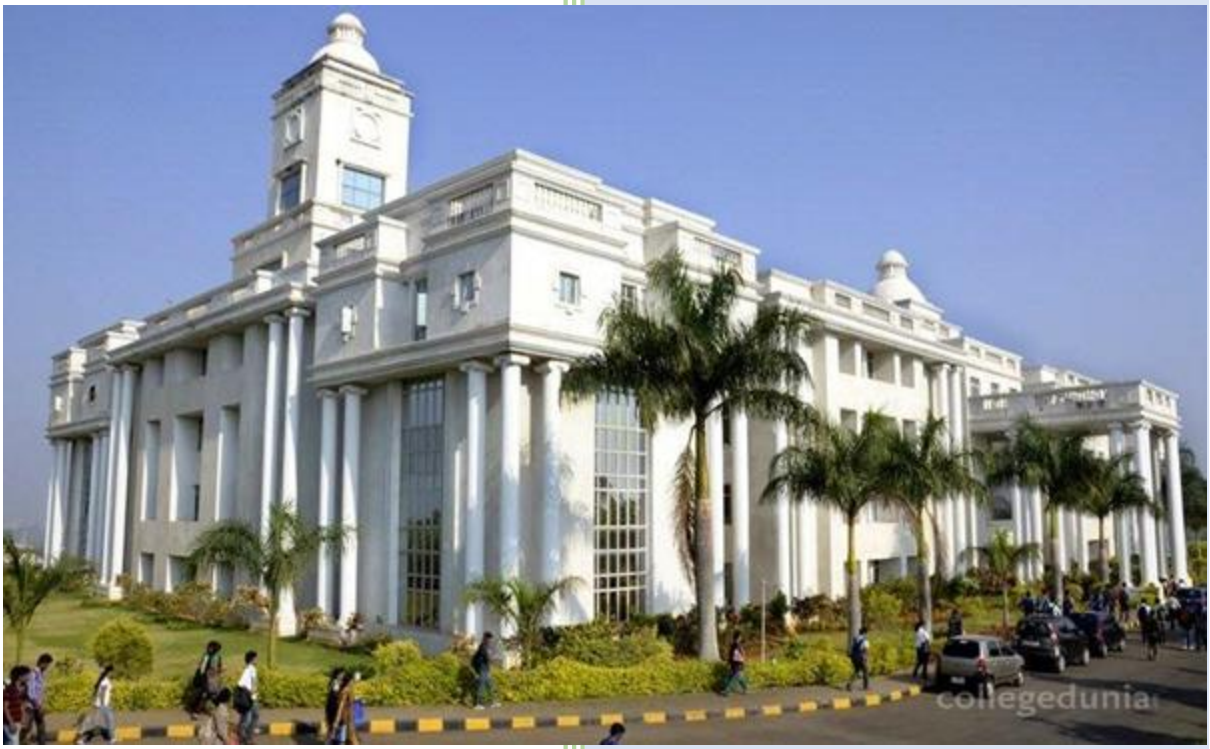
First Year
Scheme & Syllabus
(2022 Scheme)

SCHEME AND SYLLABUS



Mechanical Engineering
Stream

GLOBAL ACADEMY OF TECHNOLOGY
Autonomous institution affiliated to VTU, Belagavi.
Raja Rajeshwari Nagar, Bengaluru-560098.

GLOBAL ACADEMY OF TECHNOLOGY (Autonomous Institution Under VTU)

Scheme of Teaching and Examination 2022–23 (Effective from the academic year 2022 – 23)

I SEMESTER B.E. (PHYSICS GROUP) – ME Stream (ME/AE)

Sl. No	Course and Course Code		Course title	Offering Department	Teaching Department	Teaching Hours / Week			Examination			Credits
						Theory Lecture	Tutorial	Practical / Drawing	CIE Marks	SEE Marks	Total Marks	
						L	T	P				
1	BSC	22MAT11	LINEAR ALGEBRA AND CALCULUS	MAT	MAT	3	2	0	50	50	100	4
2	BSC	22PHY12	ENGINEERING PHYSICS (INTEGRATED)	PHY	PHY	3	0	2	50	50	100	4
3	ESC	22MEE13	ELEMENTS OF MECHANICAL ENGINEERING	ME	ME	3	0	0	50	50	100	3
4	ESC-1	22CIV14	ENGINEERING MECHANICS	CV	CV	2	2	0	50	50	100	3
5	PLC-1	22ISE151	PYTHON PROGRAMMING (INTEGRATED)	ISE	ANY	3	0	2	50	50	100	4
6	AEC	22EGH16	COMMUNICATIVE ENGLISH	HUMANITIES	ANY	1	0	0	50	50	100	1
7	HSMC	22KSK17/ 22KBK17	Samskrutika Kannada / Balake Kannada	HUMANITIES	ANY	1	0	0	50	50	100	1
					TOTAL	16	4	4	350	350	700	20

Note: BSC- Basic Science Course, ESC- Engineering Science Course, HSMC- Humanity, Social Science and Management course, AEC – Ability Enhancement Course, ETC – Emerging Technology Course, PLC – Programming Language Course

HEAD OF THE DEPARTMENT
Dept of Science & Humanities
Global Academy of Technology,
Rajarajeshwari Nagar Bengaluru-98.

Dean Academic
Global Academy of Technology,
Rajarajeshwarinagar, Bengaluru-98

GLOBAL ACADEMY OF TECHNOLOGY (Autonomous Institution Under VTU)

Scheme of Teaching and Examination 2022–23 (Effective from the academic year 2022 – 23)

I SEMESTER B.E. (CHEMISTRY GROUP) – ME Stream (ME/AE)

Sl. No	Course and Course Code		Course title	Offering Department	Teaching Department	Teaching Hours / Week			Examination			Credits
						Theory Lecture	Tutorial	Practical / Drawing	CIE Marks	SEE Marks	Total Marks	
						L	T	P				
1	BSC	22MAT11	**LINEAR ALGEBRA AND CALCULUS**	MAT	MAT	3	2	0	50	50	100	4
2	BSC	22CHE12	**ENGINEERING CHEMISTRY (INTEGRATED)**	CHE	CHE	3	0	2	50	50	100	4
3	ESC	22MEG13	**COMPUTER AIDED ENGINEERING DRAWING**	ME	ME	2	0	2	50	50	100	3
4	ESC-1	22CSE14	**C PROGRAMMING (INTEGRATED)**	CSE	ANY	3	0	2	50	50	100	4
5	ETC -1	22ANE151/ 22MEE151	**INTRODUCTION TO DRONES / INTRODUCTION TO ROBOTICS**	ME/AE	ME/AE	3	0	0	50	50	100	3
6	HSMC	22IDT16	**INNOVATION AND DESIGN THINKING**	HUMANITIES	ANY	1	0	0	50	50	100	1
7	HSMC	22CIP17	**CONSTITUION OF INDIA AND PROFESSIONAL ETHICS**	HUMANITIES	ANY	1	0	0	50	50	100	1
					TOTAL	**16**	**2**	**6**	**350**	**350**	**700**	**20**

Note: BSC- Basic Science Course, ESC- Engineering Science Course, HSMC- Humanity, Social Science and Management course, AEC – Ability Enhancement Course, ETC – Emerging Technology Course, PLC – Programming Language Course

GLOBAL ACADEMY OF TECHNOLOGY (Autonomous Institution Under VTU)

Scheme of Teaching and Examination 2022–23 (Effective from the academic year 2022 – 23)

II SEMESTER B.E. (PHYSICS GROUP) – ME Stream (ME/AE)

Sl. No	Course and Course Code		Course title	Offering Department	Teaching Department	Teaching Hours / Week			Examination			Credits
						Theory Lecture	Tutorial	Practical / Drawing	CIE Marks	SEE Marks	Total Marks	
						L	T	P				
1	BSC	22MAT21	INTEGRAL CALCULUS AND DIFFERENTIAL EQUATION	MAT	MAT	3	2	0	50	50	100	4
2	BSC	22PHY22	ENGINEERING PHYSICS (INTEGRATED)	PHY	PHY	3	0	2	50	50	100	4
3	ESC	22MEE23	ELEMENTS OF MECHANICAL ENGINEERING	ME	ME	3	0	0	50	50	100	3
4	ESC-2	22CIV24	ENGINEERING MECHANICS	CV	CV	2	2	0	50	50	100	3
5	PLC-2	22ISE251	PYTHON PROGRAMMING (INTEGRATED)	ISE	ANY	3	0	2	50	50	100	4
6	AEC	22EGH26	COMMUNICATIVE ENGLISH	HUMANITIES	ANY	1	0	0	50	50	100	1
7	HSMC	22KSK27/ 22KBK27	Samskrutika Kannada / Balake Kannada	HUMANITIES	ANY	1	0	0	50	50	100	1
					TOTAL	16	4	4	350	350	700	20

Note: BSC- Basic Science Course, ESC- Engineering Science Course, HSMC- Humanity, Social Science and Management course, AEC – Ability Enhancement Course, ETC – Emerging Technology Course, PLC – Programming Language Course

GLOBAL ACADEMY OF TECHNOLOGY (Autonomous Institution Under VTU)

Scheme of Teaching and Examination 2022–23 (Effective from the academic year 2022 – 23)

II SEMESTER B.E. (CHEMISTRY GROUP) – ME Stream (ME/AE)

Sl. No	Course and Course Code		Course title	Offering Department	Teaching Department	Teaching Hours / Week			Examination			Credits
						Theory Lecture	Tutorial	Practical / Drawing	CIE Marks	SEE Marks	Total Marks	
						L	T	P				
1	BSC	22MAT 21	INTEGRAL CALCULUS AND DIFFERENTIAL EQUATION	MAT	MAT	3	2	0	50	50	100	4
2	BSC	22CHE22	ENGINEERING CHEMISTRY (INTEGRATED)	CHE	CHE	3	0	2	50	50	100	4
3	ESC	22MEG23	COMPUTER AIDED ENGINEERING DRAWING	ME	ME	2	0	2	50	50	100	3
4	ESC-2	22CSE24	C PROGRAMMING (INTEGRATED)	CSE	ANY	3	0	2	50	50	100	4
5	ETC -2	22ANE251/ 22MEE251	INTRODUCTION TO DRONES / INTRODUCTION TO ROBOTICS	AE/ME	AE/ME	3	0	0	50	50	100	3
6	HSMC	22IDT26	INNOVATION AND DESIGN THINKING	HUMANITIES	ANY	1	0	0	50	50	100	1
7	HSMC	22CIP27	CONSTITUION OF INDIA AND PROFESSIONAL ETHICS	HUMANITIES	ANY	1	0	0	50	50	100	1
					TOTAL	**16**	**2**	**6**	**350**	**350**	**700**	**20**

Note: BSC- Basic Science Course, ESC- Engineering Science Course, HSMC- Humanity, Social Science and Management course, AEC – Ability Enhancement Course, ETC – Emerging Technology Course, PLC – Programming Language Course

Semester I

Course: Linear Algebra and Calculus

Course Code	**22MAT11**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**3:2:0**	**SEE Marks**	**50**
No. of Credits	**4**	**Examination Hours**	**03**

Course Objectives

To enable students to apply the knowledge of Mathematics in various fields of engineering by making them to learn the following:

CLO1	Solution of system of equations and Eigen values
CLO2	Polar curves, Curvature and Radius of curvature
CLO3	Partial derivatives and Jacobians
CLO4	Vector differentiation

Content	No. of Hours/ RBT levels
Module 1 Rank of a matrix by elementary row transformations. Eigen values and Eigen vectors. Consistency of linear system of equations. Solution of linear system of equations: Gauss elimination, Gauss Jordan and Gauss-Seidel methods.	**10 Hours L2, L3**
Module 2 Successive Differentiation; standard results. Fundamental Theorems: Rolle's theorem, Lagrange mean value theorem, Cauchy's mean value theorem and Taylor's theorem. Expansion of functions: Maclaurin's series.	**10 Hours L2, L3**
Module 3 Evaluation of indeterminate forms. Polar Curves: Angle between radius vector and tangent, angle between two curves. Pedal equation. Curvature and Radius of Curvature for Cartesian and polar curves.	**10 Hours L2, L3**
Module 4 Function of two or more variables, Partial derivatives, Differentiation of composite functions. Jacobians (direct examples). Taylor's theorem for functions of two variables. Maxima and Minima of functions of two variables.	**10 Hours L2, L3**
Module 5 Differentiation of vectors, velocity and acceleration. Scalar and vector point functions. Gradient, directional derivative; divergence and curl, physical interpretation of divergence and curl.	**10 Hours L2, L3**

Course Outcomes

Upon completion of this course, student will be able to:

CO11.1	Apply knowledge of matrices to test the consistency and solve system of linear equations.
CO11.2	Demonstrate the understanding of fundamental theorems of calculus.
CO11.3	Solve problems related to curvature, maxima & minima and Jacobians.
CO11.4	Compute Gradient, Divergence and Curl of a scalar/vector field.

HEAD OF THE DEPARTMENT
Dept. of Science & Humanities
Global Academy of Technology,
Rajarajeshwari Nagar, Bengaluru-98.

Text books:

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 44th Edition, 2017.
2. Higher Engineering Mathematics, B.V. Ramana, Tata McGraw-Hill, 2006

References:

1. Advanced Engineering Mathematics, E. Kreyszig, John Wiley & Sons, 10th Edition,2016.
2. Higher Engineering Mathematics, H.K. Dass and Er. Rajnish Verma, S. Chand publishing, 1st edition, 2011.
3. A Text Book of Engineering Mathematics, N.P.Bali and Manish Goyal, Laxmi Publications, 6th Edition, 2014.
4. Calculus, James Stewart, Cengage Publication, 7th Edition, 2012.

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of three sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average of Marks scored in all three tests is added to test component. CIE is executed by way of quizzes / Alternate Assessment Tools (AATs), and three tests. **Some possible AATs:** seminar/assignments/ mini-projects/ concept videos/ partial reproduction of research work/ group activity/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

Component		Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Assignments	**10**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO11.1	3	2										3
CO11.2	3	2										3
CO11.3	3	2										3
CO11.4	3	2										3
Average	3	2										3

Low-1: Medium-2: High-3

SEMESTER –I/II

SUBJECT: Engineering Physics (Integrated)

Semester	**I/II**	**CIE Marks**	**50**
Subject Code	**22PHY12/22**	**SEE Marks**	**50**
Hours/Week (L: T: P)	**3:0:2**	**Examination Hours**	**03**
No. of Credits: 04			

Course Objectives: The course will enable the students to

1	Learn the basic concepts in Physics which are very much essential in understanding and solving Engineering related challenges.
2	Make the students gain practical knowledge to correlate with the theoretical studies.
3	Achieve perfectness in experimental skills and ability to develop and fabricate engineering and technical equipment.

Content		No. of Hours/ RBT levels
Module 1 **Elasticity & Oscillations** **Elasticity** Fundamentals of elasticity: concept of stress, strain, stress-strain curve, modulii of elasticity, Relation between Y, n & σ. Beams, bending moment(no derivation), expression for Young's modulus using single cantilever, torsional oscillations, applications, numerical problems. **Oscillations** Free oscillation: Introduction, SHM, differential equation of SHM, expression for force constant in series & parallel combination of springs, numerical problems Damped oscillation: Theory of damped oscillations with examples, numerical problems. Forced oscillation: Theory of forced oscillations and resonance, numerical problems.		9 hrs/L3
Pedagogy	Chalk & Talk, multimedia presentation **Practical topics:** Torsional pendulum, Single cantilever, Spring constant, LCR	
Module 2 Quantum mechanics Wave-particle dualism, de Broglie hypothesis, de Broglie wavelength of an accelerated electron, Heisenberg's uncertainty principle, application of HUP(Non-existence of electrons inside the nucleus), significance and properties of wave function, Schrodinger's time independent wave equation, eigen functions & eigen values for a particle in one dimensional potential well of infinite height, numerical problems.		8hrs/L3
Pedagogy	Chalk & Talk, multimedia presentation Practical topics: Wavelength of LEDs	
Module 3 LASERs & Optical fibers LASERs: Interaction of radiation with matter, Einstein's coefficients, Requisites and condition for laser action, He-Ne LASER, application of lasers in measurement of pollutants in the atmosphere, numerical problems. Optical fibers: Total internal reflection, angle of acceptance and numerical aperture(NA). Modes of propagation, V number and types of optical fibers.		8hrs/L3

HEAD OF THE DEPARTMENT
Dept of Science & Humanities
Global Academy of Technology,
Rajarajeshwari Nagar Bengaluru-98.

Attenuation mechanisms, attenuation coefficient, applications, merits and de-merits, numerical problems.		
Pedagogy	Chalk & Talk, multimedia presentation Practical topics: LASER diffraction, numerical aperture	
Module 4 **Electrical properties of solids** **Quantum free electron theory**: Assumptions of quantum free electron theory, Density of states(qualitative), expression for Fermi energy, Fermi factor & its temperature dependence, success of quantum free electron theory, numerical problems. **Physics of semiconductors**: Fermi level in intrinsic semiconductor, expression for conductivity, numerical problems. **Dielectrics**: Polar and non-polar dielectrics, types of polarization, expression for internal field in solids & liquids, dielectric constant of a dielectric material, applications, numerical problems.		8hrs/L3
Pedagogy	Chalk & Talk, multimedia presentation Practical topics: Fermi energy, energy gap, dielectric constant	
Module 5 Physics of Nanoscience & Material characterization Physics of Nanoscience: Introduction, Top-down approach, Bottom-up approach, Density of states 3D, 2D, 1D & 0D. Synthesis: Ball milling, arc discharge method, applications. Material characterization: Principle, construction, working of Fourier Transform Infrared (FTIR) spectroscope, Transmission Electron Microscope (TEM), applications.		7 hrs/L2
Pedagogy	Chalk & Talk, multimedia presentation	

SL. No.	Experiments	No. of Hours/ RBT levels
1	Spring constants in series and parallel combination	2 /L3
2	Wavelength of LEDs	2/L3
3	Frequency response in series and parallel LCR circuits	2/L3
4	Energy gap of a semiconductor	2 / L2
5	Acceptance angle and numerical aperture of an optical fiber	2 / L2
6	Rigidity modulus using Torsional pendulum	2/L2
7	Fermi energy of a conductor	2 / L2
8	Dielectric constant of a dielectric material	2 / L3
9	Young's modulus by single cantilever	2 / L3
10	Wavelength of LASER using diffraction grating	2 / L2

Course Outcomes: The students will be able to:

CO1	Apply the concepts of elasticity, oscillations in various applications.
CO2	Interpret the concepts of quantum mechanics & utilize in LASERs, optical fibers and electrical properties of materials.
CO3	Illustrate the steps involved in the synthesis & characterization of materials.

Textbooks:

1. Avadhanulu M N, Kshirasagar P G & Arun Murthy TVS, A text book of Engineering Physics, 11th edition, S Chand Ltd, New Delhi(2018).
2. Basavaraju S P, A detailed textbook of Engineering Physics, Subhas Publishers (2018).
3. Gaur & Gupta, Engineering Physics, Dhanpath Rai publications (2017)

Reference books:

3. Arthur Beiser, Shobhit Mahajan, Rai Choudhury S, Concepts of Modern Physics (SIE) | 7th Edition Paperback Tata Mc Graw Hill Edu Pvt. Ltd, New Delhi (2017).
4. Pillai S O, Solid State Physics, Multicolour Ed, New Age International publishers (2020).
5. David Griffiths, Introduction to Electrodynamics, 4th Ed. Cambridge Univ. Press (2017).
6. Laud B B, Lasers & non-linear optics, 3rd Ed., New Age International publishers (2011).
7. Engineering Physics lab manual – Department of Physics, Global Academy of Technology

HEAD OF THE DEPARTMENT
Dept of Science & Humanities
Global Academy of Technology,
Rajarajeshwari Nagar Bengaluru-98.

SEMESTER – I/II

COURSE: Elements of Mechanical Engineering

Course Code	**22MEE13/23**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**3 : 0 : 0**	**SEE Marks**	**50**
No. of Credits	**3**	**Examination Hours**	**03**

Overview: The course is intended to be delivered to the I/II semester engineering students of all branches as a basic course. It covers the fundamental concepts and principles of various topics under Mechanical domain involving manufacturing systems, engine systems and advanced manufacturing principles.

Course Objectives: This course enables the students to

CLO1	Learn the fundamental concepts of the manufacturing process
CLO2	Comprehend the basic concepts of Design and Power Transmission
CLO3	Understand the concepts of Internal Combustion engines, Boilers, Turbines and Refrigeration
CLO4	Understand the concepts of Automation and Robotics in Industry
CLO5	Enumerate the knowledge of Materials, Joining process and additive manufacturing

Content	No. of Hours/ RBT levels
Module 1 **Primary Manufacturing Processes:** Casting, forging, rolling, drawing, extrusion, press tool work, plastic moulding and powder metallurgy (Introduction to the process and applications only) **Joining Processes**: Soldering, Brazing and Welding. Definitions. Working principle of Arc Welding, Oxy-Acetylene Welding. Comparison of the Soldering, Brazing and Welding processes **Introduction to additive manufacturing:** Definitions and stages involved in Additive Manufacturing. Applications of Additive Manufacturing. *Demonstration of Additive Manufacturing* *Practice on metal arc welding (running bead)*	8 Hours L3
Module 2 **Secondary Manufacturing Processes: (Turning, Drilling and Milling)** Lathe – Construction and Specifications of a Centre Lathe, Operations on Lathe Machine - Turning, Facing, Knurling, Thread Cutting, Drilling Principle of a Drilling Process, Operations on Drilling Machine – Drilling, Boring, Counter boring, Countersinking, Reaming Principle of a Milling Process, Operations on Milling Machine - Plane Milling, End Milling, Slot Milling, Angular Milling, Form Milling, Straddle Milling, and Gang Milling. *Demonstration of handheld and power tools and operations on machine tools, which may include machining of simple turning models, Drilling and/or milling.*	8 Hours L3
Module 3 **Computer Numerical Control (CNC):**Introduction, components of CNC, open-loop and closed-loop systems, advantages of CNC, CNC Machining Centres and Turning Centres. **Robotics:** Robot anatomy, joints and links, common robot configurations. Applications of Robots in material handling, processing, assembly, and inspection. *Demonstration on CNC Machines* *Preparation of simple model on robot configurations*	8 Hours L3
Module 4 **Introduction to automotive systems:** Classification, I.C. Engines parts, Four-stroke Petrol and Four-stroke Diesel Engines, Simple problems on Indicated power, Brake Power and	8 Hours L3

Mechanical Efficiency, Green Fuels (Bio-diesel, CNG), Working principle of Electric and Hybrid vehicles. **Boilers:** Introduction to boilers, classification, Working principle of Water Tube and Fire Tube Boilers, (No sketch of any Boilers). Layout of Thermal Power Plant. **Turbines:** Classification of turbines, Hydraulic Turbines –Introduction, Principles and operation of Pelton Wheel Turbine, Francis Turbine and Kaplan Turbine. **Refrigeration**: Introduction & Definitions, Principle and working of Vapor Compression Refrigeration and Vapour Absorption Refrigeration. Types of Air Conditioners. *Demonstration and identification of Components in Automobile* *Demonstration of hydraulic turbines* *Demonstration of Components of the refrigerating unit.*	
Module 5 **Introduction**: Design Process: Definition of design, Phases of Design (Shigley Model) **Belt drives:** Open & Cross Belt Drives, Definitions -Slip, Creep, Velocity Ratio, the ratio of Tension in flat belt drives, advantages and disadvantages of V belts and Timing Belts, Simple numerical problems. (No derivations) **Gear drives** Types-Spur, Helical, Bevel, Worm Gears and Rack and Pinion. Velocity Ratio, Advantages and disadvantages over Belt Drives, Simple Numerical Problems on Velocity Ratio. *Demonstration on Belt drives* *Demonstration of gears and gear drives*	8 Hours L3

Course Outcomes: Upon completion of this course, students will be able to

CO1	Demonstrate the process of primary manufacturing, joining and additive manufacturing.
CO2	Demonstrate the secondary manufacturing processes such as Turning, milling and drilling.
CO3	Illustrate with applications the working principle of CNC Machines and varied robot configurations.
CO4	Interpret the principles of utilizing water as effective source of power generation with added principles of I.C. Engines and refrigeration.
CO5	Illustrate on the principles and applications of the core concept of power transmission in mechanical elements.

Textbooks:

1. Rao, P.N. "Manufacturing Technology", Metal Cutting and Machine Tools, Tata McGraw–Hill, New Delhi, Vol 1 and 2, 2019
2. Mikell P Groover, Automation, Production systems and computer-integrated manufacturing, Pearson learning, 4th Edition, 2018
3. K R Gopalkrishna, SudhirGopalakrishna, Dr.Girish H.N, Elements of Mechanical Engineering, Subhas publications, 2019 Edition.

References:

1. R K Rajput, Elements of Mechanical Engineering, Laxmi Publications Pvt Ltd, 2005
2. Pravin Kumar, Basic Mechanical Engineering, Pearson learning, 2013.
3. M. L. Sharma and R. P. Mathur, Internal Combustion Engines, Dhanpat Rai Publications, 2014
4. Dr.P.Radhakrishnan, CAD/CAM/CIM, 3rd edition, New Age International Publishers, New Delhi, 2008
5. V K Manglik, Elements of Mechanical Engineering, PHI Publications, 2013
6. Hajra Choudhry S K, Elements of Workshop Technology, Vol 1 and 2, 2009

SEMESTER I/II

SUBJECT: Engineering Mechanics

Subject Code	**22CIV14/24**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**3:2:0**	**SEE Marks**	**50**
No. of Credits	**04**	**Examination Hours**	**03**

Overview: The course is designed for I/II semester engineering students of all branches. It covers fundamental concepts and principles of engineering mechanics, application of these basics principles to solve static equilibrium problems related to **Civil, Mechanical, Automobile, Aeronautical, Mechatronics, Robotics and other allied engineering branches** where analysis for forces and displacement of particles or rigid bodies is involved. It also introduces the real-life problems involving the forces and computer applications to solve engineering mechanics problems. The knowledge of basic mathematics and physics is essential for the course.

Course Objectives: At the end of the course the student should be able to

CLO1	Understand the scalar presentation of forces and moments, apply the principles of engineering mechanics to particles and rigid bodies in equilibrium subjected to coplanar system of forces
CLO2	Realize the mechanical and sectional properties of engineering materials
CLO3	Understand the laws of motion. The kinematics of motion and the interrelationship

Content	No. of Hours/ RBT levels
Module-1 Statics of particles Introduction to Engineering Mechanics: Basic idealization and principles in Engineering Mechanics. Newton's laws of motion, units and dimensions, scalar and vectors Force and Systems of Forces, Moment of a force and couple, Varignon's theorem, Resolution and composition of forces – Coplanar concurrent and non-concurrent force system	8 Hours L3
Module - 2 Equilibrium of Rigid bodies Equilibrium of Forces: Free body diagrams, Lami's theorem, equations of equilibrium for coplanar concurrent and non-concurrent force systems, Support reactions for statically determinate beams at different loading conditions. Exercise: Demonstration of physical models	8 Hours L3
Module - 3 Centroid and Moment of Inertia Centroid of planar and built-up sections. Moment of Inertia and radius of gyration; Plane and built-up sections ***Exercise**: Display of engineering materials and visit to laboratory for demonstration*	8 Hours L3

Module- 4 Friction **Friction:** Introduction, Frictional force, Types of friction-Static friction and Dynamic friction, Limiting friction, Laws of friction – Laws of Static friction and Laws of Dynamic friction, Angle of friction, Angle of Repose, Cone of friction, Ladder friction. Problems on Static friction – Horizontal plane, Inclined plane, Interconnected bodies and ladder friction.	8 Hours L3
Module - 5 Kinematics and Kinetics of particles Kinematics: Rectilinear and curvilinear motion, motion under gravity, projectile motion, relative motion Kinetics of Rigid Body: Introduction, Force, Mass and Acceleration, Work and Energy, Impulse and Momentum, D'Alembert's principles and dynamic equilibrium ***Exercise**: Demonstration of principles with real life examples*	8 Hours L3

Course Outcomes: The students will be able to:

CO1	***Categorize*** the system of forces and analyse for resultant of forces acting on structural elements
CO2	***Write*** the equations of equilibrium and analyse the determinate structure for forces and moments
CO3	***Evaluate*** centroid and moment of inertia of plane and composite sections
CO4	***Apply*** equations of equilibrium in analyzing frictional forces.
CO5	***Analyse*** the bodies in motion for motion characteristics and understand work energy principles

Textbooks:

1. Kumar, K. L., Kumar, V. Engineering Mechanics, Tata McGraw Hill, 4th edition, 2017

Reference books:

1. S. Rajasekharan, G. Sankarsubramanian, "Engineering Mechanics- Statics and Dynamics" - Vikas Publishing House, 2011
2. F. P. Beer and E. R. Johnston et.al., Vector Mechanics for Engineers - Statics andDynamics, McGraw-Hill; 12th edition, 2019
3. R. C. Hibbler, Engineering Mechanics: Statics and Dynamics, Pearson Education; 14thedition, 2017
4. S. Timoshenko, D.H. Young, J.V. Rao, Sukumar Pati, Engineering Mechanics (In SI Units), McGraw Hill Education; 5th edition, 2017

Web Reference:

https://nptel.ac.in/courses/112106286

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

HEAD OF THE DEPARTMENT
Dept of Science & Humanities
Global Academy of Technology,
Rajarajeshwari Nagar, Bengaluru-98.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average of three test marks will be added to test component. CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests. **Some possible AATs:** seminar/assignments/ mini-projects/ concept videos/ partial reproduction of research work/ group activity/ any other.

Typical Evaluation pattern is shown in Table 1.

Table 1: Distribution of weightage for CIE & SEE of Regular courses

Component		Marks	Total Marks
CIE	CIE Test-1	40	**50**
	CIE Test-2	40	
	CIE Test-3	40	
	Average of CIE	**40**	
	Quiz 1/AAT	05	
	Quiz 2/AAT	05	
SEE	**Semester End Examination**	**50**	**50**
Grand Total			**100**

CO/PO Mapping															
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO14/24.1	3	1													
CO14/24.2	2	2													
CO14/24.3	3	2	1												
CO14/24.4	2	2	1												
CO14/24.5	2	2													
Average	**2.40**	**1.8**	**1**												

SEMESTER – I/II

Course: Python Programming (Integrated)

Subject Code	22ISE151/251	CIE Marks	50
Hours/Week (L: T: P)	3:0:2	SEE Marks	50
Total Hours	50	Examination Hours	03
No. of Credits: 04			

Course Objectives: The course will enable students to:

CLO1	Learn the syntax and semantics of Python Programming Language.
CLO2	Write Python functions to facilitate code reuse and optimization.
CLO3	Illustrate the process of structuring the data using lists, tuples and dictionaries.
CLO4	Demonstrate the use of built-in functions related regular expression, strings and to navigate the file system.
CLO5	Appraise the need for working with various documents like Excel

CONTENTS	No. of Hours & RBT levels
Module 1 **Introduction and Flow Control** **Introduction, Python Basics:** Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation andReplication, Storing Values in Variables, Your First Program, Dissecting Your Program. **Flow control:** Boolean Values, Comparison Operators, Boolean Operators,Mixing Boolean and Comparison Operators, Elements of Flow Control,Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys. exit(). **Text Book 01: Chapters - 1, 2**	08 Hours & L3
Module 2 **Functions and List** **Functions:** def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Arguments and print(), Local and Global Scope, The global Statement, Exception Handling, A Short Program: Guess the Number **Lists:** The List Data Type, Working with Lists, Augmented AssignmentOperators, Methods, List-like Types: Strings and Tuples, References **Text Book 01: Chapters - 3, 4**	08 Hours & L3
Module 3 **Dictionaries and String** **Dictionaries and Structuring Data:** The Dictionary Data Type, PrettyPrinting, Using Data Structures to Model Real-World Things, Nested Dictionaries and Lists **Manipulating Strings** - Working with Strings, Useful String Methods Project: Password Locker **Text Book 01: Chapters - 5, 6**	08 Hours & L3
Module 4 **Regular Expressions and Files** **Pattern Matching with Regular Expressions**: Finding Patterns of Text without Regular Expressions, Finding Patterns of Text with Regular Expressions, More Pattern Matching with Regular Expressions, Greedy and Nongreedy Matching, The findall() Method, Character Classes, Making YourOwn Character Classes, The Caret and Dollar Sign Characters, The WildcardCharacter, Review of Regex Symbols, Case-Insensitive Matching, Substituting Strings with the sub() Method, Managing	08 Hours & L3

Complex Regexes, Combining re.IGNORECASE, re. DOTALL, and re. VERBOSE. **Reading and Writing Files**: Files and File Paths, The os.path Module, The File Reading/Writing Process, Saving Variables with the shelve Module, Saving Variables with the pprint.pformat() Function. **Text Book 01: Chapters - 7, 8**	
Module 5 **Files and Spreadsheets** **Organizing Files**: The shutil Module, Walking a Directory Tree, Compressing Files with the zipfile Module. **Working with Excel Spreadsheets:** Excel Documents, Installing theopenpyxl Module, Reading Excel Documents, Project: Reading Data from aSpreadsheet, Writing Excel Documents, Project: Updating a Spreadsheet,Setting the Font Style of Cells, Font Objects, Formulas, Adjusting Rows and Columns, Charts. **Text Book 01: Chapters - 9, 12**	**08 Hours & L3**

PROGRAMMING EXERCISES

Lab No.	PROGRAMMING EXERCISES ON
1.	Programs on data types, string concatenation and replication
2.	Program on operators and Flow Control Statements
3.	Programs on loops
4.	Programs on Functions
5.	Programs on List and Tuples
6.	Programs on Dictionaries
7.	Programs on String manipulation functions
8.	Programs on Pattern Matching with Regular Expressions
9.	Programs on File Handling
10.	Programs on Excel
11.	Revision/ Practice Lab/ Doubt clearing Lab
12.	Continuous Internal Evaluation (CIE) Test

Note: The sample set of programs are provided on each topic for the reference only.
The course instructor/ Lab in-chargers are given a liberty to ask any kind of questions in the laboratory on the specified the topic and encourage students to write program by themselves.

Course Outcomes: Upon successful completion of this course, student will be able to

22ISE151.1	Experiment with the concepts of data types, Operators and Flow Control Statements of Python
22ISE151.2	Write programs using functions and strings.
22ISE151.3	Make use of methods to create and manipulate lists, tuples and dictionaries.
22ISE151.4	Develop programs for Pattern Matching and file handling using python packages
22ISE151.5	Utilize python packages to work on Spread Sheets

Recommended Tools: Linux. Liclipse, PyCharm, Visual Studio 2019,

Text Books:

1. Al Sweigart, "Automate the Boring Stuff with Python", William Pollock, 2015,ISBN: 978-1593275990.

Reference Books:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition,Green Tea

Press, 2015, ISBN: 978-9352134755.
2. Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, WileyIndia Pvt Ltd. ISBN-13: 978-8126556014.
3. Wesley J Chun, "Core Python Applications Programming", 3rd Edition, Pearson EducationIndia, 2015. ISBN-13: 978-9332555365.
4. Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, "Data Structures andAlgorithms in Python", 1st Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126562176.
5. ReemaThareja, "Python Programming using problem solving approach", OxfordUniversity press, 2017. ISBN-13: 978-0199480173
6. Charles R. Severance, "Python for Everybody: Exploring Data Using Python- 3",1st Edition, Shroff Publishers, 2017. ISBN: 978-9352136278.

Web Reference:
https://infytq.infosys.com/
https://www.learnbyexample.org/python/
https://www.learnpython.org/
https://pythontutor.com/visualize.html#mode=edit

Scheme of Examination:
Scheme of Evaluation: (Integrated courses)
Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

The laboratory assessment would be restricted to only the CIE evaluation.
Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. The average of the three tests are taken for computation of CIE on a scale of 30, the CIE would also include laboratory evaluation for 20 marks. The laboratory marks of 20 would comprise of 10 marks for regular laboratory assessment to include lab record and observation. 10 marks would be exclusive for laboratory internal assessment test to be conducted at the end of the semester. Typical Evaluation pattern for integrated courses is shown in the Table below

Table: Distribution of weightage for CIE & SEE of Integrated courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**30**	**50**
	CIE Test-2	**30**	
	CIE Test-3	**30**	
	Laboratory	**20**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
22ISE151.1	3	3	2	2	3							2				
22ISE151.2	3	3	2	2	3							2				
22ISE151.3	3	3	2	2	3							2				
22ISE151.4	3	3	2	2	3							2				
22ISE151.5	3	3	2	2	3							2				
Average	3	3	2	2	3							2				

Low-1: Medium-2: High-3

HEAD OF THE DEPARTMENT
Dept of S. Humanities
Global Academy of Technology,
Rajarajeshwari Nagar, Bengaluru-98.

Semester I / II

COURSE: COMMUNICATIVE ENGLISH

Course Code	**22EGH16/26**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**1:0:0**	**SEE Marks**	**50**
No. of Credits	**1**	**Examination Hours**	**1 hour**

Course Objectives

To enable students to apply the knowledge of various forms of communication of English language in of engineering by making them to learn the following:

CLO1	Enhance the effective writing practices.
CLO2	Incorporate strong reading skills.
CLO3	Demonstrate efficient listening skills.
CLO4	Learn different styles of speaking.

Content	No. of Hours/RBT levels
Module 1- Writing Section Academic writing module: Responses to the academic writing module are short essays or general reports, addressed to an educated non-specialist audience. There are two compulsory tasks. Task 1 requires 150 words, and looking at a diagram, table, or data and to present the information in their own words. Task 2 requires at least 250 words, students to be presented with a point of view, argument, or problem and asked to provide general factual information, present a solution, justify an opinion, evaluate ideas and evidence, etc. It includes two tasks wherein the topics are of general interest and relatable for candidates applying for an undergraduate or postgraduate program. For your first task, you will be handed a paper that would contain either a diagram, table, or graph. You will be required to recapitulate and define the given data in your own words. You may be asked to explain a certain data entry, process the given information, or a flowchart to logically arrive at a conclusion. In the next task, you need to write an essay as a response to your deduction from the given data and support your argument with relevant examples, through the given data. Please note that the writing style should be strictly formal.	**3/L3**
Module 2- Reading Section This includes three long paragraphs which can be either descriptive, factual or analytical. These paragraphs are basically excerpts taken from newspapers, research works, journals, books, or even magazines.	**3/L3**
Module 3 - Listening Section The Listening module is divided into four sections. The first two conversations are concerned with social needs, while the last two are concerned with situations more closely related to education. **Sections 1 and 2 are about every day, social situations** Recording 1: The first recording would have a conversation between two people set in an everyday social context. Recording 2 – The second recording would happen to be a monologue set in an everyday social context. **Sections 3 and 4 are about educational and training situations** Recording 3 – The following recording would be a conversation between four people set in an educational or training context.	**3/L3**

Recording 4 – And the final recording would be a monologue on an academic subject	
Module 4 - Speaking Section The Speaking section is like a structured interview with an emphasis on general speaking skills. **Part 1 introduction and interview (4–5 minutes)** For the first five minutes, you will be asked some mundane questions about yourself such as family, home, studies, hobbies and interests, and so on. **Part 2 long turn (2–3 minutes)** Next, a flash card will be handed over that would contain a certain topic. You will be given a minute or two to familiarize yourself with the topic as you would need to speak on that topic for about two minutes. Post your speech **Part 3 discussions (5–6 minutes)** Deeper questions and abstract discussions would take place based on the given topic and your speech. You will get the opportunity to explore your given topic and delve into deeper issues.	**3/L3**

Course Outcomes

Upon completion of this course, student will be able to:

CO11.1	Write concisely using effective practices.
CO11.2	Read comprehension effectively and decipher required information.
CO11.3	Listen to audio from various settings and decode information.
CO11.4	Practically demonstrate good speaking skills.

Text books:

1. The Official Guide to IELTS: https://www.cambridge.org/us/cambridgeenglish/official-exam-preparation-materials/product/official-cambridge-guide-ielts.
2. Barron's IELTS: International English Language Testing System: https://www.worldcat.org/title/barrons-ielts-international-english-language-testing-system/oclc/1080598431?referer=di&ht=edition

References:

1. Check Your English Vocabulary for IELTS: https://www.bloomsbury.com/us/check-your-english-vocabulary-for-ielts-9781472947376/
2. McGraw-Hill Education 6 IELTS Practice Tests With Audio: https://www.mhprofessional.com/test-prep-study-guides/language/9780071845151-usa-mcgraw-hill-education-6-ielts-practice-tests-with-audio-group

CO/PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO11.1	2	2				2		1		2		2
CO11.2	2	2				2		1		2		2
CO11.3	2	2				2		1		2		2
CO11.4	2	2				2		1		2		2
Average	2	2				2		1		2		2

Low-1: Medium-2: High-3

HEAD OF THE DEPARTMENT
Dept of Science & Humanities
Global Academy of Technology,
Rajarajeshwari Nagar Bengaluru-98.

Semester I/II

Engineering Chemistry (Integrated)

Subject Code	**22CHE12/22**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**3:0:2**	**SEE Marks**	**50**
Total Hours	**64**	**Examination Hours**	**03**
Semester: I/II		**No. of Credits: 04**	

Course Learning Objectives: The course will enable the students to

CLO1	Know the fundamental concepts of Chemistry which are very much **essential in** day to day life, in industries and in research and development **to solve Engineering related challenges.**
CLO2	Impart Practical skills for better understanding of theoretical concepts.

Content	No. of Hours/ RBT levels
Module-1: Electrochemical Energy Systems **Electrochemistry:** Introduction: EMF of cell, Free Energy, Single electrode potential-Nernst equation, Numerical problems. Reference Electrodes: Introduction, Construction, working and applications of Calomel electrode, Ion selective electrodes-Glass electrode, determination of pH using Glass electrode.Concentration Cells: Introduction, numerical problems **Energy Systems:** Introduction, Classification. Construction, working and applications of Li-ion battery and recycling of Lithium batteries. **Fuel Cells**: Introduction, Construction, working and applications of Methanol-Oxygen fuel cell(acid electrolyte-based methanol oxygen fuel cell).	08 Hours/ L2
Module 2 Corrosion Science and Metal finishing **Corrosion Science:**Introduction: Electrochemical theory of corrosion. Types of corrosion-Differential metal corrosion, differential aeration corrosion and stress corrosion. Factors affecting the rate of corrosion-Anodic & Cathode areas, pH of corrosion medium and Nature of corrosion product. Corrosion control: Metal coating. Galvanization. Cathodic protection-sacrificial anode method and impressed current method. **Metal Finishing:** Introduction, Technological importance, Electroplating-Introduction, Electroplating of Chromium,Electroless plating-Introduction, Electroless plating of copper on PCB, Differences between electroplating and electroless plating.	08 Hours/ L2
Module 3 Chemical Energy Sources, Lubricants & Refractories **Chemical Energy Sources**: Fuels - Introduction, Classification, Calorific value-GCV & NCV, Determination of Calorific value by Bomb Calorimeter, Numerical problems. Petroleum cracking-Fluidized bed cracking **Alternative Energy sources**: Bio Diesel, Power alcohol, CNG, Biogas, Hydrogen-as a fuel, Solar energy-PV cell: construction, working and applications. **Lubricants:** Introduction, Classifications, Properties- Viscosity index, Flash point, Drop point test and applications of lubricants. **Refractories**: Introduction, Properties, brief account of steps involved in manufacturing with examples and applications.	08 Hours/ L2,L3
Module 4 Polymers& Water Technology **Polymers:** Introduction, Synthesis and applications of Polyurethane. Polymer composites-Kevlar Fibre and carbon fibre, **Conducting Polymers**: Synthesis & Mechanism of conduction in conducting poly aniline and Photoconductive polymers.	08 Hours/ L2, L3

Water Technology: Introduction, impurities in water, determination of hardness of water, COD-definition, determination and numerical problem, Softening of water by ion exchange process, Desalination of water-Reverse Osmosis, Sewage treatment.	
Module 5 Instrumental methods of analysis, Chemistry of Nanomaterials and Environmental Chemistry **Instrumental methods of analysis**:Theory, instrumentation and application of Colorimeter, Potentiometer and Conductometer. **Chemistry of Nanomaterials:** Introduction. synthesis of ZnO nano material by solution combustion method & synthesis of TiO_2nano material by sol gel method. Characterization techniques- PXRD and SEM. Applications. Carbon based nanomaterials-Introduction to fullerenesCarbon nano tubes & Graphene **Environmental Chemistry:** Air Pollutants: Sources, effects and control of Primary air pollutants-Carbon monoxide, Oxides of nitrogen and Sulphur. Waste Management: e-waste & Biomedical waste (scientific land filling, composting and recycling). Recycling of water and Rain water harvesting	08 Hours/ L2, L3

List of Engineering Chemistry Lab Experiments

SL. No.	Experiments	No. of Hours/ RBT levels
	Part- A: Instrumental Experiments	
1	Determination of pKa value of a weak acid using pH meter	2
2	Estimation of FAS present in the given solution by potentiometric method	2
3	Determination of amount of HCl and CH_3COOH present in a mixture by conductometry	2
4	Estimation of copper in the effluent from electroplating industry by colorimetric method.	2
	Part-B: Volumetric Experiments	
1	Determination of Chemical oxygen demand of industrial waste water	2
2	Determination of percentage of copper in brass by Iodometric method	2
3	Determination of percentage of iron in the given rust solution using standard Potassium Dichromate solution (External indicator method)	2
4	Determination of Total hardness of given water sample by rapid EDTA method	2
5	Determination of Nickel using EDTA by complexometric method	2

SL. No.	Experiments	No. of Hours/ RBT levels
	Part-C: Virtual & Demonstration Experiments	
1	Determination of Viscosity coefficient of a liquid using viscometer **(Virtual Experiment)**	2
2	Determination of calorific value of solid fuel using bomb calorimeter **(Demonstration)**	2
3	Synthesis of ZnO nanomaterial by sol-gel method **(Demonstration)**	2

Textbooks:

1. Uppal M.M, Jain and Jain. Engineering Chemistry, Khanna Publishers, 35th Edition, 2013.
2. P.C. Jain and Monica Jain, A test Book of Engineering Chemistry, Dhanpat Rai Publications, New Delhi, 12thEdition, 2012.

HEAD OF THE DEPARTMENT
Dept of Humanities
Global Academy of Technology,
Rajarajeshwari Nagar, Bangalore-98.

3. SS Dara &Dr. SS Umare. -A Text book of Engineering Chemistry, S Chand & Company Ltd., 12th Edition, 2011.
4. R.V. Gadag and Nitthyananda Shetty-A Text Book of Engineering Chemistry, I.K. International Publishing house. 2nd Edition, 2016.
5. B.S. Jai Prakash, R. Venugopal, Sivakumaraiah& Pushpa Iyengar.,- Chemistry for Engineering Students", Subash Publications, Bangalore.5th Edition, 2014
6. Vogel's A.I. A text book of quantitative analysis, 35th edition, 2012.
7. Willard, Merit, Dean and Settle, A text book of Instrumental analysis, 6th edition 2012.

Reference books:

1. F.W. Billmeyer, Text Book of Polymer Science, John Wiley & Sons, 4th Edition, 1999.
2. M.G. Fontana, N.D. Greene, Corrosion Engineering, McGraw Hill Publications, New York, 3rd Edition, 1996.
3. Principles of Physical Chemistry , B.R. Puri, L.R. Sharma & M.S. Pathania, S. Nagin Chand & Co., 41 Edition, 2004.
4. G.A. Ozin& A.C. Arsenault, "Nanotechnology A Chemical Approach to Nanomaterials". RSC Publishing, 2005.
5. Bansal R.K., A Text Book of Engineering Mechanics, Laxmi Publications; 6th edition, 2015.
6. G.H Jeffery, J Bassett, J Mendham and R.C. Denney Vogel's A.I. A text book of quantitative analysis, Dorling Kindersley (India) Pvt., Ltd. 35th edition, 2012.
7. Gary D Christian, Analytical Chemistry, Wiley India, 6th edition, 2015.
8. T. Pradeep, A Text book of Nanoscience and Nanotechnology, McGraw Hill Education (India) Pvt., Ltd., 1st edition, 2015.

Course Outcomes: Upon successful completion of this course, student will be able to:

CO1	Discuss the electrochemical energy systems such as electrodes, batteries and fuel cells.
CO2	Explain the fundamental concepts of corrosion, its control and surface modification methods namely electroplating and electroless plating.
CO3	Interpret the concepts of nonrenewable (Petroleum), renewable (solar energy) & alternative energy sources, Lubricants and Refractories.
CO4	Enumerate the importance, synthesis and applications of Polymer, water treatment and water analysis by volumetric methods.
CO5	Illustrate the fundamental principles and applications of instrumentations, nanomaterials, environmental pollution and its control measures.
CO6	Evaluate the percentage of copper, Nickel and Iron in the given analyte solution.

SEMESTER – I/II

COURSE: COMPUTER AIDED ENGINEERING DRAWING

Course Code	22MEG13/23	CIE Marks	50
Hours/Week (L: T: P)	2 : 0 : 2	SEE Marks	50
No. of Credits	3	Examination Hours	03

Overview: The course is designed for the I/II Semester Engineering students of all branches. It covers fundamental concepts and principles of engineering drawing with the emphasis on use of drafting software. Engineering drawing is a graphical medium of expression of technical details without the barrier of a language and termed as universal language of engineers. Engineering drawings are important in conveying useful information to other engineers with standardized conventions, rules, and regulations. The end goal of an engineering drawing is to convey all the required technical information that will allow a manufacturer to produce any kind of component in all the fields of engineering.

Course Objectives: At the end of the course, the student should be able to

CLO1	Understand the concept of BIS conventions in Engineering drawing.
CLO2	Apply the theoretical concepts to sketch orthographic projections in different positions.
CLO3	Understand the concepts of isometric projections of combination of solids.
CLO4	Use CAD tools for creation of Engineering drawings.

CONTENT	No. of Hours/ RBT levels
Module 1: Introduction to Engineering Drawing & Orthographic Projections of points and lines BIS conventions and standards. Introduction to drafting software, Planes of projection, reference line, Quadrants and conventions employed. **Projections of points** in all the four quadrants. **Projections of straight lines (First angle projection only)**: Introduction, Line inclined to both the planes, true and apparent lengths, true and apparent inclinations to reference planes. *Application problems as demonstration only.*	**10 Hours L3**
Module 2: Projections of plane surfaces (First angle projection only): Introduction, Projections of regular plane surfaces–triangle, square, rectangle, pentagon, hexagon and circle - inclined to both the planes (change of position method only).	**09 Hours L3**
Module 3: Projections of Solids Introduction, Type of solids, Projections of right regular prisms like square, hexahedron(cube), pentagon, hexagon and pyramids like square, pentagon, hexagon, cone & tetrahedron in different positions (Inclined to both HP and VP).	**12 Hours L3**
Module 4: Isometric Projection (using isometric scale only) Introduction, Isometric scale, Isometric projection of combinations of solids (Maximum of two solids) like cube, regular prisms, cylinders, pyramids, cone, tetrahedron, frustum of pyramids, cone & sphere. *Demonstration of 3D solid models of prisms and pyramids using modelling software.*	**09 Hours L3**

Problems from the above modules must be practiced on computer aided drafting software.

HEAD OF THE DEPARTMENT
Dept of Science & Humanities
Global Academy of Technology,
Rajarajeshwari Nagar, Bengaluru-98.

COURSE OUTCOMES: The students will be able to

CO1:	Demonstrate competence in the basics of orthographic projections of points, lines and planes.
CO2:	Sketch the orthographic projections of solids inclined to both horizontal & vertical planes.
CO3:	Generate isometric projections of various combinations of solids.
CO4:	Demonstrate 2D drafting of lines, planes & solids using solid edge software.

Textbooks:

1. K.R. Gopala Krishna, Sudhir Gopalakrishna, Engineering Graphics, Subhas Publishers, Bangalore, 40th edition, 2018-19.
2. N.D. Bhatt, Engineering Drawing, Charotar Publishing House, Gujarat, 53rd edition, 2014

References:

1. Luzadder Warren J., Duff John M., Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production, Pearson India, 2015.
2. P. L. Varghese, Engineering Graphics McGraw Hill Education (India) Pvt. Ltd, and New Delhi, 2013.
3. N.S. Parthasarathy & Vela Murali, Engineering Drawing, Oxford University Press, 2015.

ASSESSMENT

CIE Assessment:

Particulars	Marks
Test 1 (Module 1 and Module 2) - @ 8 week	30
Test 2 (Module 3 and 4) - @ 14 weeks	30
Average of Test 1 & Test 2	**30**
Periodic Evaluation of Sketch Book	20
Total Marks	**50**

SEE Assessment: Maximum of **THREE QUESTIONS** will be set for **SEE** as per the pattern given below:

Scheme of Evaluation:

Modules	Marks Allocated
Module 1 & 2: Projection of Points, Lines **Or** Projection of Planes	**30**
Module 3: Answer any **ONE** question out of **TWO** Questions from Projection of solids	**40**
Module 4: Answer any **ONE** question out of **TWO** Questions from Isometric Projections	**30**
Total Marks	**100**

Question No.	Solutions and sketching in the sketch book	Computer Printout	Total Marks
1	15	15	30
2	20	20	40
3	15	15	30
Total Marks	**50**	**50**	**100**

Students have to submit the computer printouts and the hand drawn sketches at the end of the examination for evaluation.

SEMESTER – I/II

Course: C Programming (Integrated)

Course Code	22CSE14/24	CIE Marks	50
Hours/Week (L: T: P)	3:0:2	SEE Marks	50
No. of Credits	4	Examination Hours	3

Course Objectives:

CO1	Write algorithms, flowcharts and programs.
CO2	Implement different programming constructs and decomposition of problems intofunctions
CO3	Use and implement data structures like arrays and structures to obtain solutions.
CO4	Define and use of pointers with simple applications

Content	No.of Hours/ RBT levels
Module 1 INTRODUCTION TO C PROGRAMMING **Introduction to Computing:** Introduction, Art of Programming through Algorithms and Flowcharts. Basic structure of C program, executing a C program. **Constants, Variable and Data Types:** Introduction, Character Set, C Tokens, Keywords andIdentifiers, Constants, Variables, Data Types, Declaration of Variables, Assigning Values to Variables, Defining Symbolic Constants, **Managing I/O functions:** Formatted Input and Formatted Output functions. **Operators and Expressions:** Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operator, Bitwise Operators, Special Operators, Arithmetic Expressions, Evaluation of Expressions, Precedence of Arithmetic Operators, Type Conversions in Expressions, Operator Precedence and Associativity, Example Programs.	08 Hours L2
Module 2 CONTROL STRUCTURES **Decision Making and Branching:** Introduction, Decision Making with IF Statement, Simple IF Statement, the IF-ELSE Statement, Nesting of IF-ELSE Statements, The ELSE IF Ladder, The Switch statement, Example Programs.	08Hours L3
Decision Making and Looping: Introduction, The while Statement, The do statement, The forstatement, Jumps in LOOPS, Example Programs.	
Module 3 INTRODUCTION TO ARRAYS AND STRINGS **Arrays:** One-dimensional Arrays, Declaration of One-dimensional Arrays, Initialization of One- dimensional Arrays, Example programs. Two-dimensional Arrays, Declaration of Two- dimensional Arrays, Initialization of Two-dimensional Arrays, Example programs. **Character Arrays and Strings:** Declaring and Initializing String Variables, Reading Strings from Terminal, Writing Strings to Screen, Arithmetic Operations on Characters, String-handling Functions, Example Programs.	08 Hours L3

HEAD OF THE DEPARTMENT
Dept of Science & Humanities
Global Academy of Technology,
Rajarajeshwari Nagar Bengaluru-98.

Module 4 **FUNCTIONS AND INTRODUCTION TO POINTERS** **User-defined Functions:** Elements of User-defined Functions Return Values and their Types,Category of Functions, Recursion, Example Programs. **Pointers:** Introduction, Declaring Pointer Variables, Initialization of Pointer variables, accessing a Variable through its Pointer, Pointer Expressions, Pointer Increments and Scale Factor, ExamplePrograms.	**08 Hours** **L3**
Module 5 **STRUCTURES AND FILE MANAGEMENT** **Structures:** Introduction, Defining a structure, declaring structure variables, accessing structuremembers, structure initialization, array of structures. **File Management in C:** Introduction, Defining and opening a file, closing a file, Input/output andError Handling on Files.	**08 Hours** **L3**

	Program List
1	Write a C program to perform swapping of two numbers using i) Repetitive subtraction technique ii) Bitwise operators.
2	Write a C program to find the circumference and area of a circle. The input must be an integer valuebut the output must be rounded off to 3 decimal digits.
3	Write a C program: - i) To find roots of a Quadratic equation. ii) Generate the Fibonacci sequence of first N numbers.
4	Write a C program to search for an element in an array using i) Binary Search algorithm ii) Linear Search algorithm
5	Write a C program to arrange the elements of an integer array using Bubble Sort algorithm.
6	Write a C program to input two matrices and perform matrix operations like multiplication, findingtrace of a matrix, transpose of a matrix.(Any one operation may be asked in the examination).
7	Write a C program to check whether the given string is palindrome or not without using Libraryfunctions.
8	Write a C program to accept the number as a parameter through a user defined function and find itsfactorial by using recursion.
9	Write a C program to count the number of lines, words and characters in a given text file and writethe output to a separate file.
10	Write a C program to maintain a record of n student details using an array of structures with four fields - Roll number, Name, Marks and Grade. Calculate the Grade according to the following conditions. Marks Grade >=80 A >=60 B >=50 C >=40 D.

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO14.1/CO24.1	Describe the fundamentals of C programming Language.
CO14.2/CO24.2	Apply appropriate Control structures to solve problems.
CO14.3/CO24.3	Describe the concept of Arrays and Strings
CO14.4/CO24.4	Write User defined functions and apply concept of recursion and files to solve problems
CO14.5/CO24.5	Describe the concept of Pointers and Structures.

Textbooks:

1. E. Balaguruswamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.

Reference books:

1. Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978- 01-9949-147-6.
2. Kernighan B.W and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.
3. Yashavant P. Kanetkar, "Let Us C", 16th Edition, 2019, BPB Publications, ISBN: 978- 93-8728-449- Jacqueline A Jones and Keith Harrow, "Problem Solving with C", Pearson Education. ISBN: 978-93-325-3800-9.
4. Jacqueline A Jones and Keith Harrow, "Problem Solving with C", Pearson Education. ISBN: 978-93-325-3800-9.
5. Dr. Guruprasad Nagraj, "C Programming for Problem Solving", Himalaya Publishing House. ISBN-978- 93-5299-361-1.

MOOCs:

1. http://elearning.vtu.ac.in/econtent/courses/video/BS/14CPL16.html
2. https://nptel.ac.in/courses/106/105/106105171/

Scheme of Examination:

Scheme of Evaluation:
(Integrated courses)
Semester End Examination
(SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to
50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

The laboratory assessment would be restricted to only the CIE evaluation.

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. The average of the three tests are taken for computation of CIE on a scale of 30, the CIE would also include laboratory evaluation for 20 marks. The laboratory marks of20 would comprise of 10 marks for regular laboratory assessment to include lab record and observation. 10 marks would be exclusive for laboratory internal assessment test to be conducted at the end of the semester.

Typical Evaluation pattern for integrated courses is shown in the Table below

Table: Distribution of weightage for CIE & SEE of Integrated courses

	Component	Marks	Total Marks
CIE	CIE Test-1	30	50
	CIE Test-2	30	
	CIE Test-3	30	
	Laboratory	20	
SEE	Semester End Examination	100	50
		Grand Total	100

HEAD OF THE DEPARTMENT
Dept of Science & Humanities
Global Academy of Technology,
Rajarajeshwari Nagar Bengaluru-98.

CO/PO Mapping														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO14.1/CO24.1	3	3	2		3			3	3					
CO14.2/CO24.2	3	3	2		3			3	3					
CO14.3/CO24.3	3	3	2		3			3	3					
CO14.4/CO24.4	3	3	2		3			3	3					
CO14.5/CO24.5	3	3	2		3			3	3					
Average	3	3	2		3			3	3					

Low-1: Medium-2: High-3

SEMESTER – I/II

COURSE: INTRODUCTION TO DRONES

Course Code	**22ANE151/251**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**3:2:0**	**SEE Marks**	**50**
No. of Credits	**4**	**Examination Hours**	**03**

Course Objectives: To enable students to understand the drone and its functioning

CLO1	To Identify & select different types of drones, drone rules and regulations
CLO2	Select different drone parts and to understand aerodynamics
CLO3	Understand BLDC motors and different type of batteries
CLO4	Understand different sensors and Flight Control System

Content	No. of Hours/ RBT levels
Module 1 **Introduction:** Different types of Drones, Nomenclatures, History of aerial drones, reputation, airframe, Configurations, basic components, current/future uses of drones. DGCA regulations	**10 Hours L1, L2**
Module 2 **Air vehicle:** Understanding Aerial platforms. Types of drones. Introduction to aerodynamics, Newton's Laws of Motion, Bernoulli's Principle, four forces of Fight, three axes of Fight, how they apply to drone Flight.	**10 Hours L1, L2**
Module 3 **Propulsion system:** Introduction to different electric motors like DC, BLDC, servo motors, working, understanding its functioning, speed torque characteristics, degree of freedom in drone. Introduction Electronic Speed Controller. Performing payload calculation, speed control techniques, thrust to weight ratio.	**10 Hours L1, L2**
Module 4 **Battery System:** Introduction of different types of batteries used in drone. Understand different specifications and their significance of batteries. Different charging circuits or batteries, battery management system (BMS) and Building Blocks of BMS.	**10 Hours L1, L2**
Module 5 **Sensors:** Introduction of different sensors used in drone like accelerometers, inertial measurement units, tilt and lidar sensor, gyro sensor. Principle of operation, their roles and characteristics. Selection of appropriate sensor as per requirement. Introduction to Flight controller system	**10 Hours L1, L2**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1	**Identify different types of drones and drone rules and regulations**
CO2	**Explain the forces acting on Drone during flight**
CO3	**Comprehend the Drone propulsion and battery system**
CO4	**Describe different sensors and Flight Control System**

HEAD OF THE DEPARTMENT
Dept of Science & Humanities
Global Academy of Technology,
Rajarajeshwari Nagar, Bengaluru-98.

Textbooks:

1. The Drone Rules, 2021. The Gazette of India: Extraordinary [Part II—Sec. 3(i)].
2. John Baichtal "Building Your Own Drones" A Beginner's Guide to Drones, UAVs, and ROVs Que Publishing, ISBN - 9780789755988
3. Julio Alberto Mendoza "Drones to Go" A Crash Course for Scientists and Makers, Apress ISBN-978-1-4842-6787-5

Reference books:

1. Paul Gerin Fahlstrom, Thomas James Gleason, Introduction to UAV Systems , Wiley Publication John Wiley & Sons, Ltd, 4th Edition 2012.
2. Landen Rosen, Unmanned Aerial Vehicle, Alpha Editions , N.Y., 2012
3. Valavanis, Kimon P, Unmanned Aerial Vehicles , Springer, 2011.
4. Valavanis, K., Vachtsevanos, George J, Unmanned Aerial Vehicles , Springer, 2015.

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. CIE is executed by way of quizzes / Alternate Assessment Tools (AATs) for 10 marks.

Typical Evaluation pattern for regular courses is shown in Table 1.

Table 1: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	40	50
	CIE Test-2		
	CIE Test-3		
	Quiz 1/AAT	10	
SEE	Semester End Examination	50	50
Grand Total			100

CO/PO Mapping

CO/PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	-	1	1	-	-	-	1
CO2	1	-	-	-	-	-	-	-	-	-	-	1
CO3	1	-	-	-	-	-	1	-	-	-	-	1
CO4	1	-	-	-	-	-	1	-	-	-	-	1
CO5	1	-	-	-	-	-	-	-	-	-	-	1
Average	1						1	1				1

Low-1: Medium-2: High-3

SEMESTER – I/II

COURSE: Introduction to Automation & Robotics

Course Code	22MEE151/251	CIE Marks	50
Hours/Week (L: T: P)	3 : 2 : 0	SEE Marks	50
No. of Credits	4	Examination Hours	03

Course Objectives: This course enables the students to

CLO1	Understand and identify the areas of automation & justify the need for automation
CLO2	Understand robot configuration, structures, basic components, workspace and generations of robots
CLO3	Understand about various types of sensory devices their working and applications.
CLO4	Understand the present &future applications of a robot.
CLO5	Understand the role of AI in robots and various knowledge representation techniques.

Contents	No. of Hours/ RBT levels
Module 1 **Introduction to Automation:** Basic elements of production system, Types of Production Machines, classification of production system, Introduction to automation, history of automation, reasons for automation, disadvantages of automation, types of automation, anautomated system	10 Hours / L3
Module 2 **Industrial Robotics:** Definition of Robotics, robot anatomy, joints and end effectors, Roboticconfiguration, Work volume, Robot motions, Robot drive system, Precision of movement: Spatial resolution, Accuracy and Repeatability. Degrees of freedom, Asimov's laws of robotics, Robot specifications, **Transformations:** 2D transformations, translation, rotation (Rotation about x, y, z axis) andscaling. Introduction to Direct and inverse kinematics. (only definition)	10 Hours / L3
Module 3 **Robot Actuators & Sensors** Robot actuators and Feedback components: Actuators: Pneumatic actuators, Hydraulic actuators: Single acting, Double acting cylinders, Rotary actuators (gear motors), Electric motors: Brush type & Brushless DC motor, A C motors, Stepper motors. Comparison of all the actuators. Sensors, Position sensors: Potentiometers, Resolvers and Encoders. Velocity sensors: Tactile sensors and Proximity sensors.	10 Hours / L3

HEAD OF THE DEPARTMENT
Dept of Science & Humanities
Global Academy of Technology,
Rajarajeshwari Nagar, Bengaluru-98.

Module 4 **Industrial robot applications:** Material handling Applications: Material transfer, Machine loading and/or Unloading. Processing operations: Spot welding, Arc Welding, Spray coating, Drilling, Routing, Grinding, Wire brushing, Waterjet cutting, Laser cutting, Assembly and Inspection, Characteristics of Robot applications. **Different types of robots:** Industrial robots, Domestic or household robots, Medical robots, Military robots, Space robots, Hobby and competition robots. Various Generations ofRobots.	**10 Hours / L3**
Module 5 **Robot technology of the future:** Robot Intelligence, Artificial Intelligence and Robotics, Knowledge representation in AI, Introduction to Machine Vision, Telepresence and related technologies, Mobility, Locomotion and Navigation: Wheeled Vehicles, Walking Machines, Universal hand, System integration and networking	**10 Hours / L3**

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

CO251.1	Interpret the importance of automation, its progression, pros and cons, forms of automation and applications.
CO251.2	Demonstrate knowledge of industrial robots, their configurations, anatomy, and their specifications
CO251.3	Describe working principle of various actuators and sensors
CO251.4	Appreciate applications of robots in industry
CO251.5	Explain robot intelligence that balance the information processing power of computational systems with the help of artificial intelligence and decision making.

Textbooks:

1. Automation, Production Systems and Computer-Integrated Manufacturing, Mikell P. Groover, 4th edition, Pearson, Mikell P Groover.
2. Industrial Robotics – Technology, Programming and Applications (SIE) – Nicholas Orday, Mithell Weiss, Mikell Groover, Roger Nagel, 2nd Edition, 2017
3. Introduction to robotics mechanics and control - John J. Craig, Pearson, 3rd edition, 2009

Reference books:

1. Robotics for Engineers - Yoram Koren, McGraw Hill International, 1st edition, 1985.
2. Industrial Robotics - Weiss, Nagel, McGraw Hill International, 2nd edition, 2012.
3. Robotic Engineering - An Integrated approach, Klafter, Chmielewski and Negin, PHI, 1st edition, 2009.
4. Computer Based Industrial Control - Krishna Kant, EEE-PHI, 2nd edition, 2010.
5. An Introduction to Automated Process Planning Systems- Tiess Chiu Chang & Richard A. Wysk.

E-Books / Web References

1. **Fundamentals of Robot Technology**: An Introduction to Industrial Robots, Tele operators and Robot Vehicles: https://www.pdfdrive.com/fundamentals-of-robot-technology-an-introduction-to-industrial-robots-teleoperators-and-robot-vehicles-d157678284.html

2. **Robot Operating System for Absolute Beginners**: Robotics Programming Made Easy: https://www.pdfdrive.com/robot-operating-system-for-absolute-beginners-robotics-programming-made-easy-e176394485.html
3. Introduction to Robotics:
   - http://www.mech.sharif.ir/c/document_library/get_file?uuid=5a4bb247-1430-4e46-942c-d692dead831f&groupId=14040
   - https://www.researchgate.net/publication/273697873_Introduction_to_Robotics

MOOCs

1. NPTEL Course: "ROBOTICS" : https://nptel.ac.in/courses/112105249
2. NPTEL Course: "Introduction to Robotics": https://onlinecourses.nptel.ac.in/noc20_de11/preview

Scheme of Examination: (Theory courses)Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question fromeach module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. The average of the three tests are taken for computationof CIE on a scale of 40. CIE is executed by way of two quizzes / Other Assessment Tools (OATs), and three tests. **Some possible AATs:** Assignments / Oral presentations / Group activity/ProjectsTypical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	40	50
	CIE Test-2	40	
	CIE Test-3	40	
	Quiz /AAT	10	
SEE	Semester End Examination	100	50
Grand Total			100

CO/PO Mapping															
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO251.1	3	2	2	-	-	1	-	-	-	-	-	1	2	-	-
CO251.2	3	2	2	-	-	1	-	-	-	-	-	1	2	-	-
CO251.3	3	2	2	-	-	1	-	-	-	-	-	1	2	-	-
CO251.4	3	2	2	-	-	1	-	-	-	-	-	1	2	-	-
CO251.5	3	2	2	-	-	1	-	-	-	-	-	1	2	-	-
Average	3	2	2	-	-	1	-	-	-	-	-	1	2	-	-

Low - 1: Medium - 2: High - 3

HEAD OF THE DEPARTMENT
Dept of Scien[illegible] Humanities
Global Acaden[illegible] Technology,
Rajarajeshwari Nagar Bengaluru-98.

Semester I / II
Innovation & Design thinking

Course Code	22IDT16/26	CIE Marks	50
Hours/Week (L: T: P)	1:0:0	SEE Marks	50
No. of Credits	1	Examination Hours	1 hour

Course Objectives

CLO1	To explain the concept of customer-oriented innovation approach
CLO2	To generate and develop creative ideas
CLO3	To understand various approaches and methods onto business process

Content	No. of Hours/RBT levels
Module - 1 **Design Thinking** Introduction, Principles of Design Thinking, process of Design Thinking, problem space and solution space. Understand the problem statement: PESTEL Analysis, Trend Impact Analysis, Delphi method, Ishikawa diagram, Root conflict analysis, Field maps Empathetic design: Nine dimensions of descriptive observations, methods for Empathetic design - Artifact Analysis, Cognitive Walkthrough, Empathy map, Heuristic Evaluation, Customer Journey, Mystery Shopping, Behavioural Mapping & Tracking	6/L3
Module -2 Defining the problem – Persona, jobs- to-be-done methods Ideate phase, stages, Internal and external sources of information, Creative principles, Intuitive Creative Techniques, Systematic Analytical Techniques, Evaluation of Ideas Prototype phase, Minimum viable product, Methods to analyse prototypes Testing Phase, methods of testing, conducting interviews, Conduct surveys, Kano model, desirability testing	6/L3

Course Outcomes
Upon completion of this course, student will be able to:

CO 1	Describe design thinking process used to solve problems by focusing on the needs of the customer.
CO 2	Analyse the problem to ascertain its context and origins and gain a better understanding of the prospective customers
CO 3	Analyse the data gathered during understand and observation stages to define the problem statement
CO 4	Create ideas and solutions for the problem that has been specified
CO 5	Create a prototype by validating assumptions and ideas that can be tested by the user.

Textbooks:

1. Handbook of Design Thinking: Tips & Tools for how to design thinking by Christian Mueller-Roterberg, Kindle Direct Publishing

2. John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design", Cengage learning (International edition) Second Edition, 2013.
3. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press, 2009.

References:

1. Yousef Haik and Tamer M.Shahin, "Engineering Design Process", Cengage Learning, Second Edition, 2011.

Web links and Video Lectures (e-Resources)

1. www.tutor2u.net/business/presentations/./productlifecycle/default.html
2. https://docs.oracle.com/cd/E11108_02/otn/pdf/. /E11087_01.pdf
3. https://www.mindtools.com/brainstm.html
4. https://designthinkingforeducators.com/design-thinking/

CO – PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22IDT16.1	2	-	-	-	-	-	-	-	-	-	-	2
22IDT16.2	2	2	2	-	-	-	-	-	-	-	-	2
22IDT16.3	2	2	2	-	-	-	-	-	-	-	-	2
22IDT16.4	2	2	2	-	-	-	-	-	-	-	-	2
22IDT16.5	2	2	2	-	-	-	-	-	-	-	-	2
22IDT16	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**

Low-1: Medium-2: High-3

HEAD OF THE DEPARTMENT
Dept of Science & Humanities
Global Academy of Technology,
Rajarajeshwari Nagar Bengaluru-98.

Semester II

Course: Integral Calculus and Differential Equations

Course Code	22MAT21	CIE Marks	50
Hours/Week (L: T: P)	3:2:0	SEE Marks	50
No. of Credits	4	Examination Hours	03

Course Objectives

To enable students to apply the knowledge of Mathematics in various fields of engineering by making them to learn the following:

CLO1	Multiple integrals and Beta-Gamma functions
CLO2	Vector integration
CLO3	First and higher order ordinary differential equations
CLO4	Partial differential equations

Content	No. of Hours/ RBT levels
Module 1 Multiple integrals: Evaluation of double integrals by direct evaluation, change of order and change of variables. Evaluation of triple integrals. Beta and Gamma functions; relation between beta and gamma functions - simple problems.	10 Hours L2, L3
Module 2 Line integrals, Green's theorem in the plane, Stoke's theorem: Relation between line and surface integrals, Gauss Divergence theorem: Relation between surface and volume integrals- simple problems.	10 Hours L2, L3
Module 3 Differential Equations of first order and first degree: Variable separable, Linear equations, Bernoulli's equation, Exact and reducible to exact differential equations. Equations of first order and higher degree (solvable for p only).	10 Hours L2, L3
Module 4 Linear differential equations with constant coefficients -Inverse differential operators, method of variation of parameters. Cauchy's and Legendre's Linear differential equations.	10 Hours L2, L3
Module 5 Formation of partial differential equations. Solution by direct integration,linear equations of first order. Homogeneous linear equations with constant coefficients. Method of separation of variables.	10 Hours L2, L3

Course Outcomes

Upon completion of this course, student will be able to:

CO21.1	Evaluate double and triple integrals
CO21.2	Evaluate definite integrals using beta and gamma functions
CO21.3	Evaluate integrals using Green's, Stokes and Gauss divergence theorem
CO21.4	Solve linear and nonlinear ordinary differential equations
CO21.5	Solve partial differential equations

Text books:

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 44th Edition, 2017.

2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill, 2006

References:

1. Advanced Engineering Mathematics, E. Kreyszig, John Wiley & Sons, 10th Edition,2016.
2. H.K. Dass and Er. Rajnish Verma: Higher Engineering Mathematics, S. Chand publishing, 1stedition, 2011.
3. A Text Book of Engineering Mathematics, N. P. Bali and Manish Goyal, Laxmi Publications, 6thEdition, 2014.
4. Calculus, James Stewart, Cengage Publication, 7th Edition, 2012.

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of three sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average of Marks scored in all three tests is added to test component. CIE is executed by way of quizzes / Alternate Assessment Tools (AATs), and three tests. **Some possible AATs:** seminar/assignments/ mini-projects/ concept videos/ partial reproduction of research work/ group activity/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

Component		Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Assignments	**10**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping												
CO/PO	IPO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO21.1	3	2										3
CO21.2	3	2										3
CO21.3	3	2										3
CO21.4	3	2										3
CO21.5	3	2										3
Average	3	2										3

HEAD OF THE DEPARTMENT
Dept of Science & Humanities
Global Academy of Technology,
Rajarajeshwari Nagar, Bengaluru-98.

Dean Academic
Global Academy of Technology,
Rajarajeshwarinagar, Bengaluru-98