measuring commands; Basic Draw Commands; Display Commands GRID, SNAP, CIRCLE, LINE, ARC LIMITS, ZOOM, PAN.
3. Practice on using Editing commands; Creating layers: CHANGE,ERASE, EXTEND, TRIM, GRIPS. Construction Commands; ARRAY, COPY, MIRROR, MOVE, OFFSET, FILLET, CHAMFER, OSNAP.
4. Placing lettering on a drawing; Crosshatching a drawing TEXT BHATCH.
5. 2D drafting of automobile components like engine crank shaft, connecting rod etc.,
6. 2D drafting of machine components.
7. 2D drafting of machine shop drawing.
8. 2D drafting of pin joints, cotter joints and bearings.

The drafting exercise include process planning sheet where student shall fill up the data for producing the product as per drawing. As per the process planning sheet the machining operations are to be conducted.

2. Eccentric turning in a Lathe
4. Machining to make a cube/ V-Block using shaper.
5. Counter sinking, Counter Boring and Tapping operation in a drilling machine.
7. Polygonal shape milling in a horizontal milling machine.
8. Flat surface grinding and cylindrical grinding operations.

TOTAL: 60 PERIODS

COURSE OUTCOMES:
At the end of the course the students will be able to
1. The student will be capable of assessing and selecting the most appropriate machining process for intricate engineering components.
2. The student will be capable of employing skills to produce part drawings corresponding to a range of manufacturing operations.
3. The student will be capable of breaking down tasks to compute machining durations across various manufacturing operations.
4. The student will be capable of generating process planning sheets tailored to different manufacturing operations.
5. The student will be capable of crafting orthographic and isometric models utilizing 2D modeling software for diverse mechanical components.

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PR5312  MATERIAL TESTING AND THERMAL ENGINEERING LABORATORY

COURSE OBJECTIVES:
- To study the mechanical properties of materials when subjected to different types of loading.
- To study the performance characteristics of various engines
- To understand the working principle of IC engines
- To understand the modes of heat transfer
- To enable the students to apply the heat transfer knowledge to real applications.

MATERIAL TESTING
1. Tension test on mild steel rod
2. Torsion test on mild steel rod
3. Hardness test on metal beam (Rockwell, Vicker’s and Brinell Hardness Tests)
4. Compression test on helical spring
5. Deflection test on carriage spring
6. Impact Test (Izod and Charpy)

THERMAL ENGINEERING LAB
1. Valve timing diagram
2. Port timing diagram
3. Performance test on four stroke diesel engine
4. Performance test on air compressor
5. Composite wall apparatus
6. Determination of convective heat transfer coefficient
7. Determination of thermal conductivity for pipe application.
8. Emissivity apparatus
9. Stefan Boltzmann apparatus
10. Pin fin apparatus

TOTAL:60 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
1. Perform Tension, Torsion, Hardness, Compression, and Deformation test on Solid materials.
2. Perform Tension, Torsion, Hardness, compression, and deformation test on Solid materials.
3. Understand the importance of valve timing, and overlap on performance
4. Analyze the performance characteristics of the given engine.
5. Distinguish different modes of heat transfer.

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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: 10 Hours
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
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

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

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**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
  nonrenewable 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**
14
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**
8
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

**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 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**  

**COURSE OUTCOMES:**

At the end of the course the students will be able to

1. To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation
2. To identify the causes, effects and environmental pollution and natural disasters and contribute to the preventive measures in the immediate society.
3. To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations
4. To recognize different forms of energy and apply them for suitable applications in for technological advancement and societal development.
5. 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 analyze effect of population dynamics on human value education, consumerism and role of technology in environmental issues

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TOTAL: 45 PERIODS
TEXT BOOKS:

REFERENCES:

PR5401  FOUNDRY AND WELDING TECHNOLOGY  L T P C  3 0 0 3

COURSE OBJECTIVES:
- To enhance the knowledge about principles/methods of casting with detail design of gating/riser system needed for casting, defects in cast objects and requirements for achieving better casting.
- To impart the basic principle, procedure and applications of various Foundry and Welding methods.
- To knowledge the principle, thermal and metallurgical aspects during solidification of metal and alloys
- To discuss SMAW, GMAW, GTAW, Oxy-acetylene welding and resistance spot welding processes
- To have a improve knowledge to design a casting and welding process and metallurgical and weldability aspects of different common engineering materials.

UNIT I  CASTING PROCESSES  9

UNIT II  SPECIAL CASTING PROCESSES  9

UNIT III  METAL JOINING PROCESSES  9

UNIT IV  SPECIAL WELDING PROCESSES  9
UNIT V  TESTING OF CASTINGS AND WELDMENTS
Causes and remedies for casting defects – welding defects – Destructive testing – Non
Destructive Testing (NDT) methods– Testing: Dye penetrant – magnetic particle – X-ray -
Radiography - ultrasonic - Case studies in testing of welded joints and castings.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Explain the key concepts and terminology related to pattern making, moulding, and core making
   in casting processes.
2. Evaluate and select appropriate special most suitable casting method for a given application.
3. Recall the fundamental concepts, terminologies, and classifications of joints and welding
   methods.
4. Compare the behavior of common and emerging welding techniques, considering their
   advantages and limitations.
5. Summarize and categorize various casting and welding defects using destructive and non-
   destructive testing methods

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REFERENCES:
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   (2003).

PR5402  ENGINEERING MATERIALS  L T P C
3 0 0 3

COURSE OBJECTIVES:
- To impart knowledge on the various microstructural features of metallic materials, also
  study the effect of alloying addition in the steel with their structural change.
- To illustrate the role of heat treatment on microstructure and properties, also study the
  case
- To desire the various non-ferrous alloys and their applications with properties.
- To introduce the concepts of mechanical behaviour of the materials, also study the various
  strengthening mechanism.
- To describe the properties and applications of various polymers and ceramics.

UNIT I  MICROSTRUCTURAL DEVELOPMENT AND METALLOLOGY
Basics of Metallographic microscopy -sample preparation – resolution – contrast – Metallographic
microscope - quantitative techniques - Homogenous and Heterogeneous nucleation - grain

[Attachment]

UNIT II HEAT TREATMENT AND KINETICS

UNIT III NON FERROUS METALS

UNIT IV DEFORMATION AND FAILURE OF METALS

UNIT V NON METALLIC MATERIALS
Polymers- Thermo, Thermoset Polymers, Co and mixed Polymers- Commodity Polymers, PE, PS,PVS PMMA, PC, PET, ABS- Engineering Polymers, PA, PPS, PI, PFE- Natural and Synthetic rubbers, Elastomers- Adhesives- Ceramics- Natural and Synthetic Ceramic- Feldspar, Corundum, Garnet- WC, TC,TiC, Si3N4,Al2O3, CBN, PCD, Uses of abrasives and cutting tools.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, the students will be able to:
1. Identify the microstructural features of ferrous materials, also understand the structural properties correlations.
2. Understand the various heat treatment concept, also identify the suitable heat treatment process for the require applications.
3. Understand the properties and uses of non-ferrous alloys, also justify the selection for the various applications.
4. Correlate the mechanical behaviour with the mechanisms of strengthening, also understand the different types of fracture with exact reason.
5. Suggest suitable polymer and ceramic for a given application

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TEXT BOOKS:

REFERENCES:

PR5403 MACHINING PROCESSES AND MACHINE TOOLS
L T P C
3 0 0 3

COURSE OBJECTIVES:
- To provide students with fundamental knowledge and principles in material removal processes.
- To understand the fundamentals aspects of metal cutting principles by studying various machining processes.
- To study the constructional features and various operations related to milling, drilling and grinding.
- To know the factors influencing the processes and their applications.
- To recommend appropriate manufacturing process when provided a set of functional requirements and constraints.

UNIT I LATHE

UNIT II SHAPER, PLANER and SLOTTER

UNIT III DRILLING
Purpose of drilling – block diagram and function – types of drilling machines – portable drilling – bench type – sensitive drilling – radial arm drilling – functions of parts – purpose and operation – gang drilling, multiple drill head, upright drilling, relative operations – reaming, boring, tapping, counter boring, courses sinking, trepanning and spot facing (with simple sketch, purpose and

**UNIT IV MILLING**

**UNIT V GRINDING**

**COURSE OUTCOMES:**
At the end of the course, students will be able to:
1. Explain the features and applications of lathe, milling, drilling and grinding machines
2. Discuss the features and applications of reciprocating machine tools and like shaper, planer and slotting machine
3. Explain the machine tool structures
4. Explain the working principles of various machines used in manufacturing
5. Identify the appropriate production process and machines.

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**REFERENCES:**
COURSE OBJECTIVES:

- To identify and enumerate different link based mechanisms with basic understanding of motion and analyze the various velocity and acceleration diagrams for various mechanisms.
- To understand the effects of friction in motion in transmission and machine components.
- To familiarize higher pairs like cams, gears and gear trains their nomenclature and their profiles.
- To study the basics of vibrations their effects on rotation and reciprocating members.
- To study the undesirable effects of unbalances and unstability resulting from prescribed motions in mechanisms, governors and gyroscopes.

UNIT I MECHANISMS 9+3

UNIT II FRICTION 9+3
Types of friction – friction in screw and nut – screw jack – pivot, collar and thrust bearings – plate and cone clutch – belt (Flat and V) and rope drives – creep in belts – open and crossed belt drives – Ratio of tensions – Effect of centrifugal and initial tensions – condition for maximum power transmission.

UNIT III GEARS AND CAMS 9+3

UNIT IV VIBRATION 9+3

UNIT V BALANCING 9+3
Static and dynamic balancing – single and several masses in different planes – primary and secondary balancing of reciprocating masses – Balancing of single and multi-cylinder engines – Governors and Gyroscopic effects.

TOTAL:60 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Able to analyze the velocity and accelerations in mechanisms, and to utilize their inversions of mechanism.
2. Able to acquire the knowledge on different type screw jack, bearings, brakes and clutches.
3. Able to design a cam and gear and to select suitable gears and gear trains for effective power transmission
4. Able to solve problems in vibration due to unbalance in rotating members
5. Able to analyze the effects of unbalancing in machines, controlling force and unstability in governors and gyroscopes.

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REFERENCES:

PR5411 MACHINING PROCESSES LABORATORY

L T P C 0 0 4 2

COURSE OBJECTIVES:
- To demonstrate the various machining operations in conventional lathe and shaping machine.
- To demonstrate the various machining operations in conventional milling machine.
- To demonstrate the grinding and gear cutting process.
- To provide the knowledge on the fundamentals of part program.

LIST OF EXPERIMENTS
1. Taper Turning and Eccentric Turning using lathe
2. External and Internal Thread cutting using lathe
3. Knurling
4. Shaping – Square and Hexagonal Heads
5. Drilling and Reaming
6. Contour milling - vertical milling machine
7. Spur and helical gear cutting using milling machine
8. Gear generation using gear hobber
9. Gear generation using gear shaper
10. Grinding – Cylindrical, Surface and Centerless grinding
11. Tool angle grinding with tool and Cutter Grinder
12. Spline Broaching
13. Measurement of cutting forces in Milling /Turning Process
14. CNC Part Programming

TOTAL: 60 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. To machine the given workpiece in the conventional lathe and shaping machine to get the required geometry
2. To machine the given workpiece in the conventional milling machine to get the required profile
3. To produce the gear with the given workpiece.
4. Calculate the values of various forces involved in the machining operations.
5. Develop a CNC program for the given part
COURSE OBJECTIVES:

- To train the students in the area of non-ferrous metal casting with the simple shapes.
- To study the basic requirements of given moulding sand by standard tests.
- To train the students to make the simple joints by various welding techniques.
- To study the solidification of metals and alloys also find the various microstructure of given specimens.
- To train the students for various heat treatment processes and their applications.

LIST OF EXPERIMENTS:

**FOUNDRY**
1. Green and Dry Strength of Moulding sand.
2. Permeability testing.
3. Determining the clay content.
4. Sieve analysis of dry silica sand.
5. Determining the moisture content.

**WELDING**
1. Welding of basic joints using gas and arc welding.
2. Welding of pipes in different positions.
3. GTAW / GMAW of ferrous and non-ferrous metals.

**METALLURGY**
1. Cooling curve- Pure metal and alloy (Pb-Sn).
2. Specimen preparation for macro – examination.
5. Heat treatments of Steel-Micro structural study: Annealing/ Normalising / Quench
7. Jominy End Quench Test.

**TOTAL: 60 PERIODS**

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Utilize testing methods and equipment to assess the quality of moulding sand.
2. Demonstrate the basic casting procedure for different materials and shapes.
3. Demonstrate the practical ability to create simple welded joints using appropriate welding techniques.


5. Explain the mechanisms behind various heat treatment processes and describe their applications.

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GE5551 STATISTICS FOR PRODUCTION MANAGEMENT

COURSE OBJECTIVES:
- To train the students so that students will be able to design experimental designs and use these concepts for research design.
- To make use of the concept of probability for industrial applications.
- To stress upon the importance of the sampling theory and its usefulness in industrial quality control.
- To make students familiarize with the concepts of estimation theory and its applications.
- To help students understand the usefulness of tests of significance and its applications in industry and research.

UNIT I PROBABILITY THEORY
Random variables – Discrete and continuous random variable- Probability mass and density functions- Joint density and mass functions-Moment about mean and origin- Moment generating and characteristic functions – Binomial, Poisson, Normal distributions and their applications- to manufacturing problems.

UNIT II SAMPLING THEORY
Sampling with and without replacement- Random sample- Sampling distributions of means, proportions, difference of means and proportions-Student 't' distribution- Chi square distribution- Fisher’s distribution and their applications to production problems.

UNIT III ESTIMATION THEORY
Point and Interval estimation- Confidence limits for mean, proportions, difference of means, proportions- Confidence limits using student ‘t’ distribution, Chi square and F distribution-applications.

UNIT IV TESTING OF HYPOTHESIS
Procedure for testing hypothesis and significance- Level of Significance of large samples for means, proportions, difference of means and difference of proportions- Tests based on student t distribution, chi square distribution and F distribution – Applications to manufacturing.

UNIT V ANOVA
One factor experiments – Mathematical model for one factor experiments- Two factor experiments-Mathematical model for two factor experiments- Applications to production problems.

TOTAL: 45 PERIODS
COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Interpret the concept of probability and statistics for industrial applications
2. Estimate the quality of the sample using sampling theory in industrial quality control
3. Estimate the life of the sample using estimation theory in industrial reliability analysis
4. Formulate hypothesis and conduct Design of experiments
5. Utilize appropriate decision making tools in production management

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REFERENCES:

PR5501 ENGINEERING METROLOGY L T P C
COURSE OBJECTIVES:
- To define the various aspects of measurement and its applications in industry
- To explain the working principles of various measuring systems
- To apply the principles of metrology and measurements in manufacturing industries.
- To evaluate the various measurable parameters of the given component using suitable measuring equipment
- To compare the advances in measurement with the traditional measuring methods.

UNIT I FUNDAMENTALS OF MEASUREMENT
Fundamentals of Engineering metrology – Line, end and wave length standards of measurement – Accuracy, Precision and Calibration of instruments - Errors in measurements – Limits, fits, tolerance and gauge design – Inter changeability and selective assembly – Uncertainties in measurements.

UNIT II LINEAR AND ANGULAR MEASURING SYSTEMS
UNIT III  
MEASUREMENT OF SURFACE TEXTURE AND MEASURING INSTRUMENTS  
Surface texture – Definitions – types of surface texture – surface texture measurement methods 
Comparison – Profilometer – Surface texture measuring instruments – Straightness and flatness 
measurement using precision level and auto collimators—Measurement of roundness and camming— Tool makers microscope – Optical and Laser Alignment telescope – Geometric Dimensioning and Tolerancing

UNIT IV  
METROLOGY OF SCREW THREADS AND GEARS  
Metrology of screw threads and gears Internal and external screw threads – terminology - 
measurement of various elements of screw threads – thread micrometer two wire and three wire - 
methods, gear terminology measurement of various elements of gears pitch circle method, 
constant chord method, base tangent method – plug method – Rolling gear tester.

UNIT V  
LASER METROLOGY AND COMPUTER AIDED METROLOGY  
Laser micrometer - Laser interferometer – non contact and in-process inspection using laser – Co- 
ordinate measuring machines – Probe sensors – Errors – Environmental factors – vision systems – 
Atomic force microscope - Scanning tunneling microscope - 3D Computed Tomograpghy.

COURSE OUTCOMES: 
At the end of the course, students will be able to: 
1. Identify the various errors in measurement and calculate the uncertainties in measurements 
2. Utilize measuring instruments for analyzing the linear and angular components 
3. Select appropriate and analyze the various parameters of surface texture 
4. Identify and calculate the various parameters of screw thread and gear tooth 
5. Apply measurements for quality control in manufacturing Industries.

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COURSE OBJECTIVES:
- To understand the basic fluid power
- To classify the different properties of hydraulic fluids and its effects
- To explain the working principle of various control elements
- To illustrate the working principle of hydraulic and pneumatic circuits for different applications
- To design electro pneumatic and PLC circuits for industrial application

UNIT I  BASICS OF FLUID POWER

UNIT II  FLUID POWER SOURCES
Fluid Power drives – Pumps – working principle and construction details of Gear, vane and piston pumps, Hydraulic motors, Hydrostatic transmission drives and characteristics, Hydraulic supply components Pneumatic power supply – compressors, air distribution, air motors.

UNIT III  FLUID POWER ACTUATORS AND ELEMENTS

UNIT IV  HYDRAULIC AND PNEUMATIC CIRCUITS DESIGN

UNIT V  ELECTRO PNEUMATICS AND PLC CIRCUITS
Fluidics -Moving part logic circuits - Use of electrical timers, switches, solenoid, relays, proximity sensors - electro pneumatics sequencing Ladder diagram – PLC – elements, functions and selection – PLC programming– Ladder and different programming methods - Sequencing circuits.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
The students will be able to
1. Recall and list the fundamental principles of fluid power systems related to hydraulic and pneumatic systems.
2. Describe the working principles of pumps, actuators and control elements in fluid power systems.
3. Explain the construction and operation of various control elements with their characteristics and applications.
4. Develop fluid power circuits for specific applications that meet industry requirements.
5. Create programmable logic controller (PLC) circuits for fluid power systems for various applications.

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REFERENCES:

UNIT I INTRODUCTION 9+3

UNIT II JOINTS 9+3
Design of Bolts under Static Load, Design of Bolt with tightening / Initial Stress, Design of Bolts subjected to Fatigue – Keys -Types, Selection of Square and Flat Keys-Design of Riveted Joints and Welded Joints.

UNIT III SHAFTS AND COUPLINGS 9+3
Design of Shaft – Static and Varying Loads, Strength and Rigidity- Design of Coupling -Types, Flange, Muff and Flexible Rubber Bushed Coupling

UNIT IV GEARS AND BELT DRIVES 9+3
Design of Spur, Helical, Bevel and Worm Gear drives- Design of Belt drives- Flat, V Belts and Timer Belts

UNIT V SPRINGS AND BEARINGS 9+3
Design of Helical Spring-Types, Materials, Static and Variable Loads- Design of Leaf Spring-Design of Journal Bearing - Antifriction Bearing-Types, Life of Bearing, Reliability Consideration, Selection of Ball and Roller Bearings

TOTAL: 60 PERIODS
COURSE OUTCOMES:
At the end of the course, students will be able to
1. Grasp the essentials of engineering design, theories of failure, and effectively solve fundamental mechanical challenges.
2. Translate their concepts into practical bolt and joint designs, while also introducing them to the process of key selection.
3. Acquire understanding in the design of a range of springs and bearings.
4. Cultivate a profound understanding of designing diverse varieties of gears and belt drives.
5. Know the design of different springs and bearings.

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TEXTBOOKS:

REFERENCES:

PR 5511  FLUID POWER SYSTEMS LABORATORY  L T P C 0 0 4 2

COURSE OBJECTIVES:
- To study the functional aspects of different pneumatic Components and its use in circuits design
- To study the functional aspects of different hydraulic components and its use in circuits
- To train the student in designing different pneumatics for different applications
- To train the student in designing different hydraulic circuits for different applications
- To train the student in designing of PLC circuits using hydraulic circuit applications

LIST OF EXPERIMENTS
1. Study and use of pneumatic and hydraulic elements.
2. Basic hydraulic and Basic Electro hydraulic circuits.
3. Single and double acting cylinder circuits using different directional control valves.
5. Logic pneumatic circuits.
6. Speed control circuits in a pneumatic trainer kit.
7. Pneumatic sequencing circuits.
8. Electro pneumatic sequencing circuits.
9. PLC based electro hydraulic sequencing circuits.
10. PLC based electro pneumatic sequencing circuits.
11. Simulation of pneumatic, Electro pneumatic and electro hydraulic sequencing circuits using software.

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES:**
At the end of the course, students will be able to
1. Demonstrate the ability to identify and assemble various components of pneumatic systems for their practical applications.
2. Operate and interact with hydraulic system components to execute tasks in hydraulic systems.
3. Analyze practical requirements and translate them into pneumatic circuit designs for its applications
4. Design electro-pneumatic circuits that integrate sensors, actuators, and logic elements to achieve specific operational sequences.
5. Create logical and sequential programmable logic controller (PLC) circuits for specific practical applications.

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**PR5512**

**ENGINEERING METROLOGY LABORATORY**

**COURSE OBJECTIVES:**
- Learn the main principle on which different instruments operate and provide hands on experience on them.
- Generate knowledge and skill in use of precision instruments.
- Learn a basic understanding of various instruments used in linear and angular
- Get familiarize with usage of tool makers microscope.
- To utilize the advanced instruments such as machine visor system and CMM

**LIST OF EXPERIMENTS**
3. Measurement of internal taper angle
5. Calibration of a Dial gauge.
7. Inspection of screw thread parameters using three wire method.
8. Measurement of gear tooth thickness
10. Measurements using profile projector.
11. Measurements using Autocollimator
13. Measurements using CMM.
14. Contact and Non-contact surface roughness measurements.

**TOTAL: 60 PERIODS**
COURSE OUTCOMES:
At the end of the course, students will be able to
1. Develop quality standards of engineering products in industries.
2. Demonstrate the use of instruments for measuring linear (internal and external) and angular dimensions.
3. Analyze the measurement of the surface roughness and perform alignment tests.
4. Utilize the optical measurement devices for various applications.
5. Demonstrate working of CMM and Machine vision for any given component.

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PR5601 METAL FORMING L T P C 3 0 0 3

COURSE OBJECTIVES:
- Students will comprehend the mechanics underlying plastic deformation and the methods of representing associated parameters.
- Students will interpret and grasp the functioning of diverse bulk forming processes, including recent technological advancements.
- Students will memorize and recall various sheet metal forming processes.
- Students will examine and evaluate powder metallurgy techniques as well as specialized metal forming processes.
- Students will apply their understanding to recognize the importance of heat treatment according to specific applications.

UNIT I FUNDAMENTALS OF METAL FORMING 9

UNIT II FORGING AND ROLLING 9

UNIT III EXTRUSION AND DRAWING PROCESSES 9

UNIT IV SHEET METAL FORMING PROCESSES 9
and press brake forming – Explosive forming, electro hydraulic forming, Magnetic pulse forming and Super plastic forming.

**UNIT V  POWDER FORGING AND RECENT ADVANCES**


**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course, students will be able to

1. Students will analyze and depict the state of stress within a metal forming process.
2. Students will evaluate and discriminate between different bulk forming processes, aligning their choices with specific applications.
3. Students will comprehend the traditional sheet metal forming procedures and discern the importance of diverse high-energy-rate forming techniques.
4. Students will critically analyze and deeply comprehend the intricacies of the powder metallurgy technique.
5. Students will apply their knowledge to choose an appropriate surface heat treatment technique in accordance with particular applications.

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**TEXT BOOKS:**


**REFERENCES:**


**COURSE OBJECTIVES:**

- To provide knowledge on the fundamentals of CNC machines.
- To educate the different components and functions of CNC machines.
- To teach the control systems, advantages and disadvantages of CNC machining centers.
- To discuss and develop the CNC program.
- To explain the different cutting tool materials and work holding devices.

**UNIT I  INTRODUCTION**

Evolution Of CNC Technology, Principles, Features, Advantages, Applications, CNC And DNC Concept, Classification Of CNC Machines – Turning Centre, Machining Centre, Grinding Machine,
UNIT II  STRUCTURE OF CNC MACHINE  9

UNIT III  CNC MACHINING  9
Coordinate systems, Axes, and Motion CNC Systems – CNC Controls – Operating a CNC Machine – CNC Milling – Types, Machines axes, Machining centers, CNC Turning – Types, Number of axes, Axes designation Advantages and Disadvantages of CNC Technology Applications.

UNIT IV  CNC PROGRAMMING  9
Coordinate Systems and Reference Points – The Ten Steps of CNC Programming Structure Of A Part Program, G Codes and M Codes, Tool Length Compensation, Cutter Radius And Tool Nose Radius Compensation, Do Loops, Subroutines, Canned Cycles, Mirror Image, Parametric Programming, Machining 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
Introduction To Cutting Tool Materials – Carbides, Ceramics, CBN, PCD – Inserts Classification – PMK, NSH, Qualified, Semi Qualified And Preset Tooling, Tooling System For Machining Centre And Turning Centre, Work Holding Devices For Rotating And Fixed Work Parts.

COURSE OUTCOMES:
At the end of the course, students will be able to
1. To describe the fundamentals of CNC machines.
2. To discuss the different components and functions of CNC machines.
3. To illustrate the control systems, advantages and disadvantages of CNC machining centers.
4. To recall and develop the CNC program.
5. To identify the appropriate cutting tool and work holding devices.

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TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES:

- To impart basic knowledge on geometric modeling, product design and finite element analysis
- To understand and apply the concepts in 2D, 3D modeling and finite element analysis
- To apply the knowledge of modeling and analysis through assembly modeling and analysis in product design
- To analyze the assembly and reduce the failures through DFM, DFA, FMEA, DOE and FEA
- To interpret and evaluate the model through FEA, bench marking and design for environment

UNIT I  COMPUTER GRAPHICS AND GEOMETRIC MODELING


UNIT II  PRODUCT DESIGN CONCEPTS


UNIT III  ELEMENTS OF FINITE ELEMENT ANALYSIS

General field problems in engineering-Discrete and continuous models-Characteristics-the relevance and place of finite element method- The method of weighted residuals-Rayleigh-Ritz and Galerkin methods - Solution of large system of equations- Gaussian elimination procedures - Discretization of Domain selection of interpolation polynomials-Convergence requirements - Formulation of element characteristics matrices and load vectors – Assembly of element characteristics matrices-Solution of finite element equations-Post processing of results.

UNIT IV  FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL AND TWO DIMENSIONAL PROBLEMS


UNIT V  APPLICATION OF FINITE ELEMENT ANALYSIS


COURSE OUTCOMES:

At the end of the course, students will be able to

1. Able to gain basic knowledge on geometric modeling, product design and finite element analysis
2. Able to understand and apply the concepts in 2D, 3D modeling and finite element analysis
3. Able to apply the knowledge of modeling and analysis through assembly modeling and analysis in product design
4. Able to analyses the assembly and reduce the failures through DFM, DFA, FMEA, DOE and FEA
5. Able to interpret and evaluate the model through FEA, bench marking and design for environment

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TEXT BOOKS:

REFERENCES:

COURSE OBJECTIVES:
- To explain the different CNC turning operations.
- To discuss the different CNC milling operations.
- To impart knowledge in making profile complex cutting.
- To educate the basic concepts on metal forming
- To teach the material behavior by various metal forming operations.

LIST OF EXPERIMENTS

CNC LAB
1. Programming and machining of step turning and taper turning operation in CNC Lathe.
2. Programming and machining of thread cutting and grooving operation in CNC Lathe.
3. Programming and simulation for canned cycle in CNC lathe.
   (i) Stock removing in facing cycle.
   (ii) Stock removing in turning cycle.
   (iii) Grooving cycle.
   (iv) Thread cutting cycle.
5. Programming for mirroring / scaling function / Pocket milling and drilling cycle in a CNC milling.
7. Programming and Simulation of profile cutting in CNC Router.
8. Programming for cross drilling in a four axis CNC machining center.
9. 3D Profile cutting in CNC machining center.

METAL FORMING LABORATORY
2. Erichsen cupping Test.
5. Water hammer forming.
6. Determination of Power consumption in sheet rolling process and wire drawing process.
7. Determination of strain rate sensitivity index of given specimen.
8. Superplastic forming studies on Pb-Sn alloys.
10. Forward Extrusion process.
12. Simulation studies on metal forming.

COURSE OUTCOMES:
At the end of the course, students will be able to
1. Program and perform various turning operation
2. Program and perform various milling operation
3. Write program to perform the machining of complex profiles.
4. Demonstrate the fundamental concepts of metal forming
5. Analyze the formability of given materials.

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TOTAL: 60 Periods

PR5612 MODELING AND ANALYSIS LABORATORY

COURSE OBJECTIVES:
- The course aims to ensure students can recall fundamental concepts of Modelling and Analysis techniques.
- Students will comprehend the fundamental concepts underlying Modelling and Analysis software usage.
- Through practical exercises, students will apply various approaches required for assembly modelling.
- Students will analyse different types of analysis and apply core principles to determine stress and other relevant parameters of bars and beams subjected to varying loading conditions.
- Students will apply their knowledge to conduct dynamic analysis in order to determine the natural frequency of different types of beams.
LIST OF EXPERIMENTS
MODELLING EXPERIMENTS
1. 3-D Assembly of Bolt and Nut
2. 3-D Assembly of Protected Type Flange Coupling
3. 3-D Assembly of Universal Coupling
4. 3-D Assembly of Plummer Block
5. 3-D Assembly of Swivel Bearing

ANALYSIS EXPERIMENTS
1. One Dimensional FEA Problem.
   a. Truss structure analysis.
   b. Cantilever beam analysis.
   c. Temperature distribution problem.
2. Two Dimensional FEA Problems.
   a. Plane stress analysis.
   b. Axisymmetric analysis.
   c. Vibration Analysis.
3. Three Dimensional FEA Problems.
   a. 3D Shell Analysis.
   b. 3D Contact Analysis.
4. FEA Application in metal forming, Metal cutting, Casting process etc.

TOTAL: 60 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
1. Students will apply their skills to conduct finite element modeling within the context of manufacturing applications and analysis software.
2. Students will operate and utilize a variety of available analysis packages.
3. By the end of the course, students will be capable of analyzing and conducting finite element modeling for solid mechanics, heat transfer, vibration, shell, and contact problems in both 2D and 3D simulations.
4. Students will evaluate and perform dynamic analysis, determining natural frequencies across different boundary conditions while also considering external forcing functions.
5. Equipped with modern tools, students will generate problem formulations, develop geometries, discretize models, and apply boundary conditions to solve problems related to bars, trusses, beams, and plates. This process will enable them to determine stress under various loading conditions.

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PR5701 MECHATRONICS FOR AUTOMATION
COURSE OBJECTIVES:
- To acquire overview of multi-domain engineering integration and make the students get acquainted with the sensors and transducers and its interfacing.
- To understand and apply the various types of actuators and its drives for interfacing.
To apply modeling of basic mechanical system elements and cognize the need of control systems.

To impart knowledge about the fundamentals of microcontroller to realize the interfacing and control.

To render exposure in the design and development of mechatronics systems.

UNIT I  
MECHATRONICS SYSTEMS AND SENSORS


UNIT II  
ACTUATORS


UNIT III  
SYSTEM MODELING AND CONTROL


UNIT IV  
MICROCONTROLLERS


UNIT V  
MECHATRONICS SYSTEM DESIGN AND APPLICATIONS


TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Recognize the working principles of sensors, controller and actuator and mathematical models to develop mechatronics systems.
2. Apprise the features of sensor, controller and actuators.
3. Select appropriate sensors, actuators and controllers to develop mechatronics systems.
4. Develop the mathematical model of the system to study on its control.
5. Apply and analyze the selected sensor, controller and actuator for the integrated application requirement.

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TEXT BOOKS:

Attested
DIRECTOR
Centre for Academic Courses
Anna University, Chennai-600 025
REFERENCES:

MECHATRONICS FOR AUTOMATION LABORATORY

LIST OF EXPERIMENTS:
1. Experimentation on Characterization and Application of Optical Sensors.
2. Experimentation on Characterization of Temperature Transducers.
5. 8 bit and 16 bit Arithmetic Operation in 8051 Microcontroller.
7. Modeling and Simulation of Mechanisms using Simulation Software.
10. Robot Control with Stepper Motor Interfacing.

TOTAL: 30 PERIODS

PR5702 COMPUTER INTEGRATED MANUFACTURING SYSTEMS L T P C
3 0 0 3

COURSE OBJECTIVES:
- To understand fundamentals and application of computer Technology in the manufacturing activities.
- To familiarize the types, working principle of various materials handling and automated data collection systems.
- To impart knowledge on group technology and its components.
- To gain knowledge to analyze existing system and implement cellular manufacturing and FMS.
- To acquire overview about different automation systems used in manufacturing activities.

UNIT I INTRODUCTION TO AUTOMATED PRODUCTION SYSTEMS

UNIT II MATERIAL HANDLING AND STORAGE SYSTEM

UNIT III CELLULAR MANUFACTURING
- Group Technology - Part families – Parts classification and coding – Production flow analysis – Types of Process Planning - Cellular Manufacturing – Composite part concept – Machine cell
design – Key machine concept - quantitative analysis in cellular manufacturing using Holier Method.

UNIT IV  FLEXIBLE MANUFACTURING SYSTEM  9

UNIT V AUTOMATED ASSEMBLY AND AUTOMATED DATA COLLECTION  9

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Describe the principle and concept of CIM, Group technology and various automated manufacturing techniques.
2. Describe the working principle and types of material handling and automated data collection system.
3. Compare the advantage and disadvantage of computer integrated manufacturing system over manual system.
4. Identify and select suitable material handling and automated data collection system for given task.
5. Analyze conventional system and implement cellular manufacturing, FMS.

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TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES
- To provide industrial exposure, work pattern and hands-on experience
- To gain practical experience and apply academic knowledge in a real world setting
- To expand professional network and refine transferable skills for future career opportunities

CERTIFICATE COURSES MUST BE STATED
1. Industry profile.
2. Organization structure.
5. Labor welfare schemes.
6. Training schedule.
7. Project work carried out.
8. Learning points.

The assessment will be based equally on the report in the prescribed format and Viva Voce examination by a committee nominated by the Head of the Department.

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Learn the application of engineering basics to solve complex industrial problems
2. Foresee group dynamics and engage in life-long learning
3. Gain knowledge on computational and design tools for sustainable product development

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PR5712 PROJECT I

COURSE OBJECTIVES:
- Stimulate creativity in themselves and learn the impact of innovation creation.
- Understand several innovation concepts/ methodologies.
- Apply creative and design thinking to real-world business situations.

EVALUATION:
- A project topic may be selected based on the literature survey and the creative ideas of the students themselves in consultation with their project supervisor.

COURSE OUTCOMES:
The students would be able to:
1. To understand and analyze the problem which needs engineering solution
2. To design and simulate the creative solution for the required applications.
3. To fabricate, analyze and evaluate the developed solution for the suitability of desired applications.
PR5811 PROJECT II

COURSE OBJECTIVES:

- Develop problem-solving skills: The objective of the project work is to provide students with an opportunity to apply the principles and concepts learned in the course to real-world problems. By working on a project, students will develop their problem-solving skills and learn how to analyze and address complex engineering challenges.

- Enhance interdisciplinary knowledge: The project work allows students to explore interdisciplinary topics and gain a deeper understanding of the interconnected nature of engineering fields. By selecting a project in consultation with faculty members, students can work on projects that involve multiple disciplines, fostering a broader perspective and knowledge base.

- Foster collaboration and project management skills: The project work involves working in teams and collaborating with faculty members as guides. This objective aims to enhance students' collaboration and project management skills, including effective communication, teamwork, time management, and task allocation.

EVALUATION:

A project area must be selected by the students in consultation with the faculty members who act as a guide. The objective of the project work is to deepen comprehension of principles by applying them to a problem which may be; design and fabrication of a device / a research project with a focus on the application needed by the industry; a software oriented project involving design and analysis; a management project to apply the latest technique for an industrial problem; material characterization (or) any interdisciplinary topic of due weightage / continued work of internship in a company etc.,

The progress of this project is evaluated based on a minimum of three reviews. The review committee will be constituted by the Head of the Department. A project report is to be submitted at the end of the project. The final end semester exam will be evaluated jointly by external and internal examiners based on oral presentation and the demonstration of the project work.

COURSE OUTCOMES:

The students would be able to:

1. Application of engineering principles: Through the project work, students will demonstrate the application of engineering principles to solve real-world problems. They will be able to identify appropriate engineering methodologies, tools, and techniques and apply them effectively to achieve project goals.

2. Proficiency in project execution: Students will gain proficiency in executing a project from inception to completion. They will demonstrate their ability to plan, organize, and manage project tasks, allocate resources, and meet project milestones and deadlines.

3. Effective communication and presentation skills: The project work will enhance students' communication and presentation skills. They will learn to articulate their ideas, methodologies, and project outcomes through written reports, oral presentations, and project demonstrations. Students will also develop the ability to effectively communicate technical concepts to both technical and non-technical audiences.
PR5001 MICROMACHINING AND FABRICATION

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COURSE OBJECTIVES:
- To introduce to various methods of micro/nano material removal as well as material build up with use unconventional processes
- To understand the mechanism of micro/nano material removal with use of abrasive flow, electro-discharge, electrochemical, laser, ultrasonic and high energy beams as well as micro/nano structure build up with use of vapour deposition, etching and electrodeposition.
- To identify process parameters of micromachining/microfabrication and their effect on the rate, finish and accuracy of material removal/build up.
- To understand the concepts of hybrid machining for high material removal and surface finish.
- To compare and analyze the various methods of micromachining/microfabrication for selection of process applicable for specific application.

UNIT I INTRODUCTION
Introduction to micromachining process – Classification of micromachining and nanomachining processes – Molecular dynamics (MD), principle of molecular dynamics simulation potential energy function – Boundary condition – MD simulation procedure.

UNIT II MICROFABRICATION METHODS
Methods of microfabrication — Electro deposition, Chemical vapour deposition, physical vapour deposition – Electro Chemical spark deposition – LIGA (Lithographie, Galvanoformung, Abformung) process- Stereolithoigraphy- MicroMoulding

UNIT III MECHANICAL MICROMACHINING
Ultrasonic machining – Abrasive jet machining – Abrasive water jet machining, water jet machining – Beam energy micromachining, Electron beam machining, Electro discharge machining, Ion beam machining, Focused ion beam machining.

UNIT IV MICROMACHINING AND NANO FUNCTIONING WITH ABRASIVE FLOW

UNIT V HYBRID MICRO MACHINING
Surface Integrity of Machined surface-Chemical Mechanical polishing – Electro chemical spark micro machining – Electro discharge grinding – Electrolytic in process dressing – Laser and Ultrasonic aided Machining – High/Low temperature aided Machining -Application.

TOTAL: 45 PERIODS

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

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1. Ability to list and match a process of micro/nano material removal as well as material build up to broad kind of micromachining/microfabrication techniques
2. To illustrate the mechanism of micro/nano material removal as well as micro/nano structure build up
3. To analyze the effect of process parameters on the performance of micromachining/microfabrication
4. To interpret the concepts of hybrid machining for high material removal and surface finish.
5. To evaluate the various methods of micromachining/microfabrication for selection of process applicable for specific application.

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TEXT BOOKS:

REFERENCES:

PR5002 MODERN CONCEPTS IN MANUFACTURING

COURSE OBJECTIVES:
- To remember the different categories of manufacturing Techniques
- To apply the advanced manufacturing techniques to increase the productivity in industries
- To introduce students the basics of additive manufacturing/rapid prototyping and its applications in various fields, reverse engineering techniques
- To incorporate knowledge about the environmental based improvements towards lean manufacturing systems
- To understand the smart manufacturing concepts

UNIT I LEAN MANUFACTURING

UNIT II AGILE MANUFACTURING
technology - A checklist, technology applications that enhance agility - agile technology make or buy decisions. - Costing for Agile Manufacturing practices - Creating the learning factory: Imperative for success, factory becoming a learning factory, building a road map for becoming a learning factory

UNIT III GREEN MANUFACTURING

UNIT IV ADDITIVE MANUFACTURING

UNIT V INTELLIGENT MANUFACTURING

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Remember the various manufacturing techniques
2. Discuss the concepts of JIT, Lean Manufacturing, and Agile Manufacturing methodologies
3. Analyzing the environmental impact of manufacturing, green strategies, efficiency principles, and enabling techniques for sustainable production, including carbon footprint management.
4. Apply knowledge on process of transforming a concept into the final product in AM technology.
5. Apply artificial intelligence (AI) and data mining (DM) techniques to improve the efficiency of manufacturing systems

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TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
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

UNIT II DESIGN FOR ADDITIVE MANUFACTURING (DFAM)

UNIT III VAT POLYMERIZATION AND MATERIAL EXTRUSION

UNIT IV POWDER BED FUSION AND DIRECT ENERGY DEPOSITION

UNIT V OTHER ADDITIVE MANUFACTURING PROCESSES

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course students shall be able to:
1. Recognize the development of AM technology and how AM technology propagated into various businesses and developing opportunities
2. Acquire knowledge on process of transforming a concept into the final product in AM technology.
3. Elaborate the vat polymerization and material extrusion processes and its applications.
4. Acquire knowledge on process and applications of powder bed fusion and direct energy deposition
5. Evaluate the advantages, limitations, applications of binder jetting, material jetting and laminated object manufacturing Processes.

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TEXT BOOKS:

REFERENCES:

PR5003 TOOL DESIGN L T P C 3 0 0 3

COURSE OBJECTIVES:
- To introduce the fundamental concepts in tool design, materials, jigs and fixtures.
- To explain the design of jigs and fixtures.
- To educate the different dies and its components.
- To teach the design of dies.
- To discuss the case studies pertain to the dies, jigs and fixtures.

UNIT I TOOL DESIGN

UNIT II DESIGN OF JIGS AND FIXTURES
Design concepts of Template Jig, Plate Jig, Sandwich Jig, Vice Jaw Jig, Latch Jig, Turnover Jig, Box Jig – Design of Jigs, Fixtures for Milling, Grinding, Turning, Welding, and Assembly – Modular fixtures.

UNIT III CONCEPTS OF DIES AND ITS ELEMENTS

UNIT IV DESIGN OF DIES
Die design – fourteen steps to design a die - Design of Blanking, Piercing, lancing, notching and bending dies, Design features of dies for drawing, extrusion, wire drawing and forging, Design of Progressive die – compound die –combination die- Bending and drawing dies

UNIT V CASE STUDIES IN JIGS, FIXTURES AND DIES
Design of jigs, fixtures and dies for industrial components.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Categorize and justify the requirements of tools, Jigs and Fixtures for Manufacturing, Testing and Assembly
2. Analyze problems related to Jigs and fixtures in Manufacturing, Testing and Assembly.
3. To explain the different dies and its components.
4. Apply the design procedure to develop the dies.
5. Provide solution for the real time issues in the design and Manufacturing of dies, jigs and fixtures.

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REFERENCES:
COURSE OBJECTIVES:
- To impart knowledge on the mechanical energy based unconventional machining process.
- To inculcate the knowledge chemical and electro chemical energy based machining processes.
- To educate the working and influence of process parameter of electric discharge machining.
- To discuss the thermal energy based machining processes.
- To recognize the significance of hybrid machining processes.

UNIT I MECHANICAL ENERGY BASED PROCESSES

UNIT II CHEMICAL AND ELECTRO CHEMICAL ENERGY BASED PROCESSES

UNIT III ELECTRICAL ENERGY BASED PROCESSES

UNIT IV THERMAL ENERGY BASED PROCESSES
Laser Beam machining (LBM) - Plasma Arc machining (PAM) - Electron Beam Machining (EBM) – Ion Beam Machining (IBM) - Principle – Parameters – Equipment – Types – MRR - Applications.

UNIT V HYBRID MACHINING
Abrasive based hybrid machining processes - Thermal based hybrid machining processes - Electro based hybrid machining processes – Vibration assisted EDM - Vibration assisted ECM.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
1. To explain the working and effect of process parameters of mechanical energy based unconventional machining processes.
2. To describe the working and significance of chemical and electro chemical energy based machining processes.
3. To illustrate the working and identify the effect of process parameter of electric discharge machining.
4. To recall the working and analyze process parameter of thermal energy based machining processes.
5. To explain the working of hybrid machining processes.

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REFERENCES:

PR5074 MATERIALS PROCUREMENT MANAGEMENT L T P C 3 0 0 3

COURSE OBJECTIVES:
- To understand the objectives and procedures of Purchasing.
- To remember the various aspects of stores management
- To apply the various concepts of inventory management
- To analyze management tools such as MRP, Aggregate planning, JIT concepts.
- To evaluate the usefulness of quantitative techniques in materials management.

UNIT I PURCHASING MANAGEMENT 9
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 9

UNIT III BASIC INVENTORY MANAGEMENT 9
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 9

UNIT V O .R TECHNIQUES IN MATERIAL MANAGEMENT 9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Identify the objectives and procedures of Purchasing.
2. Design the possible layout, selecting the appropriate equipment for material handling
3. Decide the correct inventory system for the given application
4. Develop suitable inventory management strategies
5. Select a suitable quantitative techniques for the particular situation

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PR5005 SELECTION AND TREATMENT OF MATERIALS

COURSE OBJECTIVES:
- To introduce the role of materials in the evolution of engineering
- To illustrate the various factors to be considered in materials selection
- To indicate the various methods and steps to be adopted in materials selection
- To inform the need and emergence of alternate materials
- To train in performing specific case studies in selection of materials.

UNIT I MATERIALS AND PROPERTIES

UNIT II FACTORS IN SELECTION PROCESS
Design process - types of design, design requirements, function, Material attributes. Shape and Manufacturing processes - Materials processing and design processes and their influence on design, Process attributes, Systematic process selection, Process selection diagrams, Process cost, Energy consumption for production, Material costs, availability and recyclability, Environmental consideration

UNIT III MATERIALS SELECTION PROCESS
Materials selection methods: Screening, Ranking - weighted ranking, Performance indices - Materials selection charts, Deriving property limits and material indices, Structural indices. Shape factors, Efficiency of standard sections, Material limits for shape factors, Material indices which include shape-microscopic or micro structural shape factor, Co-selecting material and shape.

UNIT IV ALTERNATE MATERIALS
Environmental design, Economics and environmental impact of materials, Hybrid materials: composites, sandwich structure, lattices and segmented structure, applications of hybrid materials, polymer foams.
UNIT V  CASE STUDIES
Automobile materials (Body panels, Engine Components), Marine structural materials (Hull and Propeller), Aircraft structural materials (Wings and landing gears), Materials for Aero engines and compressor and Gas turbines, Materials for power generation machinery (Boilers and Pressure vessels), Materials for medical applications (Surgical knives and Bone replacements), Chemical and petrochemical industries (Acid storage tanks and Fuel carrying pipes).

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, the students will be able to:
1. Understand the relationship between the evolution of materials and the development in engineering.
2. Find out the various factors governing the materials selection.
3. Adopt suitable method and essential steps in materials.
4. Identify suitable alternate materials for various engineering applications
5. Suggest and select appropriate materials in an engineering industry.

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REFERENCES:

IE5751  SUPPLY CHAIN MANAGEMENT  L T P C  3 0 0 3

COURSE OBJECTIVES:
- Describe the role and drivers of and supply chain management in achieving competitiveness.
- Explain about Supply Chain Network Design.
- Illustrate about the issues related to Logistics in Supply Chain.
- Appraise about Sourcing and Coordination in Supply Chain.
- Application of Information Technology and Emerging Concepts in Supply Chain.
UNIT I
INTRODUCTION

UNIT II
SUPPLY CHAIN NETWORK DESIGN

UNIT III
LOGISTICS IN SUPPLY CHAIN

UNIT IV
SOURCING AND COORDINATION IN SUPPLY CHAIN
Role of Sourcing in supply chain - Supplier selection - Contracts - Design Collaboration - Sourcing planning and analysis - Supply chain co-ordination - Bull whip effect – Effect of lack of co-ordination in supply chain and obstacles – Building strategic partnerships and trust within a supply chain.

UNIT V
IT AND EMERGING CONCEPTS IN SUPPLY CHAIN

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After undergoing this course, students will acquire
1. Ability to understand the scope of Supply Chain Management and the Drivers of SC performance
2. Ability to design suitable SC network for a given situation
3. Ability to solve the issues related to Logistics in SCM.
4. Ability to understand Sourcing, Coordination and current issues in SCM.
5. Ability to appraise about the applications of IT in SCM and apply SCM concepts in selected enterprise.

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REFERENCES:
PR5006  THEORY OF METAL CUTTING  L T P C  3 0 0 3

COURSE OBJECTIVES:
- To impart knowledge to students about fundamentals of cutting tool
- To make students understand the mechanics of metal cutting
- To understand thermal aspects of machining and familiarize types of cutting fluids
- To familiarize about the various cutting tool materials and its uses
- To familiarize about the various gear manufacturing methods

UNIT I  TOOL NOMENCLATURE, TOOL WEAR AND TOOL LIFE  9

UNIT II  MECHANICS OF METAL CUTTING  9

UNIT III  THERMAL ASPECTS AND CUTTING FLUIDS  9

UNIT IV  CUTTING TOOL MATERIALS  9

UNIT V  GEAR CUTTING  9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Describe various types of cutting tools, its nomenclature, composition and applications
2. Explain the mechanism of metal cutting, tool wear, and determine tool life
3. Compute various forces and process parameter involved in metal cutting operation
4. Explain the thermal aspects of metal cutting process and cutting fluids types, properties and application
5. Explain various gear manufacturing processes

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GE5001  INDUSTRIAL MANAGEMENT

COURSE OBJECTIVES:
- To familiarize students about the concepts of inventory management.
- To introduce the students about Production Management Techniques such as work study, Plant location, Layout, Materials handling.
- To illustrate to the students the importance of financial management.
- To introduce Profit Planning and management as a concept to plan for profit.
- To familiarize the students, HR and Marketing concepts and techniques.

UNIT I  INVENTORY MANAGEMENT

UNIT II  PRODUCTION MANAGEMENT

UNIT III  FINANCIAL MANAGEMENT

UNIT IV  PROFIT MANAGEMENT
Break Even Analysis – Profit planning – Angle of incidence – Margin of safety – Multi product break even analysis – Effect of variation in selling price, Fixed cost and Variable cost on break even quantity, angle of incidence and margin of safety.

UNIT V  HUMAN RESOURCE MANAGEMENT AND MARKETING MANAGEMENT
**COURSE OUTCOMES:**

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

1. Design a suitable inventory system for a given situation
2. Interpret work study and its methods to develop layout and materials handling systems
3. Prepare financial statements such as balance sheet, income statements
4. Apply concepts of Break Even Analysis for profit planning
5. Develop marketing and human resource skills.

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**COURSE OBJECTIVES:**

- To understand the basics of environmental sustainability and impact assessment methods.
- To incorporate knowledge about the environmental based improvements towards lean manufacturing systems.
- To analyze various machineries with intent to evaluate energy conservation
- To understand the environmental impact on hazardous and solid wastes and subsequently applying knowledge on its minimization or prevention.
- To evaluate and understand the Green-Co rating scores and its benefits.

**UNIT I **  ENVIRONMENTAL SUSTAINABILITY AND IMPACT ASSESSMENT  
Environmental impact assessment objectives – Legislative development – European community directive – Hungarian directive. Strategic environmental assessment and sustainability appraisal. Regional spatial planning and environmental policy.

**UNIT II **  LEAN MANUFACTURING AND GREEN ENERGY SYSTEM  
UNIT III  ENERGY SAVING MACHINERY AND COMPONENTS

UNIT IV  HAZARDOUS AND SOLID WASTE MANAGEMENT

UNIT V  GREEN CO-RATING

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Understand the Concepts of environmental sustainability and environmental impact assessment tools.
2. Remember suitable schemes towards design of Lean manufacturing requirements
3. Evaluate the energy conservation and accordingly apply on manufacturing processes.
4. Analyze manufacturing processes towards minimization or prevention of hazardous and solid wastes.
5. Apply Knowledge on green co-rating assessment and its benefits

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COURSE OBJECTIVES:
- To expose the students to design for conducting the machining processes
- To impart knowledge to the students about the design principles of casting.
- To impart knowledge to the students about the design principles of welding
- To conduct some of the cleaning and coating processes
- To outline various casting processes, several defects that appear in cast part and corresponding remedial measures, and general recommendations to achieve a good quality casting.

UNIT I DESIGN FOR MACHINING

UNIT II DESIGN FOR CASTING
Introduction to sand casting, Typical characteristics of a sand cast part, Design recommendation for sand casting, Investment casting: Introduction, Steps in investment casting, Design consideration of Investment casting, Typical characteristics and applications, Die casting: Introduction to die casting, Advantages of the die casting process, Disadvantages of the die casting process, Applications, Suitable material consideration, General design consideration, Specific design recommendation.

UNIT III DESIGN FOR WELDING

UNIT IV DESIGN FOR CLEANING

UNIT V DESIGN FOR ASSEMBLY

TOTAL:45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Apply design principles and design concepts for machining to ensure successful machining processes.
2. Analyze the design considerations for casting to ensure optimal casting outcomes and minimize defects.
3. Evaluate design principles related to welding and ensure strong and reliable joints.
4. Explain various cleaning processes to maintain the quality and functionality of components.
5. Apply design principles for assembly to create designs that simplify the assembly process.

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PR5009 COMPUTER AIDED PRODUCT DESIGN

COURSE OBJECTIVES:
- To construct applicable design challenges, execute experimental or analytical investigations, and analyze outcomes using contemporary mathematical and scientific techniques along with software tools.
- To present the concepts of computer graphics in connection with design principles.
- To initiate an understanding of geometric modeling and the practical applications of Computer-Aided Design (CAD).
- To provide insights into product design and the tools involved in the design process.
- To demonstrate comprehension of product data management and the life cycle of products.

UNIT I INTRODUCTION TO COMPUTER AIDED DESIGN
Introduction to Engineering Design – Various phases of systematic design – sequential engineering and concurrent engineering – Computer hardware and Peripherals – software packages for design and drafting.

UNIT II COMPUTER GRAPHICS FUNDAMENTALS
UNIT III GEOMETRIC MODELING

UNIT IV PRODUCT DESIGN CONCEPTS

UNIT V PRODUCT DATA MANAGEMENT

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course students could be able to
1. Students will have achieved a solid grasp of the fundamental design process and familiarized themselves with the features of cutting-edge design tools.
2. Students will have been introduced to the foundational principles of computer graphics and gained familiarity with its concepts.
3. Students will have gained expertise in geometric modeling and proficiency in utilizing CAD software packages.
4. Students will have developed comprehension of product design and a high level of proficiency in employing process tools in accordance
5. Apply concepts in data management and the management of product life cycles

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COURSE OBJECTIVES:
The students will be able to

- To introduce the need for green electronics, regulatory bodies, re-cycling and environmental concern in electronic manufacturing.
- To analyze the environmental pollution in electronic processing.
- To review the counter measures in electronic processing by adaption of new materials, eco-design and recycling.
- To provide overview of life cycle assessment of electronics manufacturing and international standards.
- To appraise the reuse and recycle of electronic products based on case studies on typical products.

UNIT I  INTRODUCTION TO GREEN ELECTRONICS 9
Environmental concerns of the modern society - Overview of electronics industry and their relevant regulations in China, European Union and other key countries - global and regional strategy and policy on green electronics industry. Restriction of Hazardous substances (RoHS) - Waste Electrical and electronic equipment (WEEE - Energy using Product (EuP) and Registration - Evaluation, Authorization and Restriction of Chemical substances (REACH).

UNIT II  GREEN ELECTRONICS MATERIALS AND PRODUCTS 9

UNIT III  GREEN ELECTRONICS ASSEMBLY AND RECYCLING 9
Various processes in assembling electronics components - the life-cycle environmental impacts of the materials used in the processes - substrate interconnects. Components and process equipments used. Technology and management on e-waste recycle system construction, global collaboration, and product disassembles technology.

UNIT IV  PRODUCT DESIGN AND SUSTAINABLE ECO-DESIGN 9
Stages of product development process in green design: Materials - Manufacturing - Packaging and use - End of Life and disposal - Design for recycling - Life Cycle Assessment (LCA), and Eco-design tools - Environmental management systems, and International standards - Eco-design in electronics industry.

UNIT V  CASE STUDIES 9

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Spell out the regulatory bodies for re-cycling and end of use of electronic products.
2. Analyze the environmental pollution in electronic processing and reprocessing.
3. Describe the counter measures in electronic processing and recycling by adaption of new materials and eco-design.
5. Infer the reuse and recycle of typical electronic products.
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PR5072 PRODUCTION OF AUTOMOTIVE COMPONENTS

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COURSE OBJECTIVES:
- To impart knowledge on the working of engines, piston and cylinder components and its manufacturing methods.
- To describe the working and manufacturing of engine components.
- To impart the knowledge in working and manufacturing of fuel system and transmission system.
- To educate the working and production of chassis and suspension 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  9
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  9
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:
1. To define the working of engines, piston and cylinder components and its manufacturing
methods.
2. To explain the working and manufacturing of engine components.
3. To recall the working and manufacturing of fuel system and transmission system.
4. To summarize the working and production of chassis and suspension system
5. To explain the recent development in automobile industries

TEXT BOOKS:
1. Hiroshi yamagata, “The Science and Technology of materials in Automotive Engines”, CRC
Publications, USA, 2011.

REFERENCES:
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ME5081  PROCESS PLANNING AND COST ESTIMATION  L T P C
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COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
- Elucidate the steps involved in preparing a process plan for a given Product.
- Provide an overview for cost estimation of a given product.
- Explain the allocation of overhead costs in manufacturing.
Elucidate the procedure to estimate the cost of castings and forging products.

Explain the costs involved in machining and estimate the machining cost.

UNIT I  PROCESS PLANNING

UNIT II  FUNDAMENTAL OF ESTIMATING AND ELEMENTS OF COST

UNIT III  OVERHEADS AND DEPRECIATION
Overhead, 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.

TOTAL = 45 PERIODS

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

1. Create a Process Plan for a given Product.
2. Identify Cost elements for a given Product.
3. Allocate Overhead to different departments in manufacturing a product.
4. Estimate cost for Casting and Forging products. Analyze the costs for machining a product.
5. Able to calculate the machining cost.

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COURSE OBJECTIVES:
- To understand the general functioning, terminologies, and applications in robotics.
- To learn how to formulate and derive kinematics for any configuration of a robot.
- To learn about the different drives and end effectors used in robotics.
- To learn about the different types of sensors used in robotics and different methods used for sensing.
- To learn about different programming techniques and commands and applications used in robotics.

UNIT I  FUNDAMENTALS OF ROBOT

UNIT II  ROBOT KINEMATICS
Forward kinematics, inverse kinematics and the difference: forward kinematics and inverse Kinematics of Manipulators with two, three degrees of freedom (in 2 dimensional), four degrees of freedom (in 3 dimensional) – derivations and problems. Homogeneous transformation matrices, translation and rotation matrices Denavit and Hartenberg transformation.

UNIT III  ROBOT DRIVE SYSTEMS AND END EFFECTORS

UNIT IV  SENSORS IN ROBOTICS
Force sensors, touch and tactile sensors, proximity sensors, non-contact sensors, safety considerations in robotic cell, proximity sensors, fail safe hazard sensor systems, and compliance mechanism. Machine vision system - camera, frame grabber, sensing and digitizing image data – signal conversion, image storage, lighting techniques, image processing and analysis – data reduction, segmentation, feature extraction, object recognition, other algorithms, applications – Inspection, identification, visual serving and navigation.

UNIT V  PROGRAMMING AND APPLICATIONS OF ROBOT
Teach pendant programming, lead through programming, robot programming languages – VAL programming – Motion Commands, Sensors commands, End-Effecter Commands, and simple programs - Role of robots in inspection, assembly, material handling, underwater, and medical fields.

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Describe the principles, feature and specifications of robot and its kinematics and accessories.
2. Summarize the configurational and peripheral features of robot.

TOTAL: 45 PERIODS
4. Use mechanical links, and joints, sensors and actuators for robots.
5. Demonstrate the robot programming and application of robot for different scenarios.

TEXT BOOKS:

REFERENCES:
1. Fu K.S. Gonalz R.C. and ice C.S.G.”Robotics Control, Sensing, Vision andIntelligence”,

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PR5011  FINITE ELEMENT ANALYSIS IN APPLICATION  L T P C
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COURSE OBJECTIVES:
- Introduce the concept of Finite Element Analysis (FEA) and its application within the realm of Manufacturing.
- Enable students to analyze provided problems by employing finite element techniques.
- Impart knowledge about the multitude of factors, pre-processing and post-processing steps, and the integration of computers in FEA implementation.
- Foster understanding in the domain of finite element methods, encompassing their principles and applications.
- Familiarize students with the various applications of FEA within the manufacturing sector.

UNIT I  INTRODUCTION

UNIT II  GENERAL PROCEDURE OF FEA
Discretization of Domain selection of interpolation polynomials-Convergence requirements-Formulation of element characteristics matrices and load vectors – Assembly of element characteristics matrices-Solution of finite element equations-Post processing of results.
UNIT III  
FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL AND TWO DIMENSIONAL PROBLEMS

One dimensional finite element analysis-Linear bar element-Quadratic bar element-Beam element-Frame elements-One dimensional heat transfer-Two dimensional finite element analysis approximation of geometry and field variables-Three noded triangular element-Four noded rectangular element-Six noded triangular element-Natural coordinates and coordinate transformation – Numerical integration-Incorporation of boundary conditions

UNIT IV  
ISO-PARAMETRIC ELEMENTS

Isoparametric elements-Dynamic analysis-Equations of motion using Lagrange’s approach-Consistent and Lumped mass matrices-Formulation of FE equations for vibration problems-Solution of Eigen value problems-Transient vibration analysis-Thermal transients.

UNIT V  
APPLICATION OF FINITE ELEMENT ANALYSIS


TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Attain understanding of the foundational principles involved in solving Finite Element problems.
2. Apply the process of discretization and solution to one-dimensional solid mechanics and heat transfer problems using Finite Element Analysis.
3. Examine the influence of shape functions and the utilization of higher order formulations in achieving convergence while solving FEA problems.
4. Implement computer-based techniques to solve problems utilizing Finite Element Analysis.
5. Analyze a production process using Finite Element Analysis, considering its parameters and effects on the process.

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COURSE OBJECTIVES:
- To familiarize the students with concepts of Linear Programming
- To introduce the replacement models to students
- To enable the students to utilize the queuing models for application to waiting line problems.
- To stress importance of inventory management and their use in industry.
- To familiarize project network and decision tree problems to students so that they can use them in project management.

UNIT I       LINEAR PROGRAMMING 9

UNIT II      REPLACEMENT MODELS AND GAME THEORY 9

UNIT III     QUEUING MODELS AND SIMULATION 9

UNIT IV      FORECASTING, SEQUENCING AND LINE BALANCING 9

UNIT V      PROJECT NETWORK ANALYSIS AND DECISION TREE ANALYSIS 9
Network – CPM/PERT – Project time estimation – critical path – crashing of network, Decision tree analysis – applications

TOTAL: 45 PERIODS

COURSE OUTCOMES:
To students will be able to
1. Use the simplex method to solve problems in industry
2. Identify a suitable replacement model so that replacement of equipment can be done optimally
3. Utilize the knowledge on queuing models and sequencing in production systems
4. Identify inventory model for a specific industry
5. Select a suitable project network technique for project management

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COURSE OBJECTIVES:
- To understand the basics of operation research & its applications
- To remember the concepts and models of operation research
- To apply the knowledge to formulate and find the solution for the managerial problems in industries
- Ability to understand and analyze the managerial problems
- To apply the OR techniques to make effective decisions in real world management problems

UNIT I INTRODUCTION

UNIT II CLASSICAL OPTIMIZATION TECHNIQUES

UNIT III NON-LINEAR PROGRAMMING
Introduction – Lagrangian Method – Kuhn-Tucker conditions – Quadratic programming – Separable programming – Stochastic programming

UNIT IV INTEGER PROGRAMMING AND DYNAMIC PROGRAMMING
Integer Programming- Cutting plane algorithm – Branch and bound technique - Zero-one implicit enumeration; Geometric Programming- Dynamic Programming.

UNIT V NETWORK TECHNIQUES
Shortest path model- Minimum spanning tree- Maximal Flow problem

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Summarizing optimization's historical development, engineering applications, problem statements, and classifications of problems.
2. Solve linear programming problems and apply the simplex algorithm to find optimal solutions.
3. Apply non-linear programming techniques, including the Lagrangian method and Kuhn-Tucker conditions, to solve optimization problems.
4. Solve operation research problems using algorithms.
5. Analyzing the shortest path, minimum spanning tree, and maximal flow problems.
### TEXT BOOKS:

### REFERENCES:

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**PR5013**

**HEAT TRANSFER**

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**COURSE OBJECTIVES:**
- To learn the principle mechanism of modes of heat transfer to the physical system
- Get familiarize the conduction heat transfer under steady state and transient conditions.
- Learn the fundamental concept and principles in convective heat transfer
- Create the fundamental concept and principles in radiation heat transfer
- Implement the knowledge of heat transfer in the design of heat exchangers

### UNIT I

**MODES OF HEAT TRANSFER AND GOVERNING EQUATION**

9 Modes of heat transfer - effect of temperature on thermal conductivity of different solids, liquids and gases- derivation of generalized equation in Cartesian, cylindrical and spherical coordinates and its reduction to specific cases- General laws

### UNIT II

**CONDUCTION**

9 Fourier’s law- One dimensional steady state conduction- heat conduction through plane and composite walls, cylinders and spheres-electrical analogy-critical radius of insulation for cylinder and sphere, overall heat transfer coefficient- Transient heat conduction- lumped heat capacity analysis, time constant, transient heat conduction in solids with finite conduction and convective resistances -Heat transfer from extended surface-Types of fin, heat flow through rectangular fin, infinitely long fin, fin insulated at the tip and fin losing heat at the tip-efficiency and effectiveness of fin-Biot number-Estimation of error in temperature measurement in a thermometer well.

### UNIT III

**CONVECTION**

9 Newton’s law of cooling-Dimensional analysis applied to forced and free convection-dimensionless numbers and their physical significance-empirical correlations for free and forced convection -Continuity, momentum and energy equations-thermal and hydrodynamic boundary layer-Blasius solution for laminar boundary layer- General solution of Von-Karman integral momentum equation
UNIT IV RADIATION
Absorptivity, reflectivity and transmissivity- black, white and grey body-emissive power and emissivity-laws of radiation – Planck, Stefan-Boltzmann, Wein’s displacement, Kirchhoff's law, intensity of radiation and solid angle- Lambert’s cosine law Radiation heat exchange between black bodies, shape factor, heat exchange between non-black bodies- infinite parallel planes and infinite long concentric cylinders- radiation shield- heat exchange between two grey surfaces-electrical analogy

UNIT V HEAT EXCHANGER
Classification- heat exchanger analysis- LMTD for parallel and counter flow exchanger- condenser and evaporator- overall heat transfer coefficient- fouling factor- correction factors for multi pass arrangement- effectiveness and number of transfer unit for parallel and counter flow heat exchanger- introduction of heat pipe and compact heat exchanger.

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Learn the modes of heat transfer for the physical situation
2. Interpret the boundary conditions and analyze problems on conduction heat transfer
3. Apply the concept of free and forced convection heat transfer principles in engineering systems
4. Implement the concept of radiation heat transfer in various systems.
5. Design the heat exchangers and understand the phase change characteristics of fluids.

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TEXT BOOKS:

REFERENCES:

PR5014 LEAN MANUFACTURING

COURSE OBJECTIVES:
- To understand the basics of lean manufacturing and to identify the industrial waste
- To understand the applications of various tools available in lean manufacturing
- To analyze and apply the tools of lean manufacturing in an organization
- To identify the perfect value creation process and obtain zero waste.
- To Remember and apply the lean manufacturing tools and techniques through case studies.
UNIT I  INTRODUCTION TO LEAN MANUFACTURING  

UNIT II  CELLULAR MANUFACTURING, JIT AND TPM  
Cellular Manufacturing – Types of Layout, Principles of Cell layout, Implementation. JIT – Principles of JIT and Implementation of Kanban. TPM – Pillars of TPM, Principles and implementation of TPM.

UNIT III  SET UP TIME REDUCTION, TQM, 5S AND VSM  
Set up time reduction – Definition, philosophies and reduction approaches. TQM – Principles and implementation. 5S Principles and implementation - Value stream mapping - Procedure and principles, EOQ, EPQ.

UNIT IV  SIX SIGMA  
Six Sigma – Definition, statistical considerations, variability reduction, design of experiments – Six Sigma implementation

UNIT V  CASE STUDIES  
Various case studies of implementation of lean manufacturing at industries.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Understand the need of waste accumulation in various manufacturing process
2. Acquire knowledge about various tools and methods in lean manufacturing
3. Analyze and apply the knowledge of various concepts of TQM, 5S and VSM to reduce manufacturing time.
4. Understand and apply the concepts of Six Sigma and Lean Manufacturing
5. Apply the knowledge of Lean manufacturing to case studies in Industries.

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REFERENCES:
COURSE OBJECTIVES:

- Understand principle behind various NDT techniques.
- Learn working procedures of various NDT techniques.
- Understand concepts of NDT in various manufacturing processes.
- Impart knowledge in selection of required NDT for specific applications.
- Learn importance of inspection and its techniques.

UNIT I - INTRODUCTION
Introduction to various non-destructive methods – need for inspection – types of inspection systems – quality of inspection – conditions for effective Non-destructive testing – Comparison of Destructive and Non destructive Tests, Visual Inspection, Optical aids used for visual inspection, Applications – benefits of Non-destructive testing.

UNIT II - LIQUID PENETRANT TESTING AND MAGNETIC PARTICLE TESTING
Physical principles, procedure for penetrant testing, Penetrant testing materials, Penetrant testing methods – Applications Principle of MPT. Magnetising technical and procedure used for testing a component, Equipment used for MPT, Applications.

UNIT III - EDDY CURRENT TESTING AND ACOUSTIC EMISSION TESTING

UNIT IV - ULTRASONIC TESTING
Principle, Ultrasonic transducers, Inspection Methods – Normal incident pulse-echo Inspection, through – transmission testing, angle Beam Pulse-echo testing, Techniques A-Scan, B-Scan, C-Scan – Applications.

UNIT V - RADIOMETRY, COMPARISON AND SELECTION OF NDT METHODS
Basic principle, Effect of radiation of Film, Thermography-Radiographic Imaging – Inspection Techniques – Single wall single image, Double wall Penetration and Multiwall Penetration technique – Comparison and selection of various NDT techniques.

TOTAL: 45 PERIODS

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

1. Classify different NDT methods based on their applications and distinguish NDT methods and mechanical testing methods.
2. Explain the principles and procedures of liquid penetrant testing and magnetic particle testing and discuss the interpretation of results for both methods.
3. Explain the techniques thermography, eddy current testing and discuss their advantages and limitations.
4. Summarize ultrasonic testing and the acoustic emission technique, including their principles, parameters, and applications.
5. Discuss radiography principles and imaging techniques and Design the NDT System for specific application.
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PR5071 PROCESSING OF PLASTICS AND POLYMERS

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

UNIT I INTRODUCTION TO PLASTICS
9

UNIT II INTRODUCTION TO POLYMERS
9
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
9
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.

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Acquire knowledge of various plastics and their applications.
2. Understand the different types of polymers and their applications.
3. Analyze and apply the knowledge to select the appropriate method to process a plastics or polymers.
4. Remember the impact on properties and accordingly appropriate polymer mixing and blending techniques should be chosen.
5. Evaluate the properties of polymers through suitable testing methods.

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PR5016     PROCESSING OF COMPOSITES     L T P C
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COURSE OBJECTIVES:
- To impart the knowledge about the different types of fibres and matrix materials.
- To understand the different polymer matrix composites processing methods and their applications for suitable production.
To create knowledge on various metal matrix composite processing methods
To apply knowledge on selection of appropriate processing technique for ceramic matrix composite component production.
To introduce the concept of composites and its composites.

UNIT I  COMPOSITES 9

UNIT II  FIBRES AND MATRIX MATERIALS 9

UNIT III  POLYMER MATRIX COMPOSITES 9
Open mould process, bag moulding, Hand layup and spray up techniques filament winding, compression and transfer moulding, BMC and SMC– pultrusion – centrifugal casting – injection moulding – structure, properties and application of PMC’s – Carbon Matrix Composites – Interfaces – Properties – recycling of PMC.

UNIT IV  METAL MATRIX COMPOSITES 9

UNIT V  CERAMIC MATRIX COMPOSITES 9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Understand the need of composites for suitable application.
2. Acquire Knowledge about various types of fibres and matrix materials.
3. Have exposure to various polymer matrix composites and their processing methods.
4. Analyze and apply knowledge on selection of suitable processing method of metal matrix composites fabrication among various types.
5. Understand the various ceramic matrix composites processing techniques.

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REFERENCES:

PR5017 SMART MATERIALS FOR MANUFACTURING L T P C
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COURSE OBJECTIVES:
- To introduce the basic concepts of smart material for shape memory, counteracting wear and energy generation as well as storage
- To understand the mechanism by which smart materials enhance performance of mechanical/energy transmission
- To outline smart manufacturing system for efficient mechanical and/ or energy transmission
- To analyze and optimize smart manufacturing system.
- To analyze and optimize energy generation and storage.

UNIT I SHAPE MEMORY ALLOYS 9
Shape Memory Alloys – Introduction, one way memory effect, two way memory effect – Types (copper-aluminium-nickel, and nickel-titanium (Ni-Ti) alloys), manufacturing methods, properties, crystal structures, applications and limitations.

UNIT II CUTTING FLUIDS 9
Cutting Fluids – definition, types – oil, water, emulsion fluid as coolant and lubricant, selection parameters for cutting fluids, functions of cutting fluid- shear – strength reduction mechanism, applications, Smart Fluids – introduction, applications - Magnetorheological fluids (MR Fluids), preparation of demineralized water (ion exchange method and permanganate method).

UNIT III ELECTROCHEMICAL ENERGY SYSTEMS 9

UNIT IV WEAR MECHANISM 9
Wear – definition, stages of wear (primary, secondary, tertiary), types – adhesive, abrasive, surface fatigue, fretting, erosion wear, measurement – Tribometry (Pin/ball on disc method), control of wear – Lubrication – theory, mechanism, types of lubricants (liquid, semi-solid, solid and gaseous), selection of lubricants.

UNIT V BATTERY TECHNOLOGY AND ENERGY SOURCES 9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
1. Recall concepts of smart material for shape memory, counteracting wear and energy generation as well as storage
2. Explain the mechanism by which smart materials enhance performance of mechanical/energy transmission
3. Examine smart manufacturing system for efficient mechanical and/or energy transmission
4. Analyze and optimize smart manufacturing system.
5. Compare and contrast the various energy generation and storage system.

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TEXT BOOKS:

REFERENCES:

PR5018 CORROSION ENGINEERING L T P C 3 0 0 3

COURSE OBJECTIVES:
- To introduce various types of corrosion and its mechanism
- To provide knowledge about various methods to prevent or control corrosion
- To familiarize about refractories – characterization, classification and properties
- To outline different metallic and non-metallic coating processes its application, advantage and limitation
- To provide fundamental knowledge on working principle and application of different surface characterization techniques.

UNIT I CORROSION AND ITS CONTROL
9
Introduction - chemical and electrochemical corrosions - mechanism of electrochemical and galvanic corrosions - concentration cell corrosion - passivity-Pourbaix diagram - soil, pitting, intergranular, water line, stress and microbiological corrosions - galvanic series - factors influencing corrosion - measurement of corrosion rate. Corrosion control – material selection and design - electrochemical protection – sacrificial anodic protection and impressed current cathodic protection.
UNIT II  HOT CORROSION AND REFRACTORIES
Oxidation, sulfidation and carbonization. Ellingham diagram, Hot corrosion— Coatings for combustion; Refractories- characteristics, classification, properties – refactoriness and Refractoriness Under Load (RUL), dimensional stability, thermal spalling, thermal expansion, porosity; acidic refractories – fire clay, silica; basic refractories – magnesite, dolomite; neutral refractories – silicon carbide, zirconia.

UNIT III  METALLIC COATINGS
Definition – methods of metallic coating, hot dipping - galvanizing, tinning, metal cladding, electroplating, electroless plating. Various other metallic coatings – displacement plating- Kanigen process – metal spraying or metallised coating – cementation or diffusion coatings.

UNIT IV  CHEMICAL CONVERSION AND ORGANIC COATINGS
Chemical Conversion coatings- Types- phosphate, chromate, chemical oxide and anodized (Aluminium) coatings -Organic coatings- paint, vehicle or drying oil, thinners, driers- Formulation of paints, failure of paint film- Varnishes, Enamels, Lacquers, Epicoating, Emulsion Paints-types, advantages and disadvantages – Special paint.

UNIT V  SURFACE CHARACTERIZATION

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
1. Describe various types of corrosion and its mechanism
2. Identify and select suitable methods to prevent or control corrosion
3. Describe refractories based on characteristic, types and properties
4. Compare and select different metallic and non-metallic coating processes based on application, advantages and limitations
5. Explain different methods of surface characterization and identify suitable technique based on requirement

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TEXT BOOKS:

REFERENCES:
GE5071 DISASTER MANAGEMENT  L T P C
3 0 0 3

COURSE OBJECTIVES:
- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc. - Differential impacts - in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don’ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR)
Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processes and Framework at State and Central Level - State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA
Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS
Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

COURSE OUTCOMES:
At the end of the course the students will be able to:
1. Differentiate the types of disasters, causes and their impact on environment and society
2. Assess vulnerability and various methods of risk reduction measures as well as mitigation.
3. Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.

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**TEXT BOOKS:**

**REFERENCES**
1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005
and risk - risk benefit analysis and reducing risk - the Three Mile Island, Bhopal Gas plant and Chernobyl as case studies.

UNIT V GLOBAL ISSUES
Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors –moral leadership-Sample code of conduct.

TOTAL: 45 PERIODS

COURSE OUTCOMES
Upon the completion of the course the students will be able to:
1. Perform with professionalism in industry
2. Understand the various ethics in industry
3. Understand their rights, legal, ethical issues
4. Understand the responsibilities pertaining to engineering profession
5. Engage in life-long learning with knowledge of contemporary issues

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TEXT BOOKS

REFERENCES

GE5072 HUMAN RIGHTS L T P C
3 0 0 3

COURSE OBJECTIVES
The course aims to
• To make students learn about the concept and regulation of human rights
• To make students aware about the constitutional human rights

UNIT I INTRODUCTION TO HUMAN RIGHTS
UNIT II  REGULATIONS IN HUMAN RIGHTS  9

UNIT III  MONITORING AGENCIES  9
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV  HUMAN RIGHTS-INDIAN PERSPECTIVE  9
Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V  IMPLEMENTATION OF HUMAN RIGHTS IN VARIOUS SCENARIO  9

TOTAL : 45 PERIODS

OUTCOMES
At the end of the course the students will be able to
1. Gain and apply the knowledge using computers for various manufacturing activities
2. Employ the most suitable material handling equipment to accomplish the given task
3. Employ the principles of cellular manufacturing
4. Gain and apply the knowledge using flexible manufacturing system
5. Evaluate the functions of shop floor control and associated systems.

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REFERENCES

PR5019  ELECTRONIC MATERIALS AND PROCESSING  L T P C
3 0 0 3

COURSE OBJECTIVES:
- Define the standards and legislation of modern electronics and also the concepts in electronics materials, products design and development, assembly and applications.
- Explain the standards, concepts in materials, design, assembly and application.
- Illustrate the standards need to be followed, materials need to be selected and technology for product design and development, assembly, recycling for an application.
- Analyze the available standards, select the material, technology, Product design and development for green electronics application.
• Implement the green electronics concepts by the way of selecting appropriate standards, materials, product design and development for green electronics application.

UNIT I  INTRODUCTION TO ELECTRONIC MATERIALS  9
Overview of Semiconductors and Other Basic Materials - Plastics, Elastomers, and Composites - Tables with Material Properties, Terms and Definitions, Trade Names, and Material Structure Correlation, Basic Electronic Components and Its Metallurgical Structure. Carrier Generation and Recombination; Junctions; Photovoltaic Materials and Devices

UNIT II  ORGANIC MATERIALS AND PROCESSES  9

UNIT III  MEMS MATERIALS AND PROCESS  9

UNIT IV  PACKAGING AND ASSEMBLY OF ELECTRONICS  9
Solder Technologies for Electronic Packaging and Assembly, Electroplating and Deposited Metallic Coatings, Printed Circuit Board Fabrication, Materials and Processes for Hybrid Microelectronics and Multichip Modules - Adhesives under Fills, and Coatings in Electronics Assemblies.

UNIT V  THERMAL MANAGEMENT OF MATERIALS AND SYSTEMS  9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
1. Reproduce the standards, concepts of electronics materials, steps in product design and development technology, concepts in assembly for an application.
2. Describe the standards, concepts in materials, design, and assembly for a green electronics application
3. Study the effect of temperature effect based on material, design and packaging
4. Apply the knowledge to select the standards, material selection, product design and development, assembly and recycling for an application.
5. Compare the standards, materials, technology for product design and development, assembly and recycling steps for an application

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TEXT BOOKS:
REFERENCES:

PR5020 MICRO ELECTRO MECHANICAL SYSTEMS AND NANO TECHNOLOGY

COURSE OBJECTIVES:
- To relate the changes in properties of materials with dimension reduction and introduce to building materials for MEMS.
- To classify and introduce the concepts of the microfabrication processes/ nanomaterial synthesis applicable for MEMS.
- To recall and consider ignored factors in conventional design of micro-sensors, micro-actuators and MEMS devices.
- To understand the principles of typical MEMS sensors, actuators and devices.
- To justify the choice material, microfabrication, packaging and testing of typical MEMS devices.

UNIT I EFFECT OF MINIATURISATION AND MATERIALS FOR MEMS

UNIT II MICRO-FABRICATION PROCESSES

UNIT III MICROSYSTEM – WORKING PRINCIPLE AND PACKAGING

UNIT IV MICROSYSTEMS DESIGN
UNIT V     NANO TECHNOLOGY

Classification of nano structures – effect of the nanometer length scale effects of nano scale dimensions on various properties – structural, thermal, chemical, mechanical, magnetic, optical and electronic properties – Fabrication methods – Top down processes – bottom up processes – nano positioning systems.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able to:
1. Understand the changes in properties of materials with reduction of dimensions by Scaling laws and list of materials for building MEMS devices.
2. Explain the various microfabrication/nanomaterial synthesis applicable for MEMS fabrication.
3. Apply conventional design with factors pertaining to micro-sensors, micro-actuators and MEMS devices.
4. Inference on the principles of typical MEMS sensors, actuators and devices.
5. Choose the appropriate material, microfabrication, packaging and testing of typical MEMS devices.

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TEXT BOOKS:
1. Mahalik N P, MEMS, McGraw Hill (India), 2009

REFERENCES:

PR5021     TOTAL QUALITY MANAGEMENT: PRINCIPLES AND APPLICATIONS

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<td>To introduce the basic needs and evaluation of quality in industry</td>
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<td>To understand the quality statements and principles in Total quality management.</td>
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<td>To familiarize about the tools and techniques for quality control.</td>
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<td>To learn and understand the TQM tools for Continuous Process improvement.</td>
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<td>To analyze the importance of Quality systems and ISO in Industries.</td>
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### UNIT I  INTRODUCTION


### UNIT II  TQM PRINCIPLES

Quality statements - Customer focus –Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Continuous process improvement – PDCA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

### UNIT III  TOOLS & TECHNIQUES I


### UNIT IV  TOOLS & TECHNIQUES II


### UNIT V  QUALITY SYSTEMS


### COURSE OUTCOMES:

At the end of the course, students will be able to
1. Apply basic need for TQM in Industries.
2. Understand about various principles in TQM
3. Acquire knowledge about TQM Tools and techniques.
4. Analyze the importance of TQM tools for Continuous process improvement
5. To Understand and apply the ISO standards.

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### TEXT BOOKS:

### REFERENCES:
PR5022 INTEGRATED PRODUCT DEVELOPMENT

COURSE OBJECTIVES:

- To introduce international trends and development methodologies pertaining to diverse products and services,
- To formulate, create prototypes, and construct product management plans for novel products, considering the product type and development methodology while integrating hardware, software, controls, electronics, and mechanical systems
- To comprehend requirement engineering principles and acquire the skills to gather, analyze, and translate requirements for new product development into design specifications
- To apply established product development processes and protocols in order to establish conclusive specifications rooted in customer requirements
- To create documentation, formulate test specifications, and collaborate with diverse teams to validate and sustain engineering customer support activities until End of Life (EOL)

UNIT I FUNDAMENTALS OF PRODUCT DEVELOPMENT


UNIT II REQUIREMENTS AND SYSTEM DESIGN


UNIT III DESIGN AND TESTING


UNIT IV SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT


UNIT V BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY


TOTAL: 45 PERIODS
COURSE OUTCOMES:
Upon completion of the course, the students will be able to:
1. Students will have to define, shape, and assess challenges associated with developing new products
2. Students will have independently addressed specific challenges or collaborate within a team to find solutions
3. Students will have acquired an understanding of the process of Innovation & Product Development within a business context
4. Students will have demonstrated the ability to function autonomously and collaboratively within teams
5. Students will effectively do a project from its initiation to its completion

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TEXT BOOKS:
1. Book specially prepared by NASSCOM as per the MoU.

REFERENCES:

AD5091 CONSTITUTION OF INDIA L T P C
3 0 0 0

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

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course the students will be able to:
1. Able to understand history and philosophy of Indian Constitution.
2. Able to understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
3. Able to understand powers and functions of Indian government.
4. Able to understand emergency rule.
5. Able to understand structure and functions of local administration.

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TEXTBOOKS:
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  9
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  9
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  9
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  9

UNIT V  VALUE EDUCATION IN SOCIAL EMPOWERMENT  9
Equality, Non violence, Humility, Role of Women, All religions and same message, Mind your Mind, Self-control, Honesty, Studying effectively

TOTAL: 45 PERIODS

COURSE OUTCOMES:
1. Gain knowledge of self-development
2. Learn the importance of Human values
3. Develop the overall personality through value education
4. Overcome the self-destructive habits with value education
5. 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.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
1. Understand the methodology of pedagogy.
2. Understand Pedagogical practices used by teachers in formal and informal classrooms in developing countries.
3. Find how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.
4. Know the factors necessary for professional development.
5. 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, ishwarpranidhan

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:
1. Develop healthy mind in a healthy body thus improving social health also improve efficiency
2. Learn Do’s and Don’t’s in life through Yam
3. Learn Do’s and Don’t’s in life through Niyam
4. Develop a healthy mind and body through Yog Asans
5. Learn breathing techniques through Pranayam
REFERENCES:
1. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata
2. ”Yogic Asanas for Group Training-Part-I” : Janardan Swami Yogabhyasi Mandal, Nagpur

AD5095 PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT L T P C
SKILLS 3 0 0 0

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:
1. To develop basic personality skills holistically
2. To develop deep personality skills holistically to achieve happy goals
3. To rewrite the responsibilities
4. To reframe a person with stable mind, pleasing personality and determination
5. To awaken wisdom in students

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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

AD5097 ESSENCE OF INDIAN KNOWLEDGE TRADITION

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

REFERENCES:

[Handwritten note: Attested by Director, Anna University, Chennai]
AD5098  SANGA TAMIL LITERATURE APPRECIATION  L T P C
                                  3 0 0 0

COURSE OBJECTIVES:
The main learning objective of this course is to make the students an appreciation for:
- Introduction to Sanga Tamil Literature.
- 'Agathinai' and 'Purathinai' in Sanga Tamil Literature.
- 'Attruppadai' in Sanga Tamil Literature.
- 'Puranaanuru' in Sanga Tamil Literature.
- 'Pathitrupaththu' in Sanga Tamil Literature.

UNIT I  SANGA TAMIL LITERATURE AN INTRODUCTION  9

UNIT II  ‘AGATHINAI' AND ‘PURATHINAI'  9

UNIT III  ‘ATTRUPPADAI'  9
Attruppadai Literature – Attruppadai in 'Puranaanuru' - Attruppadai in 'Pathitrupaththu’ – Attruppadai in 'Paththupaatu'.

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

UNIT V  ‘PATHITRUPATHTHU'  9
Pathitrupaththu in 'Etutthogai' - Pathitrupaththu's Parables - Tamil dynasty: Valor, Administration, Charity in Pathitrupaththu - Message to Society from Pathitrupaththu.

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 ‘Pathitrupaththu’ in their personal and societal life.

REFERENCES:
HU5171     LANGUAGE AND COMMUNICATION          LT P C
                        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
1. Students will be able to use linguistic and non linguistic resources of language in an integrated manner for communication.
2. Students will be able to analyse communication in terms of facts and opinions.
3. 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  L T P C  3 0 0 3

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 9
Extrinsic values- Universal and Situational values- Physical- Environmental-Sensuous- Economic-Social-Aesthetic-Moral and Religious values

UNIT II  CONCEPTS RELATED TO VALUES 9
Purusartha-Virtue- Right- duty- justice- Equality- Love and Good

UNIT III  IDEOLOGY OF SARVODAYA 9
Egoism- Altruism and universalism- The Ideal of Sarvodaya and Vasudhaiva Kutumbakam

UNIT IV  SUSTENANCE OF LIFE 9
The Problem of Sustenance of value in the process of Social, Political and Technological Changes

UNIT V  VIEWS ON HIERARCHY OF VALUES 9
The Problem of hierarchy of values and their choice, The views of Pt. Madan Mohan Malviya and Mahatma Gandhi

TOTAL: 45 PERIODS

OUTCOMES:
1. Able to understand definition and classification of values.
2. Able to understand purusartha.
3. Able to understand sarvodaya idea.
4. Able to understand sustenance of life.
5. Able to understand views of hierarchy of values.
TEXT BOOKS:
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
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
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
Yoga, Pranayam and Exercise: Aerobic and anaerobic.

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

UNIT V DEVELOPING CAREER THRUST

TOTAL: 45 PERIODS

OUTCOMES:
Students will be able to
1. Understand the importance of self-management.
2. Know how to deal with people to develop teamwork.
3. Know the importance of staying healthy.
4. Know how to manage stress and personal problems.
5. Develop the personal qualities essential for career growth.
TEXT BOOK:

REFERENCES:

HU5174

PSYCHOLOGICAL PROCESSES

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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

HU5175  EDUCATION, TECHNOLOGY AND SOCIETY  L T P C
3 0 0 3

COURSE DESCRIPTION
This course introduces students to multidisciplinary studies in Education, Technology and Society. Students will get an understanding of the relationship between education, technology and society. They will also learn about the long lasting impact of good education in a technologically advanced society.

COURSE OBJECTIVES:
The course aims

- To help learners understand the basics of different types of technology utilised in the field of education
- To make them realize the impact of education in society
- To make them evolve as responsible citizen in a technologically advanced society

LEARNING OUTCOMES
By the end of the course, learners will be able to

1. Understand the various apps of technology apps and use them to access, generate and present information effectively.
2. Apply technology based resources and other media formats equitably, ethically and legally.
Integrate their technical education for betterment of society as well as their personal life.

UNIT I INDIAN EDUCATION SYSTEM
Gurukul to ICT education – Teacher as facilitator – Macaulay’s Minutes – English medium vs Regional medium – Importance of Education in Modern India - Challenges in Education

UNIT II LEARNING THEORIES

UNIT III TECHNOLOGICAL ADVANCEMENTS
Web tools – Social media in education – elearning – MOOCs – Mobile assisted learning – Learning Apps – Blended learning - Self-directed learning

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 Fosters 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

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
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
1. Students will be able to critically read literary and media texts and understand the underlying gender perspectives in them.
2. Students will be able to analyse current social events in the light of gender perspectives.
3. 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%

HU5272 ETHICS AND HOLISTIC LIFE 3 0 0 3

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.

HU5273 LAW AND ENGINEERING

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

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

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.

Attested
DIRECTOR
Centre for Academic Courses
Anna University, Chennai-600 025
• 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
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

UNIT III FILMS ACROSS THE WORLD

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:
1. Recognize types of films, their impact on society and their roles in our lives.
2. Have an understanding of the concepts of storytelling, Mise en Scene, and other elements of film making.
3. Interpret the underlying messages in the movies.

Teaching Methods
1. 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
2. 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)
3. Assignment 1: Write a movie review with critical analysis (20 marks).
4. Assignment 2: Write a script for a scene taken from a short story / novella (20 marks).
5. Presentation: Students choose any one topic related to films and present it to the audience. (25 marks)
6. Group discussion: Students discuss in groups on the various aspects of movies and its impact on society. (25 marks)
7. 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
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                                                   9

UNIT II           MORPHOLOGY - WORDS OF LANGUAGE                                               9

UNIT III          SYNTAX- THE SENTENCE PATTERNS OF LANGUAGE AND SEMANTICS-THE MEANING OF LANGUAGE 9

UNIT IV           PHONETICS – THE SOUNDS OF LANGUAGE                                           9

UNIT V           APPLIED LINGUISTICS - THE PRACTICAL APPLICATIONS OF LANGUAGE                  9
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:
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. Shankaracharya: Viveka Chudamani
6. Camus, Albert- The Myth of Sisyphus
7. Calvino, Italo: If on a winter’s night a traveler

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