DEPARTMENT OF

MECHANICAL ENGINEERING

VISION OF THE DEPARTMENT

To develop into a Centre of Excellence in Education and interdisciplinary research with cutting edge technologies in the field of Mechanical Engineering, consistent with the contemporary and future societal needs of the country

MISSION OF THE DEPARTMENT

- To impart high quality education by using modern pedagogical tools so as to make the students technically competent in their chosen fields.
- To inculcate quality research by developing linkages with Industry and R & D organizations in India & abroad for developing technically competent and socially responsible engineers, managers and entrepreneurs.

B.TECH.
(MECHANICAL ENGINEERING)

B.TECH. (ME)

PROGRAM EDUCATIONAL OBJECTIVES

PEO-I: To prepare students for successful careers as mechanical engineers in organizations that meet the needs of Indian and global/multinational industrial/research establishments.

PEO-II: To provide a strong foundation in mathematical, scientific and engineering fundamentals in both domain and cross domain spheres, that enables students to visualize, analyze and solve mechanical engineering problems and be innovative and research oriented.

PEO-III: To train students with a wide spectrum of scientific and engineering courses so that students could comprehend, analyze, design and create products and services that address real life problems, which are efficient and cost effective.

PEO-IV: To inculcate in students a professional and ethical attitude, impart effective communication skills and ability to work in teams with multidisciplinary approach, be part of and interact with professional bodies so as to resolve engineering issues of social relevance.

PEO-V: To provide students with an academic environment that fosters excellence, leadership, yearning to pursue higher studies and passion for lifelong learning so as to have a successful professional career.

B.TECH. (ME)

PROGRAM OUTCOMES

PO-1: **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO-2: **Problem Analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO-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.

PO-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.

PO-5: **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including

prediction and modelling to complex engineering activities with an understanding of the limitations.

PO-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.

PO-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.

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

PO-9: Individual and Teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO-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.

PO-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.

PO-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.

B.TECH. (ME)

PROGRAM SPECIFIC OUTCOMES

PSO-1: Analyse, design, evaluate and provide solutions to the real-life mechanical engineering problems.

PSO-2: Research and Innovate on Product Design & Development using smart technologies and Apply managerial skills to execute professional responsibilities in industry or as an Entrepreneur.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY HYDERABAD
B.TECH. I YEAR
MECHANICAL ENGINEERING

I SEMESTER **R22**

Course Code	Title of the Course	L	T	P/D	CH	C
22BS1MT101	Matrices and Calculus	3	1	0	4	4
22BS1CH101	Engineering Chemistry	3	0	0	3	3
22ES1CS103	C Programming and Data Structures	3	0	0	3	3
22PC1ME103	Engineering Materials	2	0	0	2	2
22PC1ME101	Fundamentals of Manufacturing Processes	2	0	0	2	2
22ES2ME101	Engineering Workshop	1	0	2	3	2
22ES2CS103	C Programming and Data Structures Laboratory	0	0	2	2	1
22BS2CH101	Engineering Chemistry Laboratory	0	0	2	2	1
22PC2ME101	Manufacturing Processes Laboratory	0	0	2	2	1
22SD5ME101	Elements of Mechanical Engineering	0	0	2	2	1
22MN6HS101	Induction Programme	2	0	0	2	0
Total		**16**	**1**	**10**	**27**	**20**

II SEMESTER **R22**

Course Code	Title of the Course	L	T	P/D	CH	C
22BS1MT102	Ordinary Differential Equations and Vector Calculus	2	1	0	3	3
22BS1PH101	Engineering Physics	3	0	0	3	3
22PC1ME102	Metallurgy and Materials Science	3	0	0	3	3
22ES1ME101	Engineering Mechanics	3	1	0	4	4
22ES3ME101	Engineering Graphics	0	0	4	4	2
22HS1EN101	English for Skill Enhancement	2	0	0	2	2
22HS2EN101	English Language and Communication Skills Laboratory	0	0	2	2	1
22PC2ME102	Metallurgy and Materials Science Laboratory	0	0	2	2	1
22BS2PH101	Engineering Physics Laboratory	0	0	2	2	1
22MN6HS103	Happiness and Wellness	2	0	0	2	0
Total		**15**	**2**	**10**	**27**	**20**

L – Lecture T – Tutorial P – Practical D – Drawing CH – Contact Hours/Week
C – Credits SE – Sessional Examination CA – Class Assessment ELA – Experiential Learning Assessment
SEE – Semester End Examination D-D – Day to Day Evaluation LR – Lab Record
CP – Course Project PE – Practical Examination

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. I Semester

(22BS1MT101) MATRICES AND CALCULUS

TEACHING SCHEME		
L	T/P	C
3	1	4

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Matrices, Differentiation, Integration

COURSE OBJECTIVES:

- To know the rank of the matrix and its application to consistency of system of linear equations
- To know Eigen values and Eigen vectors
- To know the nature of Quadratic forms
- To know maximum and minimum of a given function with several variables
- To evaluate multiple integrals and their applications

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Compute the rank of a matrix and analyze the solution of a system of linear equations

CO-2: Calculate Eigen values and Eigen vectors

CO-3: Reduce the quadratic form to its canonical form

CO-4: Solve problems involving Maxima and Minima

CO-5: Evaluate multiple integrals and its applications in areas and volumes

COURSE ARTICULATION MATRIX:

*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	2	1	-	-	1	1	-	2	1	-	2	-	-
CO-2	3	2	2	1	-	1	1	-	2	1	-	2	-	-
CO-3	3	2	2	-	-	1	1	-	2	1	-	2	-	-
CO-4	3	2	1	1	-	1	1	-	2	1	-	2	-	-
CO-5	3	2	1	-	-	1	1	1	2	1	-	2	-	-

UNIT-I:

Matrices: Types of real matrices, symmetric, skew symmetric and orthogonal matrices; Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; Consistency of Homogeneous and Non-Homogeneous equations, LU Decomposition method.

UNIT-II:

Eigen Values and Eigen Vectors: Eigen values and eigenvectors and their properties, Diagonalization of matrices; Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem

UNIT-III:

Complex Matrices and Quadratic Forms: Types of complex matrices; Hermitian; Skew-Hermitian, Unitary Matrices and its properties; Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical form using Linear Transformation and Orthogonal Transformation.

UNIT-IV:

Functions of Several Variables: Definitions of Limits, Continuity. Partial differentiation: partial derivatives of first and second order, Euler's theorem, Total derivative, Jacobian, Functional dependence, Taylor's theorem of two variables (without proof). Maxima and Minima of two variables, Lagrange's method of undetermined Multipliers.

UNIT-V:

Multiple Integrals with Applications: Evaluation of Double Integrals (Cartesian and polar coordinates); change of order of integration (only Cartesian form), Change of variables (Cartesian to polar). Evaluation of Triple integrals, Change of variables (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals. Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals).

TEXT BOOKS:

1. Higher Engineering Mathematics, B. V. Ramana, Tata McGraw Hill, New Delhi,11th Reprint, 2010
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Narosa Publications
3. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley India Pvt. Ltd.

REFERENCES:

1. Linear Algebra and its Applications, Gilbert Strang, Cengage Publication
2. Matrices, A. R. Vasishtha and A. K. Vasishtha, Krishna's Educational Publishers
3. Engineering Mathematics, N. P. Bali, 4th Edition, Laxmi Publications (P) Ltd.
4. Calculus and Analytic Geometry, G. B. Thomas and R. L. Finney, 9th Edition, Pearson, 2002
5. Linear Algebra and its Applications, David C. Lay, Pearson Education India, 2003

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. I Semester

(22BS1CH101) ENGINEERING CHEMISTRY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: General Chemistry and Basic Mathematics

COURSE OBJECTIVES:

- To analyze the quality of water for sustainable living
- To acquire the knowledge about polymer science and its applications in various fields
- To outline the importance of non-conventional energy sources and portable electric devices
- To imbibe the conceptual knowledge of corrosion science
- To recognize the significance of advanced materials for sustainable living

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Assess the specification of water regarding its usage in domestic & Industrial scenarios
CO-2: Analyze the efficacy of polymers in diverse applications
CO-3: Recognize the transformations in energy sources & battery technology
CO-4: Predict the suitable corrosion control methods in safeguarding the structures
CO-5: Interpret the role of advanced materials for better efficiency in various sectors

COURSE ARTICULATION MATRIX:
*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	2	1	-	-	1	1	-	2	1	-	2	-	-
CO-2	3	2	2	1	-	1	1	-	2	1	-	2	-	-
CO-3	3	2	2	-	-	1	1	-	2	1	-	2	-	-
CO-4	3	2	1	1	-	1	1	-	2	1	-	2	-	-
CO-5	3	2	1	-	-	1	1	1	2	1	-	2	-	-

UNIT - I:

Water and its Treatment: Introduction- Hardness - causes, expression of hardness, units of hardness, types of hardness, Numerical problems (temporary & permanent hardness of water). Estimation of hardness by EDTA method.

Potable water and its specifications. Steps involved in the treatment of potable water – screening, sedimentation, coagulation, filtration, and disinfection methods- boiling, chlorination (By Chlorine gas, Bleaching powder, Chloramine), Breakpoint of chlorination.

Boiler troubles - boiler corrosion, caustic embrittlement, scale & sludge formation. Internal treatment- Calgon, phosphate, and colloidal conditioning, External treatment - Softening of water by ion- exchange processes. Desalination of brackish water – Reverse osmosis and its advantages.

UNIT - II:

Polymer Science: Definition – Classification of polymers with examples, Types of polymerizations, addition, and condensation polymerization with examples. Properties of polymers- crystallinity & glass transition temperature.

Plastics: Definition and characteristics-thermoplastic and thermosetting plastics, Preparation, Properties, and applications of Teflon, PMMA, PC, PET, Bakelite.

Moulding of Plastics (Compression, Extrusion, Blow moulding and Thermoforming).

Conducting Polymers: Classification and applications of conducting polymers.

Shape Memory Polymers (SMPs): Definition, classification based on their mode of activation (thermo-responsive, light-responsive, electrically, magnetically Induced and water activated -brief note) and applications of SMPs in various fields.

UNIT-III:

Energy Sources & Battery Technology: Definition and characteristics of fuel, Types of fuels, analysis of coal – proximate and ultimate analysis. Petroleum and its Refining, Cracking- Definition, types -moving bed catalytic cracking process. Knocking – octane and cetane rating, Gaseous fuels –Types of hydrogen fuel, generation of green hydrogen-mechanism of electrolysis of water.

Battery Technology: Definition, Characteristics of a good battery, Classification of batteries- primary, secondary, reserve and fuel cells with examples.

Primary Batteries: Zn-air battery-Construction and working.

Rechargeable Batteries: Construction and working of lithium-ion battery and its importance in electric vehicles.

Fuel Cell: Definition, construction, working, principle, and applications of methanol-oxygen fuel cell.

UNIT – IV:

Corrosion and its Control: Introduction causes and effects of corrosion, mechanism of chemical and electrochemical corrosion. Types-differential aeration corrosion (Pitting and waterline corrosion), differential metal corrosion (Galvanic corrosion).

Factors affecting corrosion-nature of metal (position, passivity, purity, areas of anode and cathode) & nature of environment (temperature, pH, humidity).

Corrosion control methods - cathodic protection-Sacrificial anodic and impressed current cathodic protection, comparison of galvanizing and tinning.

UNIT – V:

Advanced Materials:

Composites: Introduction, need for composites, classification of composites-Fibre reinforced composites-Glass fibre, carbon fibre and aramid fibre-Features and applications, Hybrid composites-natural and synthetic.

Self -healing materials-Features, principle, and applications.

Lubricants-Definition and need for lubricants, types- liquid, semi-solid, solid, mechanisms of lubrication-thick film lubrication, thin film lubrication and extreme pressure lubrication. Properties of lubricants-viscosity, cloud and pour point, flash and fire point, their definition and significance. Biodegradable lubricants-Definition, comparison with conventional lubricants, applications.

TEXTBOOKS:

1. Engineering Chemistry, P. C. Jain and M. Jain, Dhanpat Rai Publishing Company, 2010
2. Engineering Chemistry, Rama Devi, Venkata Ramana Reddy and Rath, Cengage Learning, 2016

REFERENCES:

1. Engineering Chemistry, Shikha Agarwal, Cambridge University Press, 2015
2. Engineering Chemistry, Shashi Chawla, Dhanpat Rai and Company (P) Ltd., 2011
3. A textbook of Engineering Chemistry, M. Thirumala Chary, E. Laxminarayana and K. Shashikala, Pearson Publications, 2021
4. Textbook of Engineering Chemistry, Jaya Shree Anireddy, Wiley Publications

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. I Semester

(22ES1CS103) C PROGRAMMING AND DATA STRUCTURES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To introduce the basics of programming, computing environments
- To understand various C language constructs
- To explore operations and concepts of different data structures
- To know various file operations

COURSE OUTCOMES:

CO-1: Illustrate algorithm, flow chart for a given problem
CO-2: Explore the basics of C and various data types in C
CO-3: Develop modular programs using different language constructs
CO-4: Analyse the basic concepts and different operations on Linear and Non-Linear Data structures
CO-5: Solve a given problem using C language

COURSE ARTICULATION MATRIX:

*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)		
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	1	2	2	-	-	-	-	1	1	1	-	1	-	-	-
CO-2	3	2	3	1	2	-	-	-	1	-	-	2	-	-	-
CO-3	3	3	3	2	2	-	-	2	2	2	-	2	-	-	-
CO-4	3	3	2	2	-	-	-		2		-	2	-	-	-
CO-5	3	3	3	2	2	-	-	2	2	2	-	2	-	-	-

UNIT-I:

Algorithm: Flowchart- Structure of C program- Identifiers- Basic data types-Constants-variables- Operators-Expressions- Precedence and order of evaluation.
Input-Output Statements: If and switch statements- Loops- While- Do-while and for Statements- Break- Continue- Goto and Labels- Example C Programs.

UNIT-II:

Functions: basic concepts- parameter passing- storage classes- scope rules- user defined functions- standard library functions- recursive functions- example C programs.

UNIT-III:

Arrays: Basic concepts- one-dimensional and two-dimensional arrays- Character array- string handling functions- example C programs.
Sorting: Selection sort- Bubble sort- Insertion sort.
Searching-Linear and Binary search methods.

UNIT-IV:

Structures: Declaration-Definition and Initialization of Structures-Accessing Structures-Operations on Structures, typedef. Unions- Declaration-Definition and Initialization of Unions.

Pointers: Basic concepts- Pointers and functions- Pointers and strings- Pointers and arrays- Pointers and structures- Self referential structures, Dynamic Memory Allocation-Example C programs.

UNIT-V:

Introduction to Data Structures- Stacks and Queues(Linear, Circular, Dequeue)-ADT-Implementation Using Arrays.

Linked List: Definition, representation, ADT, List of applications, Trees - Definition, representation ADT, List of applications and Graphs - Definition, representation, ADT, List of applications

TEXT BOOKS:

1. Computer Science - A Structured Programming Approach Using C, B. A. Forouzan and R. F. Gilberg, 3rd Edition, Thomson
2. The C Programming Language, B. W. Kernighan, Dennis M. Ritchie, PHI/Pearson Education
3. C Programming and Data Structures, E. Balagurusamy, TMH

REFERENCES:

1. Data Structures Using C, A. S. Tanenbaum, Y. Langsam and M. J. Augenstein, PHI/ Pearson Education
2. Programming in C, Stephen G. Kochan, 3rd Edition, Pearson Education
3. Data Structures and Program Design in C, R. Kruse, C. L. Tondo, B. P. Leung, Shashi M, 2nd Edition, Pearson Education

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. I Semester

(22PC1ME103) ENGINEERING MATERIALS

TEACHING SCHEME		
L	T/P	C
2	0	2

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To provide basic understanding of engineering materials, their structure, classification and usage
- To introduce the testing methods for various material properties and ASTM standards used in testing
- To understand the various materials used in mechanical engineering like metals, ceramics, polymers, composite materials and other new materials

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Classify the various materials that will be essential for the mechanical engineering applications

CO-2: Express the mechanical properties of metals and their testing procedures.

CO-3: Understand the application of materials and their processing

CO-4: Interpret the requirement and need for the development of the new materials

COURSE ARTICULATION MATRIX:

*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	2	1	1	1	1	1	2	2	2	2	3	1	-	-
CO-2	2	2	1	2	1	1	2	2	2	-	-	2	2	-
CO-3	3	2	-	-	2	2	1	1	2	1	2	-	-	-
CO-4	-	-	2	2	-	-	1	1	3	2	-	2	-	3

UNIT-I:

Introduction: Classification of Engineering Materials, Ashby chart, Mechanical Properties of Metals and their testing equipment / procedures, ASTM standards for testing, Stress-strain behavior of various materials.

UNIT-II:

Metals and Metal Alloys: Classification of Metal Alloys, Classification, composition, properties and applications of Ferrous alloys: Steel, HSS, Grey cast iron, White cast iron; Classification, composition, properties and applications of Non-ferrous materials: Aluminum, Titanium, Zinc, Copper, Nickel, Cobalt and their alloys.

UNIT-III:

Composites: Definitions, Reinforcements and matrices, Types of reinforcements, Types of matrices, Classification of composites, Properties of composites in comparison with standard materials

UNIT-IV:

Ceramics: Classification of ceramic materials, Applications and Properties of Ceramics, Ceramic fabrication techniques, Carbon, Diamond and Graphite.

Plastics: Important sources of plastics, Classification of plastics and their uses, food grade plastics, Applications of plastics in automobile and domestic use.

UNIT-V:

Materials in Nano Technology:

Semiconductor Nanomaterials: Zinc oxide nano materials, ceramic nano materials, titanium dioxide nanoparticles, metal nano particles (Silver, gold, iron and copper), and their applications, bio-materials and other recent materials.

TEXT BOOKS:

1. Introduction to Engineering Materials, George Murray, Charles V. White, Wolfgang Weise, CRC Press, 2007
2. Materials Science and Engineering: An Introduction, William D. Callister, David G. Rethwisch, 10th Edition, John Wiley & Sons, 2018
3. Essentials of Materials Science and Engineering, Pradeep P. Fulay, Donald R. Askeland, 2013

REFERENCES:

1. Mechanical Engineers' Handbook, Myer Kutz, John Wiley & Sons, 2015
2. Nanotechnology: The Science of Small, M. A. Shah, K. A. Shah, 2nd Edition, Wiley, 2019
3. Materials and Processes in Manufacturing, E. Paul De Garmo, J. T. Black, R. A. Kohler, 11th Edition, John Wiley and Sons, Inc., 2012
4. Ceramic Matrix composite Materials, K. K. Chawala, Kluwer Academic Publishers, 2002
5. Plastics Engineering, R. J. Crawford, Pergamon Press, 2013

ONLINE RESOURCES:

1. https://www.my-mooc.com/en/mooc/materials-science-and-engineering/
2. https://materialseducation.org/

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. I Semester

(22PC1ME101) FUNDAMENTALS OF MANUFACTURING PROCESSES

TEACHING SCHEME		
L	T/P	C
2	0	2

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PREREQUISITES: Engineering Materials, Manufacturing Science

COURSE OBJECTIVES:
- To understand about sand casting and metal casting techniques
- To impart the knowledge of various welding processes
- To evaluate the importance of rolling, forging and sheet metal operations
- To analyze the processing of plastics

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Analyze and select the suitable casting technique for making the components
CO-2: Analyze the different types of welding processes are needed for various materials and importance of welding
CO-3: Apply the methods involved in sheet metal operations, rolling, forging etc.
CO-4: Apply the various manufacturing methods in processing of plastics

COURSE ARTICULATION MATRIX:
*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	2	2	2	-	-	1	-	1	1	1	1	3	3	1
CO-2	2	2	2	-	-	1	-	1	1	1	1	3	3	1
CO-3	2	2	2	-	-	1	-	1	1	1	1	3	3	1
CO-4	2	2	2	-	-	1	-	1	1	1	1	3	3	1

UNIT – I:
Casting: Steps involved in making a casting; advantage of casting and its applications; types of foundry sands, types of patterns – materials used for patterns; pattern allowances and their construction; principles of gating.

UNIT – II:
Welding: Classification of welding processes, gas welding, arc welding, resistance welding, tungsten inert gas welding, metal inert gas welding, soldering & brazing. welding defects.

UNIT – III:
Mechanical Working-I: Hot working; cold working; comparison of properties of cold and hot worked parts.
Sheet Metal Working: Stamping, forming and other cold working processes: Blanking and piercing; Bending and forming; Coining;
Rolling: Rolling fundamentals; theory of rolling; types of rolling mills and products.

UNIT – IV:

Mechanical Working-II:

Extrusion: Basic extrusion process and its characteristics; Hot extrusion and Cold extrusion; Forward extrusion and backward extrusion hydrostatic extrusion.

Drawing: Principle of drawing and its types; Wire drawing and Tube drawing;

Forging Processes: Principle of forging; types of forging; smith forging; drop forging; roll forging; rotary forging;

UNIT – V:

Plastic Materials and Processes: Types of plastics; advantages of plastics, Injection moulding; Blow moulding; Thermoforming. Compression moulding.

TEXT BOOKS:

1. Manufacturing Technology Volume-I, P. N. Rao
2. Production Technology, R. K. Jain

REFERENCES:

1. Manufacturing Engineering and Technology, Kalpak Jian S.
2. Process and Materials of Manufacturing, Lindberg/PE
3. Principles of Metal Castings, Rosenthal
4. Welding Process, Parmar
5. Production Technology, Sharma P. C.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. I Semester

(22ES2ME101) ENGINEERING WORKSHOP

TEACHING SCHEME		
L	T/P	C
1	2	2

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

COURSE OBJECTIVES:

- To know the different popular manufacturing process
- To gain a good basic working knowledge required for the production of various engineering products
- To provide hands on experience about use of different engineering materials, tools, equipment and processes those are common in the engineering field
- To identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances

COURSE OUTCOMES: After completion of the course, the student will be able to:
CO-1: Understand various types of manufacturing processes.
CO-2: Fabricate/make components from wood and steels through hands on experience.
CO-3: Understand different machining processes like turning, drilling, tapping, etc.
CO-4: Understand electrical and electronic components and their assembly.

COURSE ARTICULATION MATRIX:
*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	2	2	2	2	2	1	2	1	3	2	1	2	3	2
CO-2	2	1	2	2	2	1	2	1	3	2	1	2	3	2
CO-3	2	2	2	2	2	1	2	1	3	2	1	2	3	2
CO-4	2	1	2	2	2	1	2	1	3	2	1	2	3	2

LECTURES & VIDEOS:

1. Manufacturing Methods - Casting, Forming, Machining, Joining, Advanced Manufacturing Methods
2. CNC Machining, Additive Manufacturing
3. Fitting Operations & Power Tools
4. Electrical & Electronics
5. Carpentry
6. Plastic Moulding, Glass Cutting
7. Welding (Arc Welding & Gas Welding), Brazing
8. Power Tools
9. Printed Circuit Boards

LIST OF EXPERIMENTS:

I. Carpentry

i. Cross lap joint

ii. Mortise & tenon joint

II. Fitting

i. Square fitting
ii. L-fitting

III. Arc Welding

I. Butt joint
II. Lap joint

IV. Smithy

i. Rectangular Tray (Tin smithy)
ii. U-hook (Black smithy)

V. Electrical & Electronics

i. Single lamp connection & Stair case connection
ii. Soldering and de-soldering on a PCB.

VI. Machine Shop

i. Step turning on lathe
ii. Drilling & tapping

TEXT BOOKS:

1. Workshop Manual, P. Kannaiah and K. L. Narayana, 3rd Edition, Scitech, 2015
2. Elements of Workshop Technology Vol.1 & 2, S. K. Hajra Choudhury, A. K. Hajra Choudhury and Nirjhar Roy, 13th Edition, Media Promoters & Publishers Pvt. Ltd., 2010
3. Printed Circuit Boards - Design, Fabrication, Assembly and Testing, R. S. Khandpur, Tata McGraw-Hill Education, 2005

REFERENCES:

1. Manufacturing Engineering and Technology, Serope Kalpakjian, Steven R. Schmid, 4th Edition, Pearson Education India Edition, 2002
2. Manufacturing Technology-I, S. Gowri, P. Hariharan and A. Suresh Babu, Pearson Education, 2008
3. Processes and Materials of Manufacture, Roy A. Lindberg, 4th Edition, Prentice Hall India, 1998
4. Manufacturing Technology Vol-1 & 2, P. N. Rao, Tata McGraw-Hill House, 2017

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. I Semester

(22ES2CS103) C PROGRAMMING AND DATA STRUCTURES LABORATORY

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

COURSE OBJECTIVES:

- To gain a working knowledge of C programming to write modular, efficient and readable C programs by Identifying the structural elements and layout of C source code
- To use different basic and derived data types
- To understand the concept of modular programming
- To identify various operations on data structures

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Use various data types and apply basic concepts of the language for a specified problem

CO-2: Choose appropriate language constructs to develop a solution for a given problem

CO-3: Execute the programs using modular approach

CO-4: Implement various operations of a given data structure

CO-5: Solve a given problem using C language

COURSE ARTICULATION MATRIX:

*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)		
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	2	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO-2	2	2	2	1	-	-	-	-	-	-	-	2	-	-	-
CO-3	2	2	1	2	1	-	-	-	2	1	-	2	-	-	-
CO-4	2	2	1	2		-	-	-	2	1	-	2	-	-	-
CO-5	2	2	2	2	1	-	-	2	2	1	-	2	-	-	-

LIST OF PROGRAMS:

WEEK 1:

Small programs on input output statements

Small programs on various types of operators

WEEK 2:

Small but tricky codes on decision making statements(If, If-else, Nested If-Else, Else if Ladder, Switch.

Programs using loops (goto, while, do..while, for)

Programs to understand difference between Break and Continue

WEEK 3:

Programs on proper parameter passing techniques

Programs to understand storage classes
Programs using recursion

WEEK 4:
Programs on I-D arrays
Programs on 2-D arrays

WEEK 5:
Programs on strings
Programs using string handling functions

WEEK 6:
Programs on searching and sorting

WEEK 7:
LAB INTERNAL-1

WEEK 8:
Programs using structures, Unions

WEEK 9:
Simple Programs using pointers

WEEK 10:
Programs using pointers on arrays, strings
Programs using pointers on structures

WEEK 11:
Program to implement stacks using arrays

WEEK 12:
Program to implement Linear queue using arrays

WEEK 13:
Program to implement Circular and Dequeue using arrays.

WEEK 14:
LAB INTERNAL-2

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. I Semester

(22BS2CH101) ENGINEERING CHEMISTRY LABORATORY

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

COURSE PRE-REQUISITES: Basic Knowledge of Volumetric Analysis and Mathematics

COURSE OBJECTIVES:

- To understand the preparation of standard solutions and handling of instruments
- To determine and evaluate the water quality
- To measure physical properties like absorption of light, surface tension, pH, conductance and viscosity of various liquids
- To conduct and collect the experimental data using different laboratory techniques
- To Summarize the data and find the applicability to real world scenario

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Learn and apply the basic laboratory methodologies for the preparation of the standard solutions and handling of instruments

CO-2: Estimate the ions / metal ions present in domestic and industrial water

CO-3: Utilize the instrumental techniques to assess the physical properties of oils and water

CO-4: Analyze the experimental data to predict solutions for complex engineering problems

CO-5: Apply the skills gained to solve societal issues related to real world scenario

COURSE ARTICULATION MATRIX:

*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
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CO-2	3	2	2	1	-	1	1	-	2	1	-	2	-	-
CO-3	3	2	2	-	-	1	1	-	2	1	-	2	-	-
CO-4	3	2	1	1	-	1	1	-	2	1	-	2	-	-
CO-5	3	2	1	-	-	1	1	1	2	1	-	2	-	-

LIST OF EXPERIMENTS:

1. Estimation of hardness of water by complexometric method using EDTA.
2. Determination of chloride content in the given sample water using Argentometric method.
3. Estimation of copper present in the given solution by colorimetric method.
4. Conductometric titration of Acid vs Base.
5. Titration of Acid vs Base using pH metric method.
6. Conductometric titration of mixture of strong acid and weak acid by strong base
7. Determination of viscosity of sample oil by Redwood Viscometer-I.

8. Estimation of acid value of given lubricant oil.
9. Determination of surface tension of a liquid by drop method using Stalagmometer.
10. Synthesis of a Polymer-Bakelite/Nylon.

VIRTUAL LAB EXPERIMENTS:

11. Basic operations of Transmission Electron Microscope (Imaging and Diffraction Pattern)
12. Polymer processing technology- study construction and working of compression moulding.
13. Basics of Scanning Electron Microscopy: Secondary Electron and BSE imaging mode.
14. Batteries for electrical vehicles

TEXT BOOKS:

1. Laboratory Manual on Engineering Chemistry, S. K. Bhasin and Sudha Rani, Dhanpat Rai Publications
2. College Practical Chemistry, V. K. Ahluwalia, Sunitha Dhingra, Adargh Gulati, University Press Pvt. Ltd.
3. Practical Chemistry, Dr. O. P. Pandey, D. N. Bajpai, and Dr. S. Giri, S. Chand Publications

REFERENCES:

1. Vogel's Text book of Quantitative Chemical Analysis, G. N. Jeffery, J. Bassett, J. Mendham and R. C. Denny, Longmann, ELBS
2. Advanced Practical Physical Chemistry, J. D. Yadav, Goel Publishing House
3. Practical Physical Chemistry, B. D. Khosla, R. Chand and Sons

ONLINE RESOURCES: (Virtual labs)

1. https://emb-iitk.vlabs.ac.in/exp/transmission-electron-microscope
2. http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/polymer_process/experimentlist.html
3. https://emb-iitk.vlabs.ac.in/exp/sem-basics/

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. I Semester

(22PC2ME101) MANUFACTURING PROCESSES LABORATORY

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

COURSE PREREQUISITES: Engineering Materials, Manufacturing Science

COURSE OBJECTIVES:
- To understand and evaluate casting techniques and sand properties
- To understand different welding processes and their use
- To understand different press working operations
- To understand about the processing of plastics

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply the knowledge involved in casting techniques
CO-2: Decide the selection of various welding techniques applicable for different materials
CO-3: Integrate the knowledge involved in press working operations
CO-4: Analyze the techniques involved in processing of plastics

COURSE ARTICULATION MATRIX:
*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
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CO-2	2	2	1	2	-	1	-	1	3	3	2	3	3	1
CO-3	2	2	1	2	-	1	-	1	3	3	2	3	3	1
CO-4	2	2	2	1	-	1	-	1	3	3	2	3	3	1

LIST OF EXPERIMENTS:

Experiments to be performed from the following:

I. Metal Casting:
1. Pattern Design and making - for one casting drawing.
2. Sand properties testing - Exercise for strength and permeability.
3. Moulding, Melting and Casting.

II. Welding:
1. Gas Welding
2. Spot Welding
3. TIG Welding
4. MIG Welding
5. Brazing

III. Mechanical Working:
1. Blanking and Piercing operations

2. Bending operation

IV. Processing of Plastics:

1. Injection Molding
2. Blow molding

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. I Semester

(22SD5ME101) ELEMENTS OF MECHANICAL ENGINEERING

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME						
D-D	PE	LR	CP	VV	SEE	TOTAL
10	10	10	10	10	-	50

COURSE OBJECTIVES:

- To measure the length, width and height of the components and calibrate the measuring instruments
- To prepare a composite laminate and join the various materials with joining techniques.
- To study the working principle of various machines and components
- To find the thermos-physical properties of fuels and lubricants

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Measure the dimensions of the components by using various measuring instruments

CO-2: Prepare simple composite laminate and join different materials using soldering and friction stir welding

CO-3: Understand the operation, usage and application of different machines and their components

CO-4: Determine the thermo-physical properties of fuels and lubricants

COURSE ARTICULATION MATRIX:

*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
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CO-2	3	2	2	1	-	-	1	-	2	2	1	2	3	3
CO-3	3	2	2	1	-	-	1	-	2	2	1	2	3	3
CO-4	3	2	2	1	-	-	2	-	2	2	1	2	3	3

LIST OF EXPERIMENTS:

1. Measurement of length, height, diameter by vernier calipers
2. To measure diameter of a given wire and sphere, thickness of a given sheet using micrometer screw gauge
3. Calibration of measuring instruments using slip gauges
4. Measure the Taper angle using Sine bar
5. Metal joining process–soldering of metal alloys to any PCB board
6. A simple composite laminate preparation by hand layup method
7. Demonstration of lathe, milling, drilling, grinding machine operations
8. Demonstration of Friction stir welding
9. Study of transmission system –gear box
10. Study of Boilers
11. Assembly /disassembly of Engines
12. Determination of Flash and Fire points of Liquid fuels/Lubricants using: Abels Apparatus

13. Determination of Viscosity of Liquid lubricants and Fuels using: Redwood Viscometer
14. Determination of Carbon Residue of Liquid fuels using: Carbon Residue test
15. Determination of Calorific value Solid/Liquid/ fuels using: Bomb Calorimeter

TEXT BOOKS:

1. The Principles of Metallographic Laboratory Practice, George L. Kehl, McGraw Hill
2. Internal Combustion Engineering, Ganesan V., 4th Edition, Tata McGraw-Hill, 2017
3. A Course in Internal Combustion Engines, M. L. Mathur, R. P. Sharma, Dhanpat Rai Pub., 2003

REFERENCES:

1. Fuels – Solids, Liquids, Gaseous, Brame J. S. S. and King J. G.