SEM I EComE

Syllabus

Course Name: Engineering Ethics **[2:0:0=2]**

Course Content:

Understand the concept of Ethics, morality, and values. Learn Principles of ethics, To be aware about the Levels of ethical analysis, Knowing & handling Ethical dilemmas, Applying Professional ethics, Awareness about Ethical issues in engineering, Ethical issues in IT, social media, industry 4.0 and artificial intelligence.

Course Outcomes:

CO1: Recognise the importance of Ethics in the engineering profession with the help of relevant examples and evaluate and compare various situations and take ethical decisions which are for the welfare of others and self.

CO2: To adapt, adopt, improve, and implement ethical practices in the work place and everyday life.

Textbook:

1) Engineering Ethics by Govindarajan M.

Reference Book:

1) Professional Ethics in Engineering by Dr. C. Senthil Kumar.

Course Name: Communication and Writing Skills **[2:0:2=3]**

Course Content:

Understanding Technical Communication, Difference between General and Technical Communication, Effective Writing Strategies- Style and Tone, Process of writing and types of Motivation in writing technical documents, Document Design, Technical Report Writing, Writing a sample technical report, Reading Comprehension, Understanding the rhetorical situation, Building Advanced Vocabulary, Office Correspondence- Email, Letter of Enquiry/ Complaints, Memo, Agenda, Minutes, Teamwork and Communication ,Dynamics of Professional Presentations.

Course Outcomes:

CO1: Apply and understand the fundamentals of technical writing such as accuracy, brevity, and clarity.

CO2: Analyze critical and logical verbal skills to draft various reports and present them.

CO3: To evaluate, design and draft logical and persuasive proposals/ reports focusing on offering pragmatic solutions of various technical problems.

Textbook:

1) Meenakshi Raman and Sangeeta Sharma, Technical Communication: Principles and Practice, New Delhi: Oxford University Press, 2012.

Course Name: Calculus for Engineers **[3:0:0=3]**

Course Content:

Curve tracing of functions, Applications of derivative, Application of Integrals to find volume of a solid, area of a surface of revolution, Centre of mass etc. Sequence and Series, Tests for convergence and absolute convergence, Maclaurin, and Taylor series expansions of functions of one variable. Function of multiple variables, Level curves and level surfaces, Limits & Continuity in higher dimension, Partial derivatives, Derivatives of composite & implicit functions, Chain rule of derivative, Applications of Partial derivatives in Maxima and Minima, Lagrange's multiplier method, Taylor's and Maclaurin's expansion for functions of two variables. Double integral and triple integrals, change of order of integration, Jacobian of transformation, Change of coordinates, Polar, Cylindrical and Spherical co-ordinates, Substitution in multiple integrals. Scalar and vector fields, Gradient, Divergence, Curl and their physical meaning, Line integral and its applications, Surface integral, Volume integrals, Green's theorem in the plane, Stoke's theorems, Gauss divergence theorem.

Course Outcomes:

CO1: Understand various concepts of single variable and multiple variable functions and their graphs, convergence/divergence of sequence and series, limits & continuity in higher dimension, multiple integrals in various coordinate systems, concept of scalar and vector field, gradient, divergence, curl, line integral, surface integral and volume integral, change of order of integration, Jacobian of transformation.

CO2: Apply the concept of derivative to plot the graphs of functions, level curves and level surfaces, concept of integrals to find volume of a solid, area of a surface of revolution, centre of mass, concept of partial derivatives to find extreme values of multivariable functions, apply the concepts of Jacobian to change the integrals from one coordinate system to other, apply the concepts of line, surface and volume integrals to solve physical problems.

CO3: Analyse the efficiency of different coordinate systems to find the volume, surface area and centre of mass of 3-D solids and intersection of solid geometries, analyse different kinds of problems arising in fluid mechanics and electromagnetism using Green's Theorem, Gauss' divergence theorem and Stokes's theorems.

CO4: Model real world problems and find their solutions mathematically, use technology to visualize the findings and write a report to summarize the results.

Textbook:

1) George B. Thomas Jr., Maurice D. Weir, Joel R. Hass, THOMAS' CALCULUS, ISBN: 978-0134439020, 14th Edition, Pearson, 2018.

Reference Book:

1) Erwin Kreyszig, Advanced Engineering Mathematics, ISBN: 978-0470458365, 10th Edition, Wiley India, 2011.
2) Dennis G. Zill, Warren S. Wright, Advanced Engineering Mathematics, ISBN: 978-93-80108-92-6, 4th Edition, Jones & Bartlett.

Course Name: Elements of Mechanical Engineering [2:0:4=4]

Course Content:

Introduction to Manufacturing: Definition, Necessity, 5Ms, Past, present and future trends of manufacturing (i.e. Industrial revolutions), Basic Manufacturing Types. Metal Casting: Definition, Methods of Casting, Sand Casting, Types of patterns, pattern materials, pattern allowances, Casting Defects, Casting Applications. Metal Forming: Definition, Cold and Hot working process, Introduction to metal forming process like Forging, Rolling and Sheet metal working etc. Metal Joining: Definition and various methods of Metal joining (permanent & temporary joining process), Welding, Introduction to Arc, MIG, TIG, Gas & Resistance welding processes, Welding Defects. Metal Cutting / Machining: Fundamentals of conventional machining processes, Machine Tools - Basics of Lathe, Milling, Drilling, Grinding operation, Cutting tools & materials. Laser Processing of Materials: Laser Cutting, Laser Engraving, Laser Marking, Laser Machining, Laser Melting, Laser Welding. Introduction to Additive Manufacturing (AM), Methods / Types of AM, Challenges Applications, Advantages and Disadvantages.

List of Experiments:

1. Machine Shop:
   - Conventional Lathe: Facing, Outside diameter turning, Step turning, Taper turning, Drilling, Knurling, Threading on Lathe
   - Conventional Milling: Surface finishing of job and Slot cutting on Milling
   - Introduction to drilling and job preparation
2. Welding:
   - Introduction of welding shop
   - Lap joint using Spot welding
   - Butt joint using Arc welding
   - Corner / T-joint using MIG / TIG / Gas Welding
3. Foundry
   - Casting [Mould preparation & pouring, fettling & finishing]
   - Smithy shop: Chisel preparation
4. Carpentry
   - Introduction
   - Carpentry -T half joint, Cross lap joint
   - Jig saw and Band saw machine
5. Laser Processing and Additive Manufacturing:
   - Introduction
   - Laser Cutting
   - 3D Printing - Design Procedure and Part manufacturing

Course Outcomes:

CO1: Understanding the fundamentals of manufacturing operations.
CO2: Analyse the concepts and parameters involved the manufacturing processes.
CO3: Develop the products / components by using traditional and modern manufacturing processes.

Textbook:

1) Nagendra Parashar, B.S. and Mittal, R.K., *Elements of Manufacturing Processes*, PHI Learning Private Limited, New Delhi, ISBN: 9788120319583, 2015.

Reference Book:

1) Kalpakjian, S. and Schmid, S. R., *Manufacturing Engineering and Technology*, 4th Ed, Pearson India, ISBN: 9788177581706, 2001.

Course Name: Computer Programming using C **[2:0:2=3]**

Course Content:

Introduction to Programming and the Programming Environment: Syntax and semantics of programming languages, Functions of a compiler, Interpreted vs compiled code, Languages and translation, Data representation. Basic Language Elements: Types, operators, variables, constants, Strings. Input & Output: Function and purpose, getchar() and putchar() functions, gets() and puts() functions, scanf() and printf () functions. Arithmetic Expressions and Precedence: Operators and expressions using arithmetic and relational operators, mixed operands, type conversion, logical operators, assignment operator, operator precedence and associativity. Control Structures: Sequence, Selection (if-else, nested if, if-elseif), Nested Branches, Iteration, Nested Loops (for, while, do-while). Methods: Parameter passing, Variable lifee and scope, returning value, calling method. Arrays: Understanding arrays, Single dimensional arrays, two-dimensional arrays, Reading array elements. Functions: Defining a function, declaring a function, calling a function, function arguments, scope rules, local variables, global variables, formal parameters, initializing local and global variables, call by value, call by reference. Storage Classes: auto storage class, register storage class, the static storage class, extern storage class. Pointers: What are pointers, how to use pointers, null pointers, call by value, call by reference, pointer arithmetic, incrementing a pointer, decrementing a pointer, pointer comparisons, array of pointers, pointer to pointer, passing pointers to functions, return pointer from functions. File I/O: Opening a file, closing a file, writing a file, reading a file, binary I/O functions.

Course Outcomes:

CO1: Understand the basic elements of C programming structures like data types, expressions, control statements, various simple functions and in view of using them in problem solving.

CO2: Apply various operations on derived data types like arrays and strings in problem solving.

CO3: Design and implement of modular Programming and memory management using pointers.

Textbook:

1) H. Schildt, “C: the Complete Reference”, 4th edition, Mcgraw Hill.
2) L. Manelli, “Understanding Algorithms and Flowcharts: step by step explanations of simple and complex algorithms with implementation in C (Fundamentals of Modern Information Technology Book 1)”, ARACNE.
3) B. S. Gottfried, Programming with C, 4th edition, Mcgraw Hill.

Reference Book:

1) P. Deitel and H. Deitel , “C How to Program”, 8th edition, Pearson Education, 2015

Course Name: Basic Electrical and Electronics Engineering **[2:0:2=3]**

Course Content:

Module 1: DC Circuits: Electric charge and current, active and passive two terminal elements, Ohm's laws, series and parallel reduction of resistive circuits, star-delta transformation, current and voltage independent and dependent sources, voltage division rule and current division rule, source transformation, Kirchhoff's laws – KCL and KVL, Mesh (Loop) analysis and Nodal analysis. DC Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's theorem, Maximum Power Transfer theorem. DC analysis of first order R, L and C circuit.
Module 2: Single Phase AC Circuits: Introduction to alternating quantities – average and effective or rms values, form and peak factors, phasor representation of sinusoidal quantity, AC series circuit containing R, L, C, R-L, R-C, and R-L-C elements, impedance triangle, Instantaneous power, apparent power, power factor, power triangle, Series-Parallel R-L-C circuits.
Module 3: Semiconductor and Diodes: Introduction to Semiconductor devices: P-N junction, forward and reverse biasing, volt ampere characteristics of p-n junction, Types of diodes: Zener diode, Schottky diode, applications of diode: rectifiers, clippers and clampers.
Module 4: Bipolar Junction Transistor: Introduction: Bipolar Junction Transistors (BJT), Familiar with Transistor fundamentals- Basic Operation and symbol Representation, Transistor configuration (CE, CB, CC), Transistor characteristics, BJT as a switch and DC Biasing.

Course Outcomes:

CO1: Understand the basic concepts of Electrical and Electronics Engineering.
CO2: Apply Kirchhoff's laws and network theorems to calculate electrical parameters in resistive circuits.
CO3: Analyze complex DC and AC circuits with current/voltage dependent sources to determine voltage, current, power factor and power in the circuit.
CO4: Design/create and simulate BJT based circuits for various applications.

Textbook:

1) "Basic Electrical and Electronics Engineering", Second Edition, S.K. Bhattacharya, Pearson India Education Services Pvt. Ltd.
2) D.P. Kothari, I. J. Nagrath, "Basic Electronics", McGraw Hill Education (India) Private Limited, 2014.

Reference Book:

1) "Foundations of electrical engineering" Leonard S. Bobrow, Oxford.
2) "Basic Electrical and Electronics Engineering", M.S. Sukhija & T.K. Nagsarkar, Oxford University Press.
3) "Basic Electrical and Electronics Engineering" J.B. Gupta, Katson

Course Name: Design Thinking- The Way to Joy of Engineering [1:0:2=2]

Course Content:

In today's increasing complexity of digital technology and modern business, customers are increasingly choosing products and services based on the quality of the experiences they have with them. To help meet these challenges, an approach known as "Design Thinking" is playing a great role in finding meaningful pathways - its process and tools are increasingly being adopted in Lean Six Sigma processes and in organizational innovation initiatives. Design thinking is a human-centered, iterative problem-solving process of discovery, ideation, and experimentation that employs various design-based techniques to gain insight and yield innovative solutions for virtually any type of organizational or business challenge. A Design Thinking mindset is essential for development of Internet of Things (IoT) platforms, smart products, and Smart Cities. Industry practitioners of Design Thinking include Apple, Google, Samsung, Uber, Airbnb, IDEO, Nike, Procter & Gamble, Singapore Airlines, DBS Bank to name a few.

In this action-oriented workshop-oriented course, students will work in teams (5-6), guided by a facilitator to experience a customer-centric approach to problem solving through re-imagination of the end-to-end customer experience journey. Students will develop skills such as ethnographers, visual thinkers, strategists, and storytellers through a hybrid of workshop discussions and activities. It covers building empathy through ethnographic research, generating ideas, prototyping, and testing new concepts.

The goal of this course is that students acquire Design Thinking skills. This is an experiential learning course where students learn by doing. Nowadays, Design Thinking and its tools are used by product and industrial design firms to ideate products. It is also used to solve so-called “wicked problems” – problems for which neither question nor the answer is well defined.

In addition, students are expected to sharpen their Critical Reasoning and problem-solving skills through an online MOOC on Coursera. Critical reasoning is a methodology for using objective and evidence-based analysis for evaluation of statements and arguments. It also helps understand the fallacies and barriers that prevent reaching conclusions in a logical and cohesive manner.

Course Outcomes:

CO1: At the end of the course the students should have understood and should be able to apply their learned knowledge in real life applications.

CO2: Identify common obstacles to effective problem solving and decision making and recognize the human variable in problem solving and decision making.

CO3: Apply concepts to enhancing personal development and organizational performance and explain the key elements of problem solving and decision making, and the barriers associated with them

Textbook:

1) Tim Brown:,Change by Design; Harper Collins (2009)

Reference Book:

1) Jonathan Littman,Tom Kelley:,The Art of Innovation:, Profile Books; 2004
2) Vijay Kumar:,101 Design Methods; John Wiley; 2013
3) Tom Kelley and David Kelley:,Creative Confidence; William Collins; 2013

4) Tina Seelig;inGenius: A Crash Course on Creativity; Hay House; 2012
5) Jon Kolko:,Well Designed; Harvard Business School Publishing; 2014
6) Richard Buchanan:,Wicked Problems in Design Thinking:,Design Issues , MIT Press,1992
7) Hugh Dubberly and Shelley Evenson:,Designing for Service: Creating an Experience Advantage:,Willey 2009