Department of Industrial and Production Engineering
Scheme of Teaching and Evaluation
(Students admitted to the First year in the Academic Year 2022 - 2023)

III Semester BE

Sl. No	SUBJECT CODE	SUBJECT	CREDITS	HOURS / WEEK			EXAMINATION MARKS		
				L	T	P	CIE	SEE	TOTAL
1.	22UMA302C	Complex analysis and integral transforms	3	3	0	0	50	50	100
2.	22UIP302C	Mechanics of Materials	3	3	0	0	50	50	100
3.	22UIP303C	Fundamentals of Material Science and Engineering	4	3	0	2	50	50	100
4.	22UIP304C	Manufacturing Processes	4	3	0	2	50	50	100
5.	22UIP305C	Engineering Thermodynamics and Fluid Mechanics	3	3	0	0	50	50	100
6.	22UIP308L	Report writing and Presentation skills	1	0	0	2	50	50	100
7.	22UHS309C	Biology for Engineers	2	2	0	0	50	50	100
8.	22UMA300M	Bridge Course Mathematics – I*	0	3	0	0	50	50	100
		Total	20	20	0	6	400	400	800

*for lateral entry students

22UMA302C	COMPLEX ANALYSIS AND INTEGRAL TRANSFORMS	Credits: 03
L: T : P - 3 : 0 : 0		CIE Marks: 50
Total Hours / Week: 03		SEE Marks: 50

UNIT – I Complex Variables	10 Hrs.

Analytic function, Cauchy-Riemann equations in Cartesian and polar forms. Construction of analytic function (Cartesian and polar forms), Discussion of conformal transformations: z^2, e^z and $z + a^2/z$ *(z # 0),* Bilinear transformations.

(RBT Levels: L1, L2 and L3)

UNIT – II Complex Integration	10 Hrs.

Complex Integration: Line integral, Cauchy's theorem – corollaries (without proof), Cauchy's integral formula. Taylor's and Laurent's series (statements only), singularities, poles, calculation of residues, Cauchy's residue theorem (without proof) - problems.

(RBT Levels: L1, L2 and L3)

UNIT – III Fourier series	10 Hrs.

Periodic functions, Conditions for Fourier series expansions, Fourier series expansion of continuous and functions having finite number of discontinuities, even and odd functions. Half-range series, practical harmonic analysis.

(RBT Levels: L1, L2 and L3)

UNIT – IV Fourier transforms	10 Hrs.

Infinite Fourier transforms and inverse Fourier transforms- simple properties, Fourier sine and Fourier cosine transforms. Inverse Fourier sine and cosine transforms.

(RBT Levels: L1, L2 and L3)

References:

1. Numerical Methods for Engineers by Steven C Chapra &Raymond P Canale.
2. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers, New Delhi.
3. Advanced Engineering Mathematics By H. K. Das, S. Chand & company Ltd. Ram Nagar, New Delhi
4. Advanced Engineering Mathematics by E Kreyszig , John Wiley & Sons**.**

Learning Objectives:

1. Exploring various applications of complex variables in engineering fields.
2. Learning Cauchy-Riemann equations and their role in determining the differentiability of complex functions.
3. Understanding contour integration and its applications in evaluating complex integrals, including, Cauchy's integral theorem, and Cauchy's integral formula.
4. To provide a way, to represent periodic functions in terms of simple trigonometric functions.
5. To transform a function from the time domain to the frequency domain.

Course Outcomes:

After completion of the course the students shall be able to,

1. Learn about analytic functions and the concept of complex differentiability, including Cauchy–Riemann equations and be able to determine if a function is analytic.
2. Understand the principles of Contour integration and be able to evaluate complex integrals using various techniques such as the Cauchy's integral theorem and the residue theorem.
3. Grasp the concept of representing periodic functions as an infinite sum sinusoidal (sine and cosine) with different frequencies.
4. Grasp the concept of the Fourier transform as a mathematical tool that converts a function from the time domain into the frequency domain.

Evaluation Scheme:

Assessment	Marks	Weightage
CIE-I	40	20
CIE-II	40	20
Assignments/ Quizzes/Case Study/ Course Project/Term Paper/Field Work	10	10
SEE	100	50
Total	**190**	**100**

Question paper pattern for CIE-I and CIE-II:

1. Question paper consists Part-A and Part-B. Part A is compulsory, it consists of short answer questions of 1 or 2 marks, covering Unit-I and Unit-II (no multiple-choice questions and No true or false questions).
2. In Part-B answer any two full questions selecting at least one from each unit (four questions are to be set as per the following table).

CIE	Number of questions / Maximum marks	Sub divisions	Unit
I	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-I
	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-II
II	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-III
	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-IV

Question paper pattern for SEE:

1. Question paper consists Part-A and Part-B. Part-A is compulsory, it consists of short answer questions of 1 or 2 marks, covering entire syllabus (no multiple-choice questions and No true or false questions, 50% of questions must be L3 and L4 level).
2. In Part-B total of eight questions with two from each unit; with internal choice to be set uniformly covering the entire syllabus.
3. Each question carries 20 marks and should not have more than four subdivisions.
4. In Part-B, any FOUR full questions are to be answered choosing at least one from each unit.
5. Sketches, figures and tables if any should be clearly drawn, as the same is scanned for printing.
6. The question paper should contain all the data / figures / marks allocated, with clarity.

22UIP302C	MECHANICS OF MATERIALS	Credits: 03
L: T : P - 3 : 0 : 0		CIE Marks: 50
Total Hours / Week: 03		SEE Marks: 50

UNIT - I	10 Hrs.

Simple stress and strain - Mechanical properties of materials, stress, strain, stress-strain relation, extension/shortening of a bars, poisson's ratio, bars with cross sections varying in steps, bars with continuously varying cross sections (circular and rectangular), elongation due to self weight, principle of superposition, thermal stresses, volumetric strain, and elastic constants.

UNIT - II	10 Hrs.

Compound stress - Introduction, plane stress system, sign convention, stresses on an inclined plane, Principal stresses.

Bending of beams - Shear forces and bending moments, types of beams, loads and reactions, rate of loading, sign conventions, relationship between shear force and bending moments, shear force and bending moment diagrams fordifferent beams subjected to concentrated loads, uniform distributed load (UDL) and couple for different types of beams.

UNIT - III	10 Hrs.

Bending and shear stresses in beams -Theory of simple bending, assumptions in simple bending, relationship between bending stresses and radius of curvature, relationship between bending moment and radius of curvature, moment carrying capacity of a section, shearing stresses in beams, shear stress across rectangular, circular, symmetrical I and T- sections.

Deflection of beams - Deflection of beams, equation for deflection, slope and moments, double integration method for cantilever and simply supported beams for point load, UDL, UVL and couple, Macaulay's method.

UNIT - IV	10 Hrs.

Thick and thin cylinders - Stresses in thin cylinders, changes in dimensions of cylinder, thick cylinders subjected to internal and external pressures (Lame's equation).

Torsion of circular shafts - Pure torsion, assumptions, derivation of tensional equations, polar modulus, torsional rigidity /stiffness of shafts, power transmitted by solid and hollow circular shafts.

Elastic stability of columns - Introduction to columns, Euler's theory for axially loaded elastic long columns, derivation of Euler's load for various end conditions, limitations of Euler's theory and Rankin's formula.

Reference Books *

1. S. S. Bhavikatti, 2006, Strength of Materials, Vikas Publications House - Pvt. Ltd., 2nd Ed.
2. W. A. Nash, Strength of Materials, TataMcGrawHill,4th edition
3. K. V. Rao, G. C. Raju, 2007, Mechanics of Materials, First Edition.
4. Ferdin and Beer, Jr. Johnston, E. Russell, John De Wolf, David Mazurek, 2011, McGraw-Hill Education.

Course Outcomes**

After completion of the course student will be able to:

1. Know the physical properties of the materials such as stresses, strains, stress-strain relationship,

elastic constants etc and study the behavior of one-dimensional simple component of varied shapes under varied load conditions.

2. Analyze the concept of principal stresses through compound stressesin1D/2D elements.
3. Develop the skill to analyze the bending of beams of different cross sections subjected to varied conditions of loading. Also comprehend the response through deflection and inclination of beams subjected to bending loads.
4. Analyze the cylinders exposed to internal and external pressures from the view point of stresses developed and change in dimensions.
5. Know the stresses developed and the rigidity of the mechanical elements transmitting tensional power.
6. Simulate the mechanical elements receiving axial compressive loads under different end conditions and determine their columnar stability.

* **Books to be listed as per the format with decreasing level of coverage of syllabus**

****Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	**Programme Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	**3**	**3**	**1**	**1**					**1**	**1**			**1**		
CO2	**3**	**3**	**1**	**1**					**1**	**1**			**1**		
CO3	**3**	**3**	**1**	**1**					**1**	**1**			**1**		
CO4	**3**	**3**	**1**	**1**					**1**	**1**			**1**		
CO5	**3**	**3**	**1**	**1**					**1**	**1**			**1**		
CO6	**3**	**3**	**1**	**1**					**1**	**1**			**1**		

22UIP303C	FUNDAMENTAL OF MATERIAL SCIENCE AND ENGINEERING	Credits: 04
L : T: P - 3 : 0: 2		CIE Marks: 50
Total Hours / Week: 03		SEE Marks: 50

UNIT- I	10 Hrs.

Crystallography - Concept of unit cell, metallic crystal structures, calculation of atomic radius, coordination number and atomic packing factor for different cubic structures.
Crystal imperfections - Point, line, surface and volume defects.
Atomic diffusion - Phenomenon, flick's I^{st} and II^{nd} law of diffusion, factors influencing diffusion, concept of slip and twining of slip and twining.

UNIT - II	10 Hrs.

Mechanical properties of metals - Concepts of stress and strain, tensile test, compression test, notch impact test and hardness test.
Fatigue - Fatigue test, fatigue loadings, S-N diagram and fatigue properties.
Fracture - Types, mechanisms of ductile fracture, Griffith's theory of brittle fracture.
Creep - Creep curve, mechanism of creep, creep resistant materials.

UNIT - III	10 Hrs.

Solidification - Mechanism of solidification, homogeneous and heterogeneous nucleation, crystal growth, cast metal structures.
Solid solutions - Types, Hume Rothary rules governing the formation of solids solutions.
Phase diagrams - Basic terms, Gibbs phase rule, construction of phase diagram involving, lever rule, different types of invariants reactions.
Iron carbon equilibrium diagram - Salient features of iron and carbon, allotropic forms of iron, Fe-C diagram and phases in the Fe-C system, TTT curves.

UNIT - IV	10 Hrs.

Heat treatment - Basic concept of heat treatment, different types of heat treatment processes.
Ferrous and non-ferrous materials - Steel, cast irons, copper and its alloys, aluminum and its alloys, magnesium and its alloys.
Powder metallurgy - Concept of powder metallurgy, application and advantages, production of powder.
Composite material - Concept andclassification of composites, matrix-polymer matrix composites (PMC), metal matrix composites (MMC), ceramic matrix composites (CMC), reinforcement-particle reinforced composites, fibre reinforced composites, reinforcement-matrix interface, applications of various types of composites - automobile, aircrafts, missiles, space hardware, electrical and electronics, marine, recreational and sports equipment.

LABORATORY COMPONENT

PART-A	**10 Hrs.**

1. **Preparation-** Specimen for metallographic examination of engineering materials and study the microstructure of mild steel, plain carbon steel, tool steel, gray cast iron, spheroidal graphite iron, brass, bronze and
2. **Heat treatment-** Annealing, normalizing, hardening and tempering of steel and to study the hardness of heat-treated samples. (Demonstration only).

PART-B	**20 Hrs.**

1. Conduct of tensile test on mild steel specimen
2. Shear test on mild steel specimen
3. Compression test on - wooden block and concrete block
4. Bending test on a mild steel specimen
5. Conduct of Izod and Charpy tests on mild steel specimen
6. Hardness tests
7. Torsion test and
8. Wear and fatigue test (Demonstration only).

Course Outcomes**

After completion of the course student will be able to:

1. Analyze the microstructure and characteristics of specimen and have heat treatment studies on various materials
2. Evaluate the values of yield stress, breaking stress and ultimate stress of the given specimen under tension test
3. To utilize UTM for shear, compression and bending tests on mild steel and wooden specimens
4. To conduct impact tests and find the impact value of test specimens
5. Justify the Rockwell hardness test over with Brinell and Vickers hardness and measure the hardness of the given specimen
6. Conduct the torsion test to determine the modulus of rigidity of given specimen and
7. To demonstrate the wear and fatigue test.

Reference Books *

1. William. D. Callister, 2006, Materials Science and Engineering - An introduction Jr Wiley India Pvt. Ltd. 7th Edition, New Delhi.
2. George E. Dieter, Adapted by David Bacon, Mechanical Metallurgy, (SI Metric Edition), McGraw-Hill Book Company.
3. K. Srinivasan, Composites Materials - Production, Properties, Testing and Applications, Narosa Publishing House, New Delhi.
4. James F. Shackel Ford, 2006, Introduction to Material Science for Engineering, 6th Edition, Pearson, Prentice Hall, New Jersy.
5. V. Raghavan, 2007, Materials Science and Engineering, 5thEdition, Prentice Hall, India.
6. O. P. Khanna,A Text Book on Material Science and Metallurgy, Dhanpat Rai Publications (P) Ltd,

New Delhi.
7. Van Vlack, Elements of Material Science and Engineering, 6th Edition, Addison Wesley Publishing Company.
8. Smith,1997, Foundation of Material Science and Engineering, 3rd Edition, Mc Graw Hill.

Course Outcomes**

After completion of the course student will be able to:

1. Analyze different class of materials their properties and structures and present in them and to understand crystal structures, impacts of defects at the atomic and microstructure scales, atomic diffusion and mechanisms.
2. Describe various testing procedure to evaluate mechanical properties of materials and their use in the design of materials for engineering applications.
3. Elucidate solidification, concepts of solid solution and solubility limits, identify phase diagrams and be able to predict the phase transformations and interpret Fe-C phase diagram, time temperature transformation curve.
4. Explain the purpose and select suitable heat treatment process to achieve desired properties of metals and alloys, classify ferrous and non-ferrous metals and study their applications, acquire knowledge about powder metallurgy and its production, composite materials, types and its applications.

***Books to be listed as per the format with decreasing level of coverage of syllabus**

****** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2											3	1	2
CO2	3	2											3	1	2
CO3	3	2											3	1	2
CO4	3	2											3	1	2

22UIP304C	MANUFACTURING PROCESSES	Credits : 04
L : T : P - 3 : 0 : 2		CIE Marks : 50
Total Hours / Week : 03		SEE Marks : 50

UNIT- I	10 Hrs.

Introduction - Concept of manufacturing process, its importance, classification of manufacturing processes, introduction to hot and cold working, forging, rolling, extrusion process and drawing operation.

Patterns - Introduction to casting process, steps involved advantages and limitations of casting process, definition, classification of patterns, pattern materials and various pattern allowances.

UNIT - II	10 Hrs.

Sand moulding and methods - Types of base sand, requirement of base sand, types of sand moulds, properties, Ingredient of moulding sands, core sands, ingredients and properties and method used for sand moulding.

Special moulding process - Study of important moulding processes, green sand, dry sand, sweep mould, CO_2 sand, shell mould, investment casting, metal moulds, gravity die-casting, pressure die casting.

Welding process - Definition, principles, classification, application, advantages and limitations of welding process.

Arc welding - Principle and classifications.

Gas welding - Principle, oxy - acetylene welding, reaction in gas welding, flame and its characteristics.

UNIT - III	10 Hrs.

Introduction - Types of cutting tools, cutting tool materials - HSS carbides, coated carbides, ceramics, cutting fluids-desired properties, types and selection, single point and multi point cutting tools, types of chips.

Turning, shaping and planning machines - Classification, constructional features of turret and capstan lathe, tool layout and machining time.

Shaping and planning machine - Classification, constructional features, driving mechanisms, shaping and planning operations, machining time.

Drilling machines - Classification, constructional features, drilling and related operations, types of drilling tools, drill bit nomenclature.

UNIT - IV	10 Hrs.

Milling machines - Classification, constructional features, milling cutters, nomenclature, milling operations, up milling and down milling, Indexing - Simple and compound indexing.

Grinding machines - Types of abrasives, grain size, bonding process, grade and structure of grinding wheels, grinding wheel types, classification and constructional features. Selection of grinding wheel.

Broaching process - Principle of broaching, details of a broach, types of broaching machines-constructional details, applications, advantages and limitations.

Finishing and other processes - Lapping and honing operations - Principles, arrangement of set up and application, super finishing process, polishing, buffing operation and application.

LABORATORY COMPONENT	
Part - A	**15Hrs.**

1. TESTING OF MOLDING SAND AND CORE SAND

Preparation of sand specimens and conduction of the following tests:

a. Compression, shear and tensile tests on universal sand testing machine.
b. Permeability test
c. Core hardness and mould hardness tests
d. Grain fineness number test (Sieve analysis test)
e. Clay content test
f. Moisture content test.

2. FOUNDRY PRACTICE

a. Use of foundry tools and other equipments.
b. Preparation of moulds using molding boxes using patterns or without patterns.
c. Preparation of one casting (Aluminum or cast iron-Demonstration only)

Part - B	**15 Hrs.**

3. MACHINE SHOP PRACTICE

Minimum four jobs consisting of following machining operations

Plain Turning, Taper Turning. Step Turning, Thread Cutting, Facing, Knurling. Eccentric Turning using lathe

Minimum two jobs consisting of following machining operations

Cutting of gear teeth using milling machine. Cutting of V-groove, Dovetail/Rectangular groove using shaping machine.

Reference Books *

1. Hazara Choudhry, 2004, Workshop Technology, Vol-II, Media Promoters and Publishers Pvt. Ltd.
2. R.K. Jain, 2003, Production Technology, Khanna Publications.
3. HMT, Production Technology, Tata Mc Graw Hill,
4. Amitabha Ghosh and Mallik,2003, Manufacturing Science, affiliated East West Press.
5. G. Boothroyd,2000, Fundamentals of Metal Machining and Machine Tools, McGraw Hill.

Course Outcomes**

After completion of the course student will be able to:

1. Students able to describe and compare different manufacturing methods.
2. Ability to select different patterns and identify appropriate different types of moulds.
3. Student's able to select different special castingprocess for types of products.
4. Realize the influence of operating parameters in different machining operations.
5. Recognize the operating principle, control parameters and applications in special machining processes.
6. Solve numerical related to various machining operations.

***Books to be listed as per the format with decreasing level of coverage of syllabus**

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Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	1	2		2	2						1	1	1	1
CO2	3	2	2		2	2			2			1	1	1	1
CO3	2	2	2		2	1			1			1		1	1
CO4	3	3			2							1	3	2	3
CO5	3	3			2							1	3	2	3
CO6	3	2	2		3							2	3	2	3

22UIP305C	ENGINEERING THERMODYNAMICS AND FLUID MECHANICS	Credits : 03
L : T : P - 3 : 0 : 0		CIE Marks : 50
Total Hours / Week : 03		SEE Marks : 50

UNIT- I	10 Hrs.

Basic concepts of thermodynamics -Basic definition, thermodynamic systems, macroscopic v/s microscopic point of view, pure substance, thermodynamic equilibrium, thermodynamic properties, path and point functions, quasi static, reversible and irreversible processes.

Energy, work and heat - Definition, sign convention, similarities and dissimilarities of heat and work.

Zeroth law of thermodynamics -Concept of temperature and thermal equilibrium.

First law of thermodynamics- Internal energy, Law of conservation of energy, statement of first law, application of first law to a process, perpetual motion machine of the first kind - PMM-I, application of first law of thermodynamics to closed system and steady state steady flow energy equation.

UNIT - II	10 Hrs.

Second law of thermodynamics - Heat reservoir, source and sink, heat engine, refrigerator, heat pump, reversed heat engine, statement of second law of thermodynamics - Kelvin-Planck statement and Clausius statement, equivalence of Clausius statement to the Kelvin-Planck statement, perpetual motion machine of second kind - PMM-II.

Entropy - Definition, Clausius inequality proof, Carnot theorem, principal of increase of entropy, entropy as a quantitative test for irreversibility.

UNIT - III	10 Hrs.

Properties of fluids - Introduction to fluid mechanics and its applications, properties of fluids, types of fluids.

Fluid pressure - Pressure variation in a static fluid, absolute, gauge, atmosphere and vacuum pressure.

Manometers - Simple and differential manometers, total pressure and centre of pressure.

Buoyancy - Buoyancy, center of buoyancy, meta centre and metacentric height.

UNIT - IV	10 Hrs.

Fluid kinematics - Types of fluid flow, continuity equation in three dimensions, velocity and acceleration, velocity potential function and stream function.

Fluid dynamics- Equations of motion, Euler's equation of motion, Bernoulli's equation from Euler's equation, limitation of Bernoulli's equation.

Fluid flow measurements -Venturimeter, Orifice meter and Pitot tube.

Flow through pipes - Frictional loss in pipe flow, Darcy-Weisbach equation and Chezy's equation for loss of head due to friction in pipes, hydraulic gradient line and total energy line.

Reference Books *

1) P. K. Nag, 2017, Basic and Applied Thermodynamics6th Edition, Tata McGraw Hill.
2) R. K. Hegde and Niranjan Murty,2005, Basic and Applied Thermodynamicsby, Sapna Book House, Bengaluru.
3) R. K. Bansal,2009, A Textbook of Fluid Mechanics and Hydraulic Machines, Laxmi Publications Pvt. Ltd.
4) Dr, Jagadish Lal (SI unit and MKS unit),1995, Fluid Mechanics and Hydraulics - 9thEdition,

Metropolitan Book Co Pvt. Ltd., New Delhi.
5) K. Subramanya 1000 Solved Problems in Fluid Mechanics (Includes Hydraulic Machines), 2005, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2005.
6) Dr. P. N. Modi, Dr. S. M. Seth, (SI Unit), 2005, Hydraulics and Fluid Mechanics including Hydraulic Machines by Standard Book House, 5th Edition, New Delhi.

Course Outcomes**

After completion of the course student will be able to:

1. To analyze and explain the various laws of thermodynamics, the theory and applications of engineering thermodynamics, thermodynamic properties, equations of state, methods used to describe and predict phase equilibria.
2. To learn the equivalence of two statements of second law of thermodynamics, to study the inequality of Clausius and application of the inequality of Clausius and establish the property entropy of a system and to apply the concepts to solve various heat problems.
3. Identify and obtain fundamental aspects of fluid flow behavior, analyze and understand the various fluid flow principles and governing equations and understand the principles of continuity, momentum, and energy as applied to fluid motions.
4. To develop and apply the fluid flow equations for various flow instruments and flow problems. Estimate pressure drop in fluid flow systems.

***Books to be listed as per the format with decreasing level of coverage of syllabus**

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Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2											3	1	2
CO2	3	2											3	1	2
CO3	3	2											3	1	2
CO4	3	2											3	1	2

22UIP308L	REPORT WRITING AND PRESENTATION SKILLS	Credits: 01
L: T:P - 0: 0: 2		CIE Marks: 50
Total Hours/Week: 02		SEE Marks: 50

UNIT-I	04 Hrs.

Written forms of communication: Letters, memos, e-mails, reports, technical proposals, research papers, instruction manuals and technical descriptions.

UNIT - II	04Hrs.

Word processing packages: Introduction to different word processing packages, various techniques to create dynamic layouts, format documents effectively using Microsoft word styles, create and manage table layouts, perform mail merges to create mailing labels and form letters, manage templates, prepare documents for printing and exporting, control page formatting and flow with sections and page breaks, work with tab stops to align content properly, build and deliver word forms, track and accept/ reject changes to a document.

UNIT - III	04 Hrs.

Spreadsheet packages: Introduction to different spreadsheet packages, build a solid understanding of the basics of spreadsheet, learn the most common spreadsheet functions used in the office, maintain large sets of spreadsheet data in a list or table, Wow your boss by unlocking dynamic formulas with IF, VLOOKUP, INDEX, MATCH functions and many more, harness the full power of spreadsheet by automating your day to day tasks through macros and VBA, create dynamic reports by mastering one of the most popular tools, pivot tables.

UNIT - IV	04 Hrs.

Presentation packages: Introduction to different presentation packages, master the basic features of power point, build effective power point presentations, enhance power point presentations with graphical elements, leverage advanced text editing operations with power point, prepare to deliver a power point presentation.

Reference Books *

1. Lesikar and Fatley, “Basics Business Communication Skills for Empowering the Internet Generation” 10th edition, Tata McGraw Hill edition, ISBN: 978-0-07-059975-.
2. Meenakshi Raman and Sangeeta Sharma, “Technical Communication Principles and Practices” Oxford University Press, ISBN-13 978-0-19-566804-9.
3. Meenakshi Raman and Prakash Singh, “Business Communication”, Oxford University Press, ISBN-13: 978-0-19-567695-2.

Software - Any Office packages

Course Outcomes**

After completion of the course student will be able to

1. Deign different forms of written communication like memo, report, technical report etc.
2. Design different written communication formats using word processing package.
3. Design different spread sheets for business applications using any spreadsheet package.
4. Design different academic and business presentations using any presentation package.

***Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1								2		3		3	1		2
CO2					3					3		3	1		1
CO3					3					3		3	1		1
CO4					3					3		3	1		1

22UBT340C/22UBT440C	BIOLOGY FOR ENGINEERS	Credits: 02
L:T:P - 2: 0: 0		CIE Marks: 50
Total Hours/Week: 26		SEE Marks: 50

UNIT-I	06 Hrs.

NATURE BIOINSPIRED MATERIALS AND MECHANISMS

Bio inspiration - Introduction, Alliance between Engineering and Biology, Biomimicry - Science mimicking nature. Human Blood substitutes-hemoglobin based oxygen carriers (HBOCs) and perflourocarbons (PFCs). Artificial Intelligence for disease diagnosis. Bioichips & their applications.

Biosensors & their applications. Nanobiomolecules in medical science. Biofilms in dental treatment

UNIT–II	06 Hrs.

BIOINSPIRATION MODELS USED IN ENGINEERING:

BioEcholocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf), Respiration (MFCs), Bird flying (GPS and aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Gecko Feet, Plant burrs (Velcro), Shark skin (Friction reducing swimsuits), Kingfisher beak (Bullet train), Fire fly LED.

UNIT–III	07 Hrs.

HUMAN ORGAN SYSTEMS AND BIO DESIGNS

Brain as a CPU system (architecture, CNS and Peripheral Nervous System, signal transmission, EEG, Robotic arms for prosthetics. Engineering solutions for Parkinson's disease).

Heart as a pump system (architecture, electrical signalling - ECG monitoring and heart related issues, reasons for blockages of blood vessels, design of stents, pace makers, defibrillators).

Lungs as purification system gas exchange mechanisms, spirometry, Ventilators, Heart-lung machine).

Eye as a Camera system, bionic eye. **Kidney** as a filtration system - dialysis systems. **Muscular and Skeletal Systems** as scaffolds, bioengineering solutions for muscular dystrophy and osteoporosis.

UNIT–IV	07 Hrs.

TRENDS IN BIOENGINEERING

Bioprinting techniques and materials, 3D printing of ear, bone and skin. 3D printed foods, electrical tongue and electrical nose in food science, DNA origami and Biocomputing, Bioimaging and Self-healing Bioconcrete (based on bacillus spores, calcium lactate nutrients and biomineralization processes) and Bioremediation and Biomining via microbial surface adsorption (removal of heavy metals like Lead, Cadmium, Mercury, Arsenic). Bio-bleaching.

Reference Books *

1. Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022
2. Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012
3. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
4. Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011

5. Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2020.
6. Biomimetics: Nature-Based Innovation, Yoseph Bar-Cohen, 1st edition, CRC Press, 2012
7. Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008
8. Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N GeethaA C Udayashankar Lambert Academic Publishing, 2019
9. 3D Bioprinting: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 2016
10. Electronic Noses and Tongues in Food Science, Maria Rodriguez Mende, Academic Press, 2016

Web links and Video Lectures (e-Resources)

- VTU EDUSAT / SWAYAM / NPTEL / MOOCS / Coursera / MIT-open learning resource
- https://nptel.ac.in/courses/121106008
- https://freevideolectures.com/course/4877/nptel-biology-engineers-other-non-biologists
- https://ocw.mit.edu/courses/20-020-introduction-to-biological-engineering-design-spring-2009
- https://ocw.mit.edu/courses/20-010j-introduction-to-bioengineering-be-010j-spring-2006
- https://www.coursera.org/courses?query=biology
- https://onlinecourses.nptel.ac.in/noc19_ge31/preview
- https://www.classcentral.com/subject/biology
- https://www.futurelearn.com/courses/biology-basic-concepts

Course Outcomes**

After completion of the course student will be able to

1. Corroborate the concepts of biomimetics for specific requirements.
2. Elucidate the basic biological concepts via relevant industrial applications and case studies.
3. Evaluate the principles of design and development, for exploring novel bioengineering projects.
4. Think critically towards exploring innovative biobased solutions for ecofriendly and socially relevant problems.

Course Outcomes	Programme Outcomes												Programme Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO 1	3		2	1		3						1			
CO 2	3	2	1	1		3						1			
CO 3	3		3	1		3						1			
CO 4	3		1	2		3	3					1			

22UBT340C/22UBT440C	BRIDGE COURSE MATHEMATICS-I	Credits: 03
L:T:P - 3: 0: 0		CIE Marks: 50
Total Hours/Week: 40		SEE Marks: 50

Differential Equations-1	10 Hrs.

Introduction to Differential Equations: Ordinary differential equations of first order**:** Variable separable, Homogeneous. Exact form and reducible to exact differential equations- Integrating factors on $1/N$ $(\partial M/\partial y - \partial N/\partial x)$ and $1/M$ $(\partial N/\partial x - \partial M/\partial y)$. Linear and Bernoulli's equation.
(RBT Levels: L1, L2 and L3)

Differential Equations-2	10 Hrs.

Introduction to Higher Order Differential Equations: Second and higher order linear ODE's with constant coefficients-Inverse differential operator, method of variation of parameters (second order); Cauchy's and Legendre homogeneous equations.
(RBT Levels: L1, L2 and L3)

Partial differentiation	10 Hrs.

Introduction to function of several variables: Partial derivatives; Euler's theorem - problems. Total derivatives-differentiation of composite functions. Jacobeans-problems.
(RBT Levels: L1, L2 and L3)

Integral Calculus and Beta, Gamma functions	10 Hrs.

Introduction to Multiple integrals: Evaluation of double and triple integrals. Area bounded by the curve.
Introduction to Beta and Gamma functions: Definitions, Relation between beta and gamma functions-problems.
(RBT Levels: L1, L2 and L3)

References:

1. Maurice D weir, Joel Hass and Frank R. Giordano, "Thomas calculus", Pearson, eleventh edition, 2011
2. B.S. Grewal : Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
3. B. V. Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. Erwin Kreyszing's Advanced Engineering Mathematics volume1 and volume1I,wiley India Pvt.Ltd.,2014

Course Objectives:

This course will enable students

1. Used (ODE'S) to describe and model various phenomenon's in Physics, Engineering, Biology, Economics and other scientific disciplines.
2. To formulate mathematical equations that capture the behavior and relationships of the variables involved.
3. Can better understand the behavior of multivariable functions, solve optimization problems, analyze physical systems, and develop advanced mathematical techniques for various applications.
4. Gain tools and techniques necessary to analyze accumulated quantities, calculate areas and volumes optimize functions, model physical systems.
5. To provide (beta and Gamma functions) valuable tools in diverse areas of Engineering.

Course Outcomes:

At the end of the course the student should be able to,

5. Obtaining solutions that describe the behaviour of the unknown function/functions involved.
6. Find the general solution, which is a family of functions that satisfy the equation.
7. Provide a powerful framework for quantifying and analyzing quantities that depend on multiple variables.
8. Provide essential tools for solving problems, analyzing data and understanding mathematical and physical phenomena.

Evaluation Scheme:

Assessment	Marks	Weightage
CIE-I	**40**	**20**
CIE-II	**40**	**20**
Assignments/ Quizzes/Case Study/ Course Project/Term Paper/Field Work	**10**	**10**
SEE	**100**	**50**
Total	**150**	**100**

Question paper pattern for CIE-I and CIE-II:

3. Question paper consists Part-A and Part-B. Part A is compulsory, it consists of short answer questions of 1 or 2 marks, covering two units (no multiple choice questions and No true or false questions).
4. In Part-B, any TWO full questions are to be answered.

CIE	Number of questions / Maximum marks	Sub divisions	Contents
I	Four questions of 15 marks (Solve any two)	Sub divisions shall not be mixed with Differential Equations-I & Differential Equations-II	**Differential Equations-1**
		Sub divisions shall not be mixed with Differential Equations-I & Differential Equations-II	**Differential Equations-2**
II	Four questions of 15 marks (Solve any two)	Sub divisions shall not be mixed with Integral Calculus, Beta, Gamma functions & Partial Differentiation	**Partial differentiation**
		Sub divisions shall not be mixed with Integral Calculus, Beta, Gamma functions & Partial Differentiation	**Integral Calculus and Beta, Gamma functions**

Question paper pattern for SEE:

7. Question paper consists Part-A and Part-B. Part A is compulsory, it consists of short answer questions of 1 or 2 marks, covering entire syllabus (no multiple-choice questions and No true or false questions, 50% of questions must be L3 and L4 level).
8. In Part-B total eight questions, any FOUR full questions are to be answered. Uniformly covering the entire syllabus.
9. Each question carries 20 marks and should not have more than four subdivisions.
10. Sketches, figures and tables if any should be clearly drawn, as the same is scanned for printing.
11. The question paper should contain all the data / figures / marks allocated, with clarity.