मौलाना आजाद राष्ट्रीय प्रौद्योगिकी संस्थान, भोपाल

स्कीम और सिलेबस

(केवल प्रथम वर्ष)

सेशन 2025-26 से आगे

प्रथम वर्ष B.Tech./B.Tech.-M.Tech. (डुअल डिग्री)

MAULANA AZAD

NATIONAL INSTITUTE OF TECHNOLOGY, BHOPAL

Scheme and Syllabus

(First Year Only)

Session 2025-26 Onwards

First Year B. Tech./B.Tech.-M.Tech. (Dual Degree)

Session 2025-26 Onwards
First Year B. Tech./B.Tech.-M.Tech. (Dual Degree)
Scheme

First Semester

(Section A,B,C,D& E)/(Section F, G, H, I & J)

Course Code	Course Name	Periods per week			Credits
		L	T	P	
MC1101	Mathematics 1	3	1	-	4
PY1102/ CY1107	Physics/ Engineering Chemistry	3	-	-	3
CE1103/ EE1108	Engineering Mechanics/ Basic Electrical & Electronics Engineering	3	**1**	-	4
ME1104/ME1109	Engineering Graphics/ Manufacturing Science	1	-	-	1
CS1105/CY1110	Computer Programming & Problem Solving/ Environmental Science	2	-	-	2
HS1106/BS1111	Communication Skill/Biology for Engineers	1/2	-	-	1/2
CE1121/EE1125	Engineering Mechanics Laboratory / Basic Electrical & Electronics Engineering Laboratory	-	-	2	1
PY1122/CY1126	Physics Laboratory / Engineering Chemistry Laboratory	-	-	2	1
ME1123/ME1127	Engineering Graphics Laboratory / Manufacturing Science Laboratory	-	-	2	1
CS1124/HS1128	Computer Programming Laboratory / Language Laboratory	-	-	2	1
SA1141or SA1142 / SA1143 or SA1144 or SA1145	(Life Skill Management or Physical Education)/ (NSS or Yoga or Universal Human Values and Professional Ethics)	-	-	2	1
Total Hours = 25/26		**13/14**	**2**	**10**	**20/21**
NC1151*	National Cadet Corps I	**1**	**1**	**-**	**2**

*Not to be counted in SGPA/ CGPA calculations

Second Semester

(Section A,B,C,D& E)/(Section F, G, H, I & J)

Course Code	Course Name	Periods per week			Credits
		L	T	P	
MC1201	Mathematics II	3	1	-	4
CY1207/PY1202	Engineering Chemistry/Physics	3	-	-	3
EE1208/CE1203	Basic Electrical & Electronics Engineering/ Engineering Mechanics	3	**1**	-	4
ME1209/ME1204	Manufacturing Science/ Engineering Graphics	1	-	-	1
CY1210/CS1205	Environmental Science /Computer Programming & Problem Solving	2	-	-	2
BS1211/HS1206	Biology for Engineers/ Communication Skill	2/1	-	-	2/1
EE1225/CE1221	Basic Electrical & Electronics Engineering Laboratory / Engineering Mechanics Laboratory	-	-	2	1
CY1226/ PY1222	Engineering Chemistry Laboratory / Physics Laboratory	-	-	2	1
ME1227/ME1223	Manufacturing Science Engineering Laboratory /Graphics Laboratory	-	-	2	1
HS1228/CS1224	Language Laboratory/ Computer Programming Laboratory	-	-	2	1
SA1243 or SA1244 or SA1245 / SA1241or SA1242	NSS or Yoga or Universal Human Values and Professional Ethics / Life Skill Management or Physical Education	-	-	2	1
Total Hours = 26/25		**14/13**	**2**	**10**	**21/20**
NC1252*	National Cadet Corps II	**1**	**1**	**-**	**2**

* Not to be counted in SGPA/ CGPA calculations

Syllabus

First Semester (Scheme)

(Section A,B,C,D& E)/(Section F, G, H, I & J)

Course Code	Course Name	Periods per week			Credits
		L	T	P	
MC1101	Mathematics 1	3	1	-	4
PY1102/ CY1107	Physics/ Engineering Chemistry	3	-	-	3
CE1103/ EE1108	Engineering Mechanics/ Basic Electrical & Electronics Engineering	3	**1**	-	4
ME1104/ME1109	Engineering Graphics/ Manufacturing Science	1	-	-	1
CS1105/CY1110	Computer Programming & Problem Solving/ Environmental Science	2	-	-	2
HS1106/BS1111	Communication Skill/Biology for Engineers	1/2	-	-	1/2
CE1121/EE1125	Engineering Mechanics Laboratory / Basic Electrical & Electronics Engineering Laboratory	-	-	2	1
PY1122/CY1126	Physics Laboratory / Engineering Chemistry Laboratory	-	-	2	1
ME1123/ME1127	Engineering Graphics Laboratory / Manufacturing Science Laboratory	-	-	2	1
CS1124/HS1128	Computer Programming Laboratory / Language Laboratory	-	-	2	1
SA1141or SA1142 / SA1143 or SA1144 or SA1145	(Life Skill Management or Physical Education)/ (NSS or Yoga or Universal Human Values and Professional Ethics)	-	-	2	1
Total Hours = 25/26		**13/14**	**2**	**10**	**20/21**
NC1151*	National Cadet Corps I	**1**	**1**	**-**	**2**

*Not to be counted in SGPA/ CGPA calculations

Section A to E (Sem I)

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: I	Academic Year: 2025-26 onwards		
Name of Course	**Mathematics-I**					
Course Code	**MC 1101**					
Core / Elective / Other	**Core**					
Concerned Department/ Section/Centre	Department of Mathematics, Bioinformatics and Computer Applications					
Credits	**4**	**Periods per week**		**L**	**T**	**P**
				3	**1**	**0**
Prerequisite:						
Prerequisite: None						
Course Outcomes: At the end of this course, the student will be able to:						
1.	Understand and interpret the concepts of differential calculus, integral calculus, vector calculus.					
2.	Compute the solution of high dimensional homogeneous and non-homogeneous differential equations.					
3.	Integrate higher dimension and vector calculus problems.					
4.	Design and find the analytical solution of their engineering problems.					
Description of Contents in brief:						
1.	Calculus: Sequence and Series, Convergence of sequence and series. Limit, Continuity, Partial differentiation, Total differentiation, Taylor's Series. Maximum and Minima of functions of two or more variables, Lagrange method of undetermined multipliers.					
2.	Multiple Integral: Double and triple integral, Change of order of integration, length of curves, Area, Volume of solids of revolution.					
3.	Vector Calculus: Vector differentiation, Gradient, Directional derivative, Divergence and curl of vector point function, Line integral, Surface integral, Gauss divergence theorem, Stokes theorem, and Green's theorem.					
4.	Ordinary Differential Equation (ODE): Formation of ODE, Existence and uniqueness of first order ODE, Differential equation of first order and first degree, exact ODE, Integrating factor, Cauchy-Euler equations, Simultaneous differential equations, Higher order differential equations with constant coefficients, Variation of parameters.					
List of Textbooks:						
1.	James Stewart. Calculus Early Transcendentals, 7th Edition, Brooks/Cole Cengage Learning, Narosa Publishing House, New Delhi, 2016.					
2.	R. K. Jain and S. R. K. Iyengar. Advanced Engineering Mathematics, 5th Edition, CRC Press, Narosa Publishing House, New Delhi, 2016.					
3.	E. Kreyszig. Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, Inc., New York, 2016.					
4.	Shepley L Ross. Differential Equations, 3rd Edition, John Wiley & Sons, 2004					
List of Reference Books:						
1.	B.V. Ramana, Higher Engineering Mathematics, 1st Edition, Tata McGraw-Hill Education, New Delhi, 2017.					
2.	G. B. Thomas, Jr., M. D. Weir and J. R. Hass, Thomas' Calculus, 13th Edition, Pearson Education, Inc., New York, 2014.					
URLs:						
1.	https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-ma49/					
2.	https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-ma37/					
3.	https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-ma27/					
4.	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-ma12/					
Lecture Plan (about 42-45 Lectures):						
Lecture No.	**Topic**					
1-2	Sequence, Series and their convergence					

3	Limit and continuity of a real valued function of multiple variables
T-1	Tutorial 1
4-6	Partial differentiation, total differentiation, and related problems
7	Expansion of functions using Taylor's series
T-2	Tutorial 2
8-9	Maxima and minima of functions of two or more variables
10	Lagrange method of undetermined multipliers
T-3	Tutorial 3
11-12	Beta and Gamma function, double and triple integrals
13-14	Change of order of integration
T-4	Tutorial 4
15-16	Length of curves, Area, Volume of solids of revolution
17-18	Vector differentiation, gradient, directional derivative, Divergence & curl of vector point functions
T-5	Tutorial 5
19-21	Line integral, surface integral and their applications
T-6	Tutorial 6
22-24	Gauss divergence theorem, Stokes theorem, Green's theorem
T-7	Tutorial 7
25	Introduction to ordinary differential equations: Formation of ODE
26	Existence and Uniqueness of first order of ODE
27-28	Differential equation of first order and first degree, exact ODE, Integrating factor
T-8	Tutorial 8
29-32	Linear ODE with constant coefficients, Simultaneous homogeneous linear ODE
T-9	Tutorial 9
33-34	Higher order homogeneous linear ODE with constant coefficients, Cauchy-Euler equations
35	Variation of parameters
T-10	Tutorial 10

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: I	Academic Year: 2025-26 onwards
Name of Course	Physics			
Course Code	PY 1102			
Core / Elective / Other	Core			
Concerned Department/ Section/Centre	Physics			

Credits	3	Periods per week	L	T	P
			3	0	0

Prerequisite:	
	Students must have the basic knowledge of physics with emphasis on optics, types of static/dynamic forces, Newton's law of motions, basic semiconductor devices, nuclear physics and knowledge of Engineering mathematics involving differentiation and integration.
Course Outcomes: Upon successful completion of the course the student will be able to:	
1.	**Understand basic physical fundamentals and the key vocabulary to describe them:** Interference and Diffraction of light, Energy band gaps, Quantum effect, Particle accelerator, Fission & Fusion, LASER, Fiber optics communication, Theory of Relativity and Electron ballistics.
2.	Apply an understanding of these concepts to various systems and devices.
3.	Acquire problem solving skills, mathematical techniques, and the ability to apply conceptual understanding of the Physics to general real-world situations.
4.	To design and conduct new experiments and to analyze the data interpretation.
Description of Contents in brief:	
1.	**Wave Optics:** Interference and Diffraction, Michelson's interferometer
2.	**Solid State and Semi-Conductor Physics:** Energy bands in solids, Electron and hole mobility, Hall effect, PN junction transistor, Transistor parameters, Photo cell and Solar cell
3.	**Quantum Mechanics:** Schrodinger wave equation, Particle in a box, Harmonic oscillator, Tunnel effect
4.	**Nuclear Physics:** Nuclear properties, Nuclear models, Particle accelerator, Fission & Fusion, Chain reaction, Nuclear reactor, Particle detectors
5.	**Laser and Fiber Optics:** Laser phenomena, Ruby and He-Ne laser and applications, laser holography, Types of optical fibers, Attenuation, Fiber losses, Fiber optics communication
6.	**Theory of Relativity:** Transformation equations, Time dilation mass energy equation
7.	**Electron ballistics:** Motion of charged particles in electric and magnetic field, Electron microscope, Mass spectrographs
List of Text Books:	
1.	Engineering Physics: M.N. Avadhanulu, P.G.Kshirsagar, T V S Arun Murthy, (S. Chand)
2.	Engineering Physics: Hitendra K Malik, A. K. Singh, (Tata McGraw-Hill)
3.	Concepts of Modern Physics: Arther Beiser (McGraw-Hill)
4.	Principles of Optics: Brijlal Subramanyam (S. Chand)
List of Reference Books:	
1.	Modern Physics: Kenneth Krane, (John Wiley Eastern)
2.	Modern Physics: Paul A. Tipler & Ralph A. Llewellyn, (W. H. Freeman)
3.	Quantum Mechanics Concepts and Applications: Nouredine Zettili (Wiley)
4.	Optics: Ajoy K. Ghatak, (Tata McGraw-Hill Education)
5.	Fiber Optics & Lasers The Two Revolutions: Ajoy Ghatak & K. Thyagarajan , (Macmillan India Limited)

6.	Quantum Mechanics Concepts and Applications: Nouredine Zettili (Wiley)
7.	Quantum Mechanics Concepts and Applications: Nouredine Zettili (Wiley)
8.	Essentials of Quantum Mechanics by Fozia Z. Haque (Asian Books)
9.	University Physics: H.D. Young, Roger A Freedman, (Pearson)
10.	Solid State Electronics: B. G. Streetman, (Prentice Hall India)
11.	Solid State Physics: S. O. Pillai, (New Age International Publishers)
12.	A Textbook of Optics: N Subrahmanyam, Brij Lal & M N Avadhanulu, (S. Chand)
URLs:	
	https://www.youtube.com/watch?v=i_CijGuk7fw
	https://www.youtube.com/watch?v=Kp-jS6NHsB8

Lecture Plan (about 40-50 Lectures):

Lecture No.	Topic
Lecture 1	Introduction to syllabus, Interference: Introduction, Coherence, Types of Interference, Interference in thin (parallel surfaced) films
Lecture 2	Wedge shaped film, Newton's rings Experiment, Numerical Problems
Lecture 3	Michelson's Interferometer: Theory and applications, Numerical Problems
Lecture 4	Diffraction: definition, types and diffraction, Single slit diffraction
Lecture 5	Double slit diffraction p, missing order
Lecture 6	Diffraction through n-slit, Transmission Grating, Numerical Problems
Lecture 7	Tutorial of wave optics
Lecture 8	Semiconductor Physics: Free electron theory, Band theory of solids
Lecture 9	Fermi Energy and Fermi Energy level in Intrinsic and Extrinsic Semiconductors
Lecture 10	Charge carrier concentration in intrinsic semiconductor, electron hole mobility and conductivity, Numerical Problems
Lecture 11	P- N junction diode, Photocell
Lecture 12	Solar cell and its applications
Lecture 13	Hall effect and its applications, Numerical Problems
Lecture 14	Introduction to transistor: CE, CB and CC mode.
Lecture 15	Transistor parameters (α, β, γ and their relation), Numerical Problems
Lecture 16	Tutorial of semiconductor Physics
Lecture 17	Quantum Mechanics: Introduction to Quantum Mechanics, de-Broglie hypothesis, Concept of wave packet, Heisenberg's uncertainty principle, Postulates of Quantum Mechanics
Lecture 18	Properties of matter wave, Probabilistic interpretation of wave function
Lecture 19	Schrodinger's time dependent and time independent wave equation.
Lecture 20	Particle in a box (1D and 3D), Tunnel effect (α-decay)
Lecture 21	Harmonic Oscillator, Zero-point energy, Numerical Problems
Lecture 22	Tutorial of quantum mechanics
Lecture 23	Nuclear Physics: Nuclear properties, Mass defect, Semi-empirical mass formula, binding energy and Numerical Problems
Lecture 24	Nuclear Models: Liquid drop model and its success & failure
Lecture 25	Shell model
Lecture 26	Particle accelerators: Cyclotron, synchro-cyclotron, Numerical Problems
Lecture 27	Betatron and Numerical Problems
Lecture 28	Nuclear fission and fusion, Chain reaction and Nuclear reactor
Lecture 29	Nuclear particle detectors (GM counter), Numerical problems
Lecture 30	Mass Spectrographs (Bainbridge and Aston)
Lecture 31	Tutorial of Nuclear Physics
Lecture 32	LASER: Absorption and Emission process, Einstein's A & B coefficient

Lecture 33	Pumping Scheme and its types, component of LASER
Lecture 34	Ruby laser and He-Ne Laser
Lecture 35	Laser Holography and applications
Lecture 36	Fibre Optics: Introduction to optical fibre, Acceptance angle.
Lecture 37	Types of fibre, V-number, Losses in optical fibre, Uses & applications of fibre
Lecture 38	Tutorial of LASER and optical fibre
Lecture 39	Theory of Relativity: Introduction, Michelson-Morley Experiment, Postulates of special theory of relativity
Lecture 40	Galilean transformation and Lorentz transformation equation
Lecture 41	Length contraction and time dilation
Lecture 42	Theorem of addition of velocities, Principle of simultaneity
Lecture 43	Mass energy equivalence relation, Relativistic mass, Numerical problems
Lecture 44	Tutorial of theory of relativity
Lecture 45	Electron Ballistic: Motion of charged particle (electron) in uniform electric field when the field is parallel, perpendicular and at an angle to velocity of electron
Lecture 46	Motion of charged particle (electron) in uniform magnetic field when the field is parallel, perpendicular and at an angle to velocity of electron
Lecture 47	Electron Optics: Bethe's law, electrostatic lens
Lecture 48	CRT, Electron microscope and Numerical Problems
Lecture 49	Tutorial of electron ballistic

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: I	Academic Year: 2025-26 onwards
Name of Course	Engineering Mechanics			
Course Code	CE1103			
Core / Elective / Other	Core			
Concerned Department/ Section/Centre	Civil Engineering			

Credits	4	Periods per week	L	T	P
			3	1	0

Prerequisite:

Course Outcomes: At the end of the course, the student will be able to:

1.	Apply concept forces in equilibrium in a static rigid body.
2.	Analyse trusses using method of joints and section.
3.	Determine centroid and moment of inertia of a planar surface
4.	Draw shear force and bending moment diagram for determinate beams
5.	Apply kinematics of particle and rigid bodies in various conditions

Description of Contents in brief:

1.	Force and Equilibrium:
2.	Vector representation of forces and moments- Vector operations, Planar Force system, composition of concurrent forces in plane free body diagram, reduction of force system to a force and a couple, equilibrium of Rigid bodies in two and three dimensions.
3.	Analysis of Trusses:
4.	Basics, classification of the force system, combination of forces and moments, method of joints, method of section, method of Tension coefficient and graphical approach.
5.	Centroid and Moment of Inertia:
6.	Centroid and Moment of Inertia for areas, Principal moment of inertia, Parallel axis theorem, Perpendicular axis theorem, Moment of Inertia for composite area.

List of Text Books:

1.	Timoshenko, S., Young D.H., Rao, J.V., and Pati, Sukumar, Engineering Mechanics (In SI Units), McGraw Hill Publishers.
2.	Meriam, J.L., Kraige, L.G. and Bolton, J.N., Engineering Mechanics (Statics and Dynamics) Wiley India.

List of Reference Books:

1.	Hibbeler, R. C., Engineering Mechanics (statics and dynamics) (SI Edition), Pearson publication

URLs:

1.	https://nptel.ac.in/
2.	https://swayam.gov.in/

Lecture Plan (about 40-50 Lectures):

Lecture No.	Topic
1-5	Force and Equilibrium Vector representation of forces and moments- Vector operations, Planar Force system, composition of concurrent forces in plane free body diagram, reduction of force system to a force and a couple, equilibrium of Rigid bodies in two and three dimensions.
6-11	Analysis of Trusses Basics, classification of the force system, combination of forces and moments, method of joints, method of section, method of Tension coefficient and graphical approach.
12-17	Centroid and Moment of Inertia Centroid and Moment of Inertia for areas, Principal moment of inertia, Parallel axis theorem, Perpendicular axis theorem, Moment of Inertia for composite area.
18-26	Analysis of determinate beams Shear force and bending moment diagrams for simply supported beams, cantilever beams and over hanged beams, Load vs shear force vs bending moment relationship

27-32	Friction Friction, Coulombs laws of dry friction, Limiting friction, Problems on Wedge friction, Belt Friction-problems.
33-40	Plane Kinematics and Kinetics of a rigid body Relative velocity and Acceleration, Instantaneous centre of zero velocity, Rotating axis, Force, Mass and Acceleration, Work & Energy, Impulse & Momentum; Introduction to three-dimensional kinematics and kinetics of rigid body, Coriolis force.
40	Total No. of Lectures

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: I	Academic Year: 2025-26 onwards
Name of Course	Engineering Graphics (Theory)			
Course Code	ME1104			
Core / Elective / Other	Core			
Concerned Department/ Section/Centre	Mechanical Engineering			
Credits	01	Periods per week	L: 1	T: 0 / P: 0

Prerequisite: Basic Knowledge of working on computer software and Geometry	
Course Outcomes: At the end of the course, the student will be able to:	
1.	Apply the accepted conventions and abbreviations of engineering graphics so that they can draw clearly for those familiar with the subject
2.	Visualize and create the drawing with the aid of CAD software.
3.	Design the objects in 2D and 3D projections
Description of Contents in brief:	
1.	Basic Concepts-Introduction to engineering drawing, types of lines, dimensioning, title block, Basic drawing tools and commands of Computer Aided Drafting software, Theory of Projections, Reference planes, Types of Projection methods, Orthographic projection. Projection of points in different orientations.
2.	Projection of Straight lines, Projection of Planes, Projections using auxiliary planes method.
3.	Projection of solids- Projection of polyhedrons, Prisms, and pyramids, Projection of solids of revolution in different positions.
4.	Section of solids- cutting planes, auxiliary planes, frustum, and truncated parts of solids.
5.	Development of solids- principle of development, parallel line method, radial line method.
List of Text Books:	
1.	Varghese, P. I. (2013). Engineering Graphics. McGraw Hill Education.
2.	Bhatt, N.D. (2014). Engineering Drawing (53rd Edition). Charotar Publishing House.
3.	French, T.E., Vierck, C.J., Foster, R.J. Engineering Drawing and Graphic Technology. McGraw-Hill International.
List of Reference Books:	
1.	Shah, M.B. Rana, B.C (2009). Engineering Drawing (2nd Ed.). Pearson Education India.
2.	Dhananjay, J.A. (2017). Engineering Drawing with an Introduction to AutoCAD. McGraw Hill Education.
3.	Gill, P.S. (2013). Engineering Drawing. S.K. Kataria& Sons
URLs:	
1.	https://nptel.ac.in/courses/112104172/

Lecture Plan (about 20-30 Lectures):	
Lecture No.	Topics
Lecture 1	Basic Concepts-Introduction to Engineering Drawing, Dimensioning and Labelling.
Lecture 2	Theory of Projections, Reference planes, Types of projection methods
Lecture 3	Projection of Points
Lecture 4	Orthographic projection
Lecture 5	Orientation of Straight Lines, Trace of Lines, Projection of Lines parallel and perpendicular to reference planes
Lecture 6	Projection of Lines inclined to reference planes, Miscellaneous Problems
Lecture 7	Orientation of Planes, Trace of Planes, Projection of Planes parallel to reference planes
Lecture 8	Projection of Planes perpendicular to reference planes, parallel to profile planes

Lecture 9	Projection of Planes inclined to reference planes, Miscellaneous Problems
Lecture 10	Classification and Orientation of Solids, Projection of Solids with axis perpendicular to reference planes
Lecture 11	Projection of Solids with axis parallel to reference planes, Miscellaneous Problems
Lecture 12	Projection of Solids with axis inclined to either of one of the reference planes
Lecture 13	Projection of Solids with axis inclined to both the reference planes, Miscellaneous Problems
Lecture 14	Terminologies used, Types of Section Planes, Projection of Section of Solids by Plane Perpendicular to reference planes
Lecture 15	Projection of Section of Solids by Plane Perpendicular to both the reference planes
Lecture 16	Section of Solids by Plane inclined to the reference planes, Projection of the True shape of Section
Lecture 17	Miscellaneous Problems - Projection of frustum and truncated parts of solids
Lecture 18	Classification of Surfaces and Different Methods of Development
Lecture 19	Development of Prism, Cylinder.
Lecture 20	Development of Cones, Pyramids, and Spheres.

Name of Program	B.Tech.	Year: First Year	Semester: I	Academic Year: 2025-26 onwards
Name of Course	Computer Programming and Problem Solving			
Course Code	CS1105			
Core / Elective / Other	Core			
Concerned Department/ Section/Centre	Department of Computer Science			

Credits	2	Periods per week	L	T	P
			2	0	0

Prerequisite:	
1	There are no prerequisites to learn C programming.
2	Just a bit of logical skills should be enough.
Course Outcomes: At the end of the course, the student will be able to:	
1.	Identify situations where computational methods and computers would be useful. Given a computational problem, identify and abstract the programming task involved.
2.	Design algorithm and illustrate flowchart for a given problem.
3.	Write the program on a computer, edit, compile, debug, correct, recompile and run it.
4.	Identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.
5.	Learn the basics of the Internet of Things and its applications. Understand Arduino Architecture, programming and interfacing with sensors.
Description of Contents in brief:	
1.	Introduction to Computer and its organization.
2.	Problem solving using Computers by Flowchart and Algorithms.
3.	Developing and running computer programs in C.
4.	C programming using conditions, loop, array, functions, pointers and structures.
5.	Introduction to IoT using Arduino.
List of Text Books:	
1.	E. Balaguruswamy, “Programming in ANSI C”, Tata McGraw-Hill.
2.	Suresh Kumar Srivastava, “C in Depth”, BPB Publication.
3.	R. G. Dromey, "How to Solve It By Computer", Pearson
4.	K R Venugopal, “Mastering C”, Tata McGraw-Hill.
List of Reference Books:	
1.	Yashavant P. Kanetkar, “Let us C”, BPB Publication
2.	A.R. Bradley, "Programming for Engineers", Springer
3.	Schildt Herbert, “C- The Complete Reference” ,Tata McGraw-Hill.
4.	Dan Gookin,”Begin programming with C for Dummies”, Wiley
URLs:	
1.	https://nptel.ac.in/courses/106/105/106105171/
2.	https://www.nptel.ac.in/courses/106/104/106104128/

Lecture Plan (about 24-30 Lectures):	
Lecture No.	**Topic**
1	Fundamentals of Computing, Evolution of Computer Hardware and Moore’s Law, Organization of Computing Systems - Input/Output devices, Memory,Instructions, Program,Software, Operating System
2-3	Problem solving using Computers- Writing algorithms
4	Problem solving using Computers- Flowcharting technique,
5	Assembler, Compiler, Interpreter, Debugger, Editor, Program execution, Phases of developing a running computer program in C
6-7	Constants, Variables, Expressions,Statements: Declarations, Input-Output Statements,Operators,Operator precedence in C. Data types, size and values, Char, Unsigned and Signed data types, Overflow
8	Number systems and representations.
9-10	Selection Statements & Compound statements

11-12	Repetitive statements - While loop
13-14	Do-while loop
15-16	For loop
17	Arrays
18	Sorting problem: Bubble Sort, Search problem: Linear search
19	Multidimensional Arrays and Matrices -I
20	Functions: The prototype declaration, Function definition, Function call: Passing arguments to a function by value
21	Pointers: Pointer variables, Declaring and dereferencing pointer variables, Function call: Passing arguments to a function by reference
22	Accessing arrays through pointers
23	Scope of variable, Recursive function call
24	Pointer arithmetic, Pointer Types , Strings: String operations in C
25	Structures and Union in C, Typedef Structures.
26	File input-output in C. Opening, closing and reading from files
27	Introduction to the Internet of Things and Arduino. Sensors. Interfacing with LED with an Arduino board and ON/OFF the LED.
28	Interfacing with different sensors with an Arduino board and displaying their reading - I

Name of Program	**B.Tech**	**Semester: I**	**Year: 2025**		
Name of Course	**Communication Skills**				
Course Code	**HS1106**				
Core	**Core**				
Concerned Department/ Section/Centre	**Humanities and Social Sciences**				
Credits	**1**	**Periods per week**	**L**	**T**	**P**
			1	**0**	**0**

Prerequisite:	
1.	To succeed in this course, the students should have basic knowledge of English grammar
2.	They should be able to frame sentences in English using appropriate vocabulary and grammar, and apply them in their social and professional life
3.	The students should also have the ability to analyse communication behaviours
Course Outcomes:	
1.	On successful completion of this course, undergraduate students will be able to comprehend and communicate in English through exposure to the theory and practice of communication skills.
2.	They will be able to apply the basic grammatical skills of English Language through intensive practice.
3.	The students will also be able to write, organise, comprehend, and present short and long-form technical work effectively.
Description of Contents in brief:	
1.	Unit I: Communication Communication Skills: Introduction, Significance, Communication process, Barriers to communication, Verbal and non-verbal communication, Body language
2.	Unit II: Oral and Written Communication Oral presentations, Multimedia presentation, Communication styles, Voice modulation, Group discussion, Paragraph writing, Letter writing, Report writing
3.	Unit III: Soft Skills Interpersonal skills: emotional and social skills, Critical thinking and problem solving, Positive attitude, Time management, Leadership, SWOT analysis, Stress management
4.	Unit IV: Developing Other Skills Reading styles and strategies, Vocabulary, Idioms and phrases, Functional grammar and Common errors,
List of Text Books:	
1.	English Language Communication Skills. UrmilaRai. Himalaya Publishing House (2024)
2.	Communication Skills for Engineers and Scientists. Binod Mishra &Sangeeta. Sharma. PHI Learning Pvt. Ltd, 2023
3.	The Essence of Effective Communication – Ron Ludlow and Fergus Panton (PH). 1992
List of Reference Books:	
1.	A Textbook of Communicative English. Dr. Nisheeth Srivastava. The Hospitality Press (2023)
2.	Soft Skills for Everyone. Jeff Butterfield.
3.	Improving Your English Skills: The Ideal Companion for English Improvement.
URLs:	
1.	https://nptel.ac.in/courses/109/105/109105110
2.	https://nptel.ac.in/courses/109/105/109105117
3.	https://nptel.ac.in/courses/109/104/109104115

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: I	Academic Year: 2025-26 onwards		
Name of Course	Engineering Mechanics Lab					
Course Code	CE1121					
Core / Elective / Other	Core					
Concerned Department/ Section/Centre	Civil Engineering					
Credits	1	Periods per week		L	T	P
				0	0	2

Prerequisite:

Course Outcomes: At the end of the course, the student will be able to:

1.	Apply the fundamental laws of mechanics—triangle, parallelogram, and polygon laws—to analyze force systems in equilibrium.
2.	Demonstrate the principles of moments, support reactions, and axial forces in structural members through experimental setups.
3.	Analyze the behavior of physical systems under static and dynamic conditions, including friction, motion, and energy conservation.
4.	Evaluate the centroid and moment of inertia of mechanical elements to support engineering design and structural analysis.

Description of Contents in brief:

1.	These experiments focus on verifying fundamental principles of engineering mechanics such as force equilibrium (triangle, polygon, and parallelogram laws), moments, and support reactions. They include practical setups like the bell crank lever, trusses, simply supported beams, and 3D force systems to observe real-time mechanical responses. Frictional behavior and energy conservation are studied through motion experiments and inclined planes. Additionally, geometric and mass properties like centroids and moment of inertia are experimentally determined to reinforce theoretical understanding.

List of Text Books:

1.	Timoshenko, S., Young D.H., Rao, J.V., and Pati, Sukumar, Engineering Mechanics (In SI Units), McGraw Hill Publishers.
2.	Meriam, J.L., Kraige, L.G. and Bolton, J.N., Engineering Mechanics (Statics and Dynamics) Wiley India.

List of Reference Books:

1.	Hibbeler, R. C., Engineering Mechanics (statics and dynamics) (SI Edition), Pearson publication

URLs:

1.	https://nptel.ac.in/
2.	https://swayam.gov.in/

List of Experiments

Experiment.	Experiment
1.	Verification of triangle law and parallelogram law of forces
2.	Verification of polygon law of forces
3.	Verification of principle of moments using the bell crank lever apparatus
4.	Verification of support reactions of a simply supported beam
5.	Verification of condition of equilibrium of a system of forces
6.	Verification of axial forces in the members of a truss
7.	Verification of equilibrium of three dimensional forces
8.	Determination of coefficient of friction between two surfaces
9.	Verification of centroid of different laminae
10.	Determination of moment of inertia of a flywheel
11.	Verification of Newton’s law of motion
12.	Verification of motion parameters using conservation of energy

Name of Program	B.Tech.	Year: First Year	Semester: I	Academic Year: 2025-26
Name of Course	**Physics Laboratory**			
Course Code	**PY 1122**			
Core / Elective / Other	**Core**			
Concerned Department/ Section/Centre	Physics			

Credits	02	Periods per week	L	T	P
			2	0	0

Prerequisite:	
	The knowledge of physics with special reference to concept of light, types of static/dynamic forces, Newton's law of motions, basic semiconductor devices and knowledge of Engineering mathematics involving differentiation and integration.
Course Outcomes: At the end of the course, the student will be able to:	
Upon successful completion of the course the student will be able:	
1.	To design and conduct simple experiments as well as analyze and interpret data.
2.	Develop skills in observation, interpretation, reasoning, synthesis, generalizing, predicting, and questioning as a way to learn new knowledge.
3.	To apply conceptual understanding of the physics to general real-world situations.
Description of Contents in brief:	
1.	To plot the characteristics curves of a p-n junction diode and calculate its resistance.
2.	To plot the characteristics curves of PNP transistors in CE mode.
3.	To determine frequency of AC mains using an electrical vibrator.
4.	To determine the radius of curvature of a lens by Newton's ring method.
5.	To determine the refractive index and dispersive power of the material of the prism for various colors of mercury light using prism and spectrometer.
6.	To determine the wavelength of different colors of mercury light using a plane transmission grating.
7.	To determine percentage of transmission of light for a semitransparent film using Lummer-Brodhum photometer.
8.	To study diffraction at multi-slit using He-Ne laser.
9.	To determine the wavelength of He-Ne laser by Michelson Interferometer.
10.	To determine Hall Potential and Hall Coefficient.
11.	To verify the formula for the combination of lenses and to determine the cardinal points of the combination using Nodal Slide assembly.
12.	To measure resistivity of a semiconductor by Four Probe method at different temperatures and determine the Band-gap.
13.	To determine the Plank's Constant using LED.
14.	To study the characteristic of Photoconductive material.
List of Text Books:	
1.	Engineering Physics: M.N. Avadhanulu, P.G.Kshirsagar, T V S Arun Murthy, (S. Chand).
2.	Concepts of Modern Physics: ArtherBeiser (McGraw-Hill).
3.	Principles of Optics: Brijlal Subramanyam (S. Chand).
List of Reference Books:	
1.	Concepts of Modern Physics: ArtherBeiser (McGraw-Hill).
2.	Text Book on Advanced Practical Physics by Chauhan & Singh.
3.	Laboratory Manual of MANIT Physics Lab.

URLs:	
1.	https://www.manit.ac.in/sites/default/files/documents/BTech%20I%20Yr%20Physics%20Lab%20Mannuals%20hindi-english%20%282%29.pdf
2.	https://www.vlab.co.in/broad-area-physical-sciences

List of experiments: 14	
experiments No.	**Experiments name**
1	P-N Junction Diode
2	Transistor
3	AC Mains
4	Newton's Rings
5	Refractive Index & Dispersive Power
6	Transmission Grating
7	L-B Photometer
8	Multi slit Experiment
9	Michelson Interferometer
10	Hall Effect
11	Nodal slide Assembly
12	Four Probe
13	Planck's Constant
14	Photo Conductivity

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: I	Academic Year: 2025-26 onwards		
Name of Course	**Engineering Graphics Laboratory**					
Course Code	**ME1123**					
Core / Elective / Other	**Core**					
Concerned Department/ Section/Centre	Mechanical Engineering					
Credits	**01**	**Periods per week**		**L**	**T**	**P**
				0	**0**	**2**

Prerequisite: Basic Knowledge of working on computer software and Geometry

Course Outcomes: At the end of the course, the student will be able to:

1.	Apply the accepted conventions and abbreviations of engineering graphics so that they can draw clearly for those familiar with the subject
2.	Visualize and create the drawing with the aid of CAD software.
3.	Design the objects in 2D and 3D projections

Description of Contents in brief:

Experiment No. 1	To describe the basic features and tools of CAD software.
Experiment No. 2	To draw 2D sketches of different geometrical shapes.
Experiment No. 3	To convert a 3D view of different solid models into 2D views using Orthographic Projection.
Experiment No. 4	To draw projections of points in four angle projections.
Experiment No. 5	To draw a projection of straight lines in simple positions.
Experiment No. 6	To draw a projection of straight lines inclined to both the reference planes.
Experiment No. 7	To draw a projection of planes in different orientations.
Experiment No. 8	To draw a projection of regular 3D objects.
Experiment No. 9	To draw a sectional view of regular 3D objects, including Auxiliary Cutting Planes.
Experiment No. 10	To develop the surface of regular 3D objects using parallel lines and radial line methods.

List of Text Books:

1.	Varghese, P. I. (2013). Engineering Graphics. McGraw Hill Education.
2.	Bhatt, N.D. (2014). Engineering Drawing (53rd Edition). Charotar Publishing House.
3.	French, T.E., Vierck, C.J., Foster, R.J. Engineering Drawing and Graphic Technology. McGraw-Hill International.

List of Reference Books:

1.	Shah, M.B. Rana, B.C (2009). Engineering Drawing (2nd Ed.). Pearson Education India.
2.	Dhananjay, J.A. (2017). Engineering Drawing with an Introduction to AutoCAD. McGraw Hill Education.
3.	Gill, P.S. (2013). Engineering Drawing. S.K. Kataria& Sons

URLs:

1.	https://nptel.ac.in/courses/112104172/

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: I	Academic Year: 2025-26 onwards		
Name of Course	Problem Solving & C Programming					
Course Code	CS 1124					
Core / Elective / Other	Core					
Concerned Department/ Section/Centre	Computer Science and Engineering					
Credits	01	Periods per week		L	T	P
				0	0	2

Prerequisite:	
	NIL
Course Outcomes:	
Upon successful completion of the course the student will have:	
1.	Understanding of fundamentals of C programming
2.	Ability to choose appropriate loops/decision constructs while writing C programs.
3.	Ability to modularize C programs through functions
4	Understanding of pointers and their usage
5.	Ability to implement different operations on arrays
Description of Contents in brief:	
1.	Mobile Application development without the use of programming constructs
2.	Programs to understand the basics of C Programming language (variables, constants, operators, expression evaluation, managing input and output)
3.	Programs for implementing decision making statements
4.	Programs to understand the working of looping construct in C (1D and 2D)
5.	Programs to implement the concept of functions for modularizing C programs
6.	Programs to understand the working of pointers
7.	Programs to understand the application of arrays for solving computational problems
8.	Simulation of Arduino Sensor interfacing
List of Text Books:	
1.	E. Balaguruswamy, “Programming in ANSI C”, Tata McGraw-Hill.
2.	K R Venugopal, “Mastering C”, Tata McGraw-Hill.
3.	Yashavant P. Kanetkar, “Let us C”, BPB Publication
List of Reference Books:	
1.	Schildt Herbert, “C- The Complete Reference”, Tata McGraw-Hill.
2.	The C Programming Language, 2e, by Brian W. Kernighan & Dennis M. Ritchie, PHI/Pearson Education
3.	Programming with C by Gottfried, Tata McGraw Hill (Schaum’s Series)
URLs:	
1.	https://appinventor.mit.edu/
2.	https://wokwi.com/
List of experiments: 9	

Experiment No.	Experiments name
1	Design your own mobile app (without using any programming) by using the MIT APP Inventor portal.

2	a	Write a C program that calculates the total interest income on amount Rupees 5 lakhs in a period of 10 years. Show the results for simple interest, compounded interest when the compounding is done annually, semi-annually, quarterly, monthly and daily. Assume that the interest rate is 3.5% per year.
	b	Write a C program that reads two values from the keyboard, swaps their values and prints the result.
	c	Write a C program to find the sum of individual digits of a 3 digit number.
	d	If a four digit number is input through the keyboard, write a program to obtain the sum of the first and last digit of the number.
	e	Write a program to calculate roots of a quadratic equation.x=(-b±√(b^2-4ac))/2a. The roots are real −b±√D 2a if the discriminant D = b2 −4ac is non-negative. If the discriminant is negative, then the roots are complex conjugate −b 2a ± √−D 2a i. The program proceeds in the following steps. (a) It accepts the values of a,b and c from the keyboard. (b) No solution if both a and b are zero. The program finishes with appropriate message. (c) Linear equation if a = 0 but b 6= 0 and the root is −c/b. The program prints out the root with appropriate message and the program finishes. (d) Calculates the discriminant D and determines the corresponding roots. (e) Prints out the roots with appropriate message and the program finishes.

3	a	Write a C program that calculates the absolute difference between an input number and 50, if the input number is greater than 20, double the absolute difference.
	b	Write a C program that verifies an input number is divisible by 3 or 7 and falls between 100 and 500. If the condition is satisfied the program should print 1 otherwise it should print 0
	c	A gym offers a special discount on membership renewal based on attendance. To qualify for the discount, a member must meet the following criteria: • Attend at least 80% of their scheduled sessions. • Have no outstanding payments or dues. • Have been a member for at least 6 months. Write a C program that takes the following inputs from a gym member: Scheduled Sessions, Attended Sessions, Any Outstanding Payments (1 for Yes 0 for No), No. of months as a member The program should then display the following message if the member is eligible for discount: Congratulations! You qualify for the special discount on membership renewal. OR if the member is not eligible for discount, then the program should display the following message Print Sorry, you do not qualify for the special discount on membership renewal. (Reason for not qualifying should also be printed)
	d	Write a C program that takes three numbers as input. If all numbers are distinct, output the difference between the second highest and lowest. If all three numbers are equal, output the sum of all. If any two numbers are equal, print the sum of the lowest and highest
	e	Write a C program to calculate the electricity bill (accept number of units from the user) according to the following criteria: • First 50 units Rs. 0.0 per unit and service charge Rs. 0.30 per unit. • Next 50 units Rs. 1.50 per unit and service charge Rs. 0.40 per unit. • Next 100 units Rs. 2.50 per unit and service charge Rs. 0.50 per unit. • After 200 units Rs. 3.75 per unit and service charge Rs. 0.60 per unit.
4	a	Write a C program to print multiplication table till 10 for the given number.
	b	Population of a state is increased steadily at the rate of 5% growth per year for the last four years. Write a C program that takes a population figure (positive Integer) as input and prints population at the end of each year for the four years.
	c	Write a C program to calculate overtime pay of 10 employees. Overtime is paid at the rate of Rs. 12.00 per hour for every hour worked above 40 hours. Assume that employees do not work for fractional part of an hour.
	d	Write a C program that asks the user to input 10 integers and then print the sum of the largest odd and smallest even numbers.
	e	Write a C program that takes a number ‘n’, with four or more than 4-digits as input. The program should find and print the mid digits of number ‘N’ entered by the user and calculate the mid digits product. Mid digits imply all the digits of the number excluding first and last digit. If a number having less than four digits is entered, the program should display a message as Entered number is not a 4 or more than 4-digit number. Use only conditional and looping statements to write the code.

5	a	Write a C program that asks the user to enter a positive integer n less than 10. If the user enters an invalid input, the code repeats the command of asking the user for a positive integer less than 10 until the input is correct. It then prints out the sum of the first n terms of the series 14 +24 +44 +74 +114 +⋯+m4 and terminates.
	b	Write a C program that prints out the prime numbers between 1 and 100. The output should be such that each row contains a maximum of 7 prime numbers.
	c	Write a C program to print the following pattern * * * * * * * * * * * * * * * *
	d	Write a C program to print the following pattern ***** **** *** ** *
	e	Write a C program to print the following pattern ********* ******* ***** *** *
6	a	Write a C program that invokes a function power(a, b) to calculate and print the value of a raised to b. Do not use any library function/operator.
	b	Write a C program that takes an integer from the user and invokes a function to compute and print the binary equivalent of the integer.
	c	Write a C program that invokes two functions for swapping the value of two variables. The first function (swap_by_value) should demonstrate call by value principle while the second function (swap_by_reference) should demonstrate call by reference principle. The program should print the following in the given order: a. Value of variables in main() before calling any function b. Value of variables after swapping in swap_by_value function c. Value of variables in main() after calling swap_by_value function d. Value of variables after swapping in swap_by_reference function e. Value of variables in main() after calling swap_by_reference function
	d	Given three variables x, y, z write a C program that invokes a function to circularly shift their values to right. In other words if x = 5, y = 8, z = 10, after circular shift x = 10, y = 5, z = 8. Call the function with variables a, b, c to circularly shift values. The new values of the variables should be printed in the main function after the function call.
	e	A computer game to ascend a building with a specified number of floors. You have three different facilities for each floor to reach the top: the elevator (1), the escalator (2), and walking up the stairs (3). Each facility has its own scoring rule. Assume the initial score is zero. • Elevator (1): Score increments to the next even number. • Escalator (2): Score increments to the next odd number. • Walk (3): Score increments to the next prime number. Write a C program to display the score to ascend a building. Create different functions for incrementing score according to the facility.

7	a	Write a C program to copy the contents of one array into another in the reverse order.
	b	Write a C program to find the second largest number in an array entered by the user.
	c	Write a C program which mergers two different arrays and prints the result in sorted (ascending) order. If a number is duplicate, it should appear only once in the sorted array.
	d	Write a C program which performs the following tasks: • Initialize an integer array of 10 elements in main( ) • Pass the entire array to a function modify( ) • In modify( ) multiply each element of array by 3 • Return the control to main( ) and print the new array elements in main( )
	e	Write a C program to with a user defined function having the following signature: int perfect_squares(int *userList, int *finalList) where userList is a pointer to an array of integers entered by a user and finalList is an empty array. The function should extract the perfect squares from the original array and copy it in finalList array. The program should then display the finalList array. A perfect square is an integer that is a square of another integer. For example, 25 is a perfect square as 5 square is 25.
8	a	Write a C program to check if two integers have opposite signs.
	b	Write a C program to check whether the given integer is odd or even.
	c	Write a C program to set the nth bit of an integer.
	d	Write a C program to toggle the nth bit of an integer.
	e	Write a C program to swap two numbers without using arithmetic operator.
9	Explore different types of sensors and simulate their interfacing with arduino board	

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: I	Academic Year: 2025-26 onwards		
Name of Course	Life Skills Management					
Course Code	SA 1141					
Core / Elective / Other	Elective					
Concerned Department/ Section/Centre	Humanities and Social Sciences					
Credits	01	Periods per week		L	T	P
				0	0	2
Prerequisite:						

1	To enhance one's ability to be fully self-aware by helping oneself to overcome all fears and insecurities and to grow fully from inside out and outside in.
2	To increase one's knowledge and awareness of emotional competency and emotional intelligence at place of study/work.
3	To provide opportunity for realizing one's potential through practical experience.
4	To develop interpersonal skills and adopt good leadership behaviour for empowerment of self and others.
5	To set appropriate goals, manage stress and time effectively.
6	To manage competency- mix at all levels for achieving excellence with ethics.
Course Outcomes:	
1	This course is designed for imparting skill-based education that would address the issues in day-to-day life, to face the challenges of the new millennium, ruled by globalization and market forces.
2	To familiarize students in theoretical foundation in Life Skills Education, prepare students in training methodologies, enable students to apply Life Skills in various spheres, develop professionals in Life Skills Management and enhance the ability to contribute as youth workers specialized in the area of Life Skills Management.
3	To help others to make informed decisions, solving problems, thinking creatively and critically, building healthy relationships through effective communication and further, deal with risk situations.
4	To foster the social responsibility of the students and enhance their positive and healthy behaviour.
5	After undergoing the course in Life Skills Education, students are enhanced with employability skills to be absorbed in Corporate/HR set ups, NGO's and Community Organisations, Adolescent Health Medical Counselling Centre's, Health Organisations and Government Organisations as well as self- employment.
Course Content in Brief:	
1	Introduction to Life Skills: What are the life skills, who needs, life skills development
2	Self-awareness: Definition, Importance, Dimensions, Components, strategies for nurturing the self-awareness
3	Effective Communication: Assertiveness, Effective Listening, Negotiation Techniques & Process, Barriers of Communication, Presentation Skills
4	Interpersonal Relationship: Definition, Factors Affecting Relationships, Ending relationship constructively
5	Thinking Skills: Critical Thinking: Analytical Thinking, Strategies to enhance Critical Thinking
6	Creative Thinking: Out-of-the box thinking, Stages of Creative Thinking, Factors hindering creative thinking, Characteristics of Creative thinkers
7	Decision Making: Definition, Informed Decision Making, Consequences of Decision Making and Models of Decision Making
8	Coping with Stress: Definition, Types, Sources of Stress, Strategies to Manage Stress
9	Concept and strategies to promote Healthy Life Style Skills
10	Leadership Skills

11	Skill of building Self-confidence and Self-Motivation
12	Preventing suicide, Skills to prevent abuse: physical, sexual, & emotional abuse
13	Study Skills and Memory Techniques
14	Life Skills and Career: goal setting; career planning

Methods of Transaction

Discussion, Debate, Role Play, Simulation Exercises, Case Study, Demonstration, Team Work, Question & Answer, Games

List of Text Books:

1. Adolescence and Life Skills (2003) Commonwealth Youth Programme Asia Centre, Tata McGraw- Hill
2. Darkar Framework for Action, Education for All: Meeting our Collective Commitments, (April 2000), Dakar, Senegal.
3. Family Health International, NACO, USAID (2007), Life Skills Education tool kit for Orphans and vulnerable children in India
4. Hilgard, E, Atkinson R C & Atkinson R L (1976), Introduction to Psychology (6th Ed), IBH Publishing Co.,Pvt Ltd. New Delhi.
5. Life Skills Resource Manual, Schools Total Health Program, (2006), Health Education and Promotion International Inc., Chennai.
6. Global Evaluation of Life Skills Education Programmes Final Report, United Nations
7. Children's Fund, New York, 2012
8. Kumar .J. Keval, (2008), Mass Communication in India, Jaico Publication India Pvt. Ltd
9. Mangal S.K. (2008), An Introduction to Psychology, Sterling Publishers Pvt. Ltd., New Delhi.
10. Morgan and King,(1993)Introduction to Psychology ,Tata McGraw-Hill Publishing Company Ltd, New Delhi.
11. Nair V. R. (2010). Life Skills Personality and Leadership. RGNIYD, Tamilnadu
12. Rao P.L. (2008) Enriching Human Capital Through Training and Development, Excel Books, Delhi.
13. RGNIYD. (2008). Facilitators Manual on Enhancing Life Skills. Tamil Nadu
14. Singh Madhu, (2003), Understanding Life Skills, Background paper prepared for Education for All: The Leap to Equality
15. Stella Cottrell, (2008), The Study Skills Handbook, Palgrave Macmillan Ltd. (3rd Ed), New York
16. UNESCO and Indian National Commission for Co-operation with UNESCO (2001): Life Skills in Non-formal Education: A Review
17. Wallace R. Masters, (2001) Personal Development for Life and Work: UK, South Western.
18. YUVA School Life Skills Programme: Handbook for Teachers, Vol. I – IV, (2008), Department of Education and State Council of Educational Research and Training, Delhi.

Web Sites:

- UNESCO – http://www.unesco.org/
- UNFPA - http://www.unfpa.org/
- UNICEF - http://www.unicef.org/
- United Nations - http://www.un.org/
- WHO - http://www.who.int/en/
- India Portal - www.indiaportal.gov.in
- http://hhd.org/sites/hhd.org/files/paho_lifeskills.pdf
- http://www.who.int/school_youth_health/media/en/sch_skills4health_03.pdf
- http://wikieducator.org/Introduction_to_life_skills_education
- https://www2.ed.gov/offices/OVAE/AdultEd/OCE/LifeSkills/intro.html
- https://www.britishcouncil.gr/sites/default/files/life-skills-developing-active-citizens-en.pdf
- http://www.macmillanenglish.com/uploadedFiles/wwwmacmillanenglishcom/Content/Campa
- igns/life-skills/The-Life-Skills-Handbook.pdf
- https://www.unodc.org/pdf/youthnet/action/message/escap_peers_07.pdf

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: I	Academic Year: 2025-26 onwards
Name of Course	Physical and Health Education			
Course Code	SA1142			
Core / Elective / Other	Elective			
Concerned Department/ Section/Centre	Physical Education & Sports Section			

Credits	1	Periods per week	L	T	P
			0	0	2

Prerequisite:

Course Outcomes: At the end of the course, the student will be able to:

1.	To understand knowledge of Health , Wellness and Personal Fitness Management
2.	To know the mental and psychological aspects of health
3.	To know about obesity and body weight control fundamentals
4.	To know about modules of training and fundamentals of nutrition.

Description of Contents in brief:

1.	Introduction to Health, Wellness & Personal Fitness Introduction to Fitness and Training Benefits of Exercise ii. Components of Physical Fitness & Fitness through Nature play iii.Principles of Exercise training to improve personal fitness iv. Introduction to Health, Wellness and it's dimensions. v. Development of physical Fitness (Cardiovascular Endurance, Muscular Strength, Muscular endurance, Flexibility, Body composition), vi. Exercise prescription for Obesity and Weight control
2.	Exercise & Nutrition: Nutrition & Balanced Diet Hydration and Dehydration Sports Drinks Obesity & Body Weight control, measuring Body Fat Body Mass Index (BMI) and calculation,
3.	Exercise Physiology and Sports Injuries Oxygen debt and second wind Effect of exercise on Cardio Respiratory system Effect of exercise on Musculoskeletal System Effect of exercise on central nervous system First Aid - Aims and Objectives Sports Injuries Classification (Abrasion,Contusion, Laceration, Incision, Sprain & Strain), Chronic injuries Tennis elbow, Rotator cuff injury, Football knee Injuries, football ankle Injuries etc)
4.	Exercise Psychology and Psychological Health Concept of Exercise Psychology Motivation & its types Personality, Attitude & Self Esteem Healthy Aging & Longevity Aggression, Anxiety , Depression & Stress
5.	Course Related Practical Work & Field Work Gait, Jogging and Running technique Warming up & Cooling down Weight Training & Strengthening Exercises Exercises for Backache, cervical spondylosis Stretching & Flexibility Exercises Core Strength & Stability Exercises First Aid for different sports injuries Postural Deformities and remedies (a) Kyphosis (b) Lordosis c) Knock – knees (d) Flat-foot (e) Scoliosis.

	Hydrotherapy, Cryotherapy, Contrast Bath Yoga Sutras & Pranayama practice Yoga Nidra and Meditation
List of Text Books:	
1.	Greenberg, Dintiman, Oakes. Physical fitness & wellness (3rd Ed.). IL: Human Kinetics (2004)
2.	Thomas Fahey and Paul Insel and Walton Roth, "Fit & Well: Core Concepts and Labs in Physical Fitness and Wellness" (14" Ed.). Boston: McGraw Hill co". 2016
List of Reference Books:	
1.	Keleher, H and Mac, Dougall, C. Understanding health (No. Ed. Oxford University Press 2015.
2.	Weinberg Robert and Gould Daniel. Foundation of Sports and Exercise Psychology 7th edition. Human Kinetics USA (2018)
URLs:	
Lecture Plan (about 40-50 Lectures):	
Lecture No.	Topic
Lecture 1	Introduction to Fitness and Training Benefits of Exercise
Lecture 2	Components of Physical Fitness & Fitness through Nature play
Lecture 3	Principles of Exercise training to improve personal fitness

Section F to J (Sem I)

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: I	Academic Year: 2025-26 onwards		
Name of Course	**Mathematics-I**					
Course Code	**MC 1101**					
Core / Elective / Other	**Core**					
Concerned Department/ Section/Centre	Department of Mathematics, Bioinformatics and Computer Applications					
Credits	**4**	**Periods per week**		**L**	**T**	**P**
				3	**1**	**0**
Prerequisite:						
Prerequisite: None						
Course Outcomes: At the end of this course, the student will be able to:						
1.	Understand and interpret the concepts of differential calculus, integral calculus, vector calculus.					
2.	Compute the solution of high dimensional homogeneous and non-homogeneous differential equations.					
3.	Integrate higher dimension and vector calculus problems.					
4.	Design and find the analytical solution of their engineering problems.					
Description of Contents in brief:						
1.	Calculus: Sequence and Series, Convergence of sequence and series. Limit, Continuity, Partial differentiation, Total differentiation, Taylor's Series. Maximum and Minima of functions of two or more variables, Lagrange method of undetermined multipliers.					
2.	Multiple Integral: Double and triple integral, Change of order of integration, length of curves, Area, Volume of solids of revolution.					
3.	Vector Calculus: Vector differentiation, Gradient, Directional derivative, Divergence and curl of vector point function, Line integral, Surface integral, Gauss divergence theorem, Stokes theorem, and Green's theorem.					
4.	Ordinary Differential Equation (ODE): Formation of ODE, Existence and uniqueness of first order ODE, Differential equation of first order and first degree, exact ODE, Integrating factor, Cauchy-Euler equations, Simultaneous differential equations, Higher order differential equations with constant coefficients, Variation of parameters.					
List of Textbooks:						
1.	James Stewart. Calculus Early Transcendentals, 7th Edition, Brooks/Cole Cengage Learning, Narosa Publishing House, New Delhi, 2016.					
2.	R. K. Jain and S. R. K. Iyengar. Advanced Engineering Mathematics, 5th Edition, CRC Press, Narosa Publishing House, New Delhi, 2016.					
3.	E. Kreyszig. Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, Inc., New York, 2016.					
4.	Shepley L Ross. Differential Equations, 3rd Edition, John Wiley & Sons, 2004					
List of Reference Books:						
1.	B.V. Ramana, Higher Engineering Mathematics, 1st Edition, Tata McGraw-Hill Education, New Delhi, 2017.					
2.	G. B. Thomas, Jr., M. D. Weir and J. R. Hass, Thomas' Calculus, 13th Edition, Pearson Education, Inc., New York, 2014.					
URLs:						
1.	https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-ma49/					
2.	https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-ma37/					
3.	https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-ma27/					
4.	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-ma12/					
Lecture Plan (about 42-45 Lectures):						
Lecture No.	**Topic**					
1-2	Sequence, Series and their convergence					
3	Limit and continuity of a real valued function of multiple variables					

T-1	Tutorial 1
4-6	Partial differentiation, total differentiation, and related problems
7	Expansion of functions using Taylor's series
T-2	Tutorial 2
8-9	Maxima and minima of functions of two or more variables
10	Lagrange method of undetermined multipliers
T-3	Tutorial 3
11-12	Beta and Gamma function, double and triple integrals
13-14	Change of order of integration
T-4	Tutorial 4
15-16	Length of curves, Area, Volume of solids of revolution
17-18	Vector differentiation, gradient, directional derivative, Divergence & curl of vector point functions
T-5	Tutorial 5
19-21	Line integral, surface integral and their applications
T-6	Tutorial 6
22-24	Gauss divergence theorem, Stokes theorem, Green's theorem
T-7	Tutorial 7
25	Introduction to ordinary differential equations: Formation of ODE
26	Existence and Uniqueness of first order of ODE
27-28	Differential equation of first order and first degree, exact ODE, Integrating factor
T-8	Tutorial 8
29-32	Linear ODE with constant coefficients, Simultaneous homogeneous linear ODE
T-9	Tutorial 9
33-34	Higher order homogeneous linear ODE with constant coefficients, Cauchy-Euler equations
35	Variation of parameters
T-10	Tutorial 10

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: I	Academic Year: 2025-26 onwards
Name of Course	Engineering Chemistry			
Course Code	CY1107			
Core / Elective / Other	CORE			
Concerned Department/ Section/Centre	Department of Chemistry			

Credits	3	Periods per week	L	T	P
			3	0	0

Prerequisite:	
1.	Student should have sound knowledge of basics of chemistry, like atomic structure, bonding , chemical reactions, periodic table, their properties etc.
2.	Student should have the capability to understand how chemistry can explain various concepts of technology.
3.	Basic mathematics for doing calculations and numerical problems is desired.

Course Outcomes:	
1.	Upon successful completion of the course the student will be able to: Select lubricants for various purposes and can apply accordingly.
2.	Understand the importance of fuel in modern world scenario.
3.	Describe impurities present in water, boiler troubles, removal of impurities.
4.	Apply corrosion technology methods that are useful to know about the protection of metals from corrosion by various technologies.
5.	Describe advanced polymer materials and their industrial applications.

Description of Contents in brief:	
1.	LUBRICANTS- Role and Effects of Friction, Functions of Lubricants, Mechanisms of Lubrication – Thick Layer, Thin layer and Extreme Pressure Lubrication. Liquid, Solid and Semi-solid Lubricants: their Physical and Chemical Properties, Importance and Testing; Examples and Their Structures; Lubricating Emulsions; Cutting Fluids; Selection of Lubricants for light and heavy machinery
2.	FUELS- Calorific value, Classification and Characteristic of a Good Fuel, Comparison between Solid, Liquid and Gaseous Fuels, Determination of Gross and Net Calorific Value by Bomb Calorimeter. Classification, Selection Criteria, Proximate and Ultimate Analysis of Coal, Pulverized Coal. Classification of Petroleum, Types of Cracking, Knocking, Octane and Cetane Number. Numerical problems related to caloric value and ultimate analysis.
3.	WATER- Sources of water, Specifications of Drinking Water, Step-wise procedure for Purification of water, Difference between Disinfection and Sterilization. Classification and Disadvantages of Hardness, Caustic Embrittlement, Boiler Corrosion, Priming and Foaming, Scale and Sludge formation: Prevention (Internal &External Treatments). Softening Methods: Lime-Soda Processes (cold and hot both), Zeolite Process, Ion-Exchange Process. Numerical problems related to purification of water.
4.	MATERIALS Types of Polymerization, Mechanism of Addition Polymerization and coordination polymerization, Molecular weight determination of Polymers, Thermosetting &Thermoplastic Polymers, Methods of Moulding of Plastics, Preparation, Properties and Uses of Thermoplastic Resins, Thermosetting Resins and Synthetic Rubbers. Classification and Vulcanization of Rubber, Polymer Composites, Polymers for biomedical applications. Classification, Raw Materials, Gypsum, Manufacture of Portland Cement (Both Wet and Dry Process), Chemical Composition and Constitution of Cement, Setting and Hardening of Cement, Significance of lime saturation factor and silica modulus. Special Cements: Aluminous Cement, High Early Strength Cement, White Portland Cement, Water Proof Cement. Concrete and RCC

5.	CORROSION AND ITS CONTROL Mechanism of Chemical and Electrochemical Corrosion, Galvanic Corrosion, Concentration Cell Corrosion, Passivity, Soil Corrosion, Pitting Corrosion, Inter-granular Corrosion, Waterline Corrosion, Stress Corrosion, Galvanic Series, Factors influencing Corrosion, Ways to protect against Corrosion. Protective Coatings, Anodic and Cathodic Coatings.
List of Text Books:	
1.	Engineering Chemistry by Jain and Jain
2.	Engineering Chemistry by S.S. Dara
3.	Engineering Chemistry by B.K. Sharma
4.	Engineering Chemistry by Shashi Chawla
List of Reference Books:	
1.	Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015 edition.
2.	Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition (second).
3.	Engineering Chemistry by PrasanthRath, Cengage Learning, 2015 edition.
4.	Applied Chemistry by H.D. Gesser, Springer Publishers
5.	B. Siva Shankar, “Engineering Chemistry”, Tata McGraw Hill Publishing Limited, 3rd Edition, 2015.
6.	C. V. Agarwal, C. P. Murthy, A. Naidu, “Chemistry of Engineering Materials”, Wiley India, 5th Edition, 2013.
7.	R. P. Mani, K. N. Mishra, “Chemistry of Engineering Materials”, Cengage Learning, 3rd Edition, 2015.
Lecture Plan (about 42 Lectures):	
Lecture No.	Topic
	LUBRICANTS
Lecture 1	Introduction, Role and Effects of Friction, Functions of Lubricants.
Lecture 2	Mechanism of Lubrication – Thick Layer, Thin layer and Extreme Pressure Lubrication.
Lecture 3	Physical and Chemical Properties of oils, Their Importance and Testing.
Lecture 4	Physical and Chemical Properties of oils, Their Importance and Testing.
Tutorial	Problems based on topics covered in above four lectures and discussions.
Lecture 5	Liquid Lubricants: Detailed classification of Vegetable Oils, Animal Oils, Mineral Oils, Blended and Synthetic Oils.
Lecture 6	Semi-solid Lubricants: Examples, Physical and Chemical Properties, Their Importance and Testing.
Lecture 7	Solid Lubricants: Examples and Their Structures, Biodegradable Lubricants.
Lecture 8	Lubricating Emulsions; Cutting Fluids; Selection of Lubricants.
Tutorial	Problems based on topics covered in above three lectures and discussions
	Fuels
Lecture 1	Introduction, Classification, Calorific value, Characteristic of a Good Fuel, Comparison
Lecture 2	between Solid, Liquid and Gaseous Fuels. Numerical Problems based on Calorific Value. Bomb Calorimeter, Numerical Problems based on calorimeter.
Lecture 3	Coal: Classification, Selection Criteria, Proximate Analysis, Numerical Problems based on
Lecture 4	Proximate Analysis. Problems based on topics covered in above three lectures and discussions.
Tutorial	Ultimate Analysis of coal, Numerical Problems based on Ultimate Analysis.
Lecture 5	Pulverized Coal. Petroleum: Classification and separation. Types of Cracking.
Lecture 6	Knocking, Octane and Cetane Number.
Lecture 7	LPG, Natural Gas, Producer Gas, Water Gas, Bio Gas.
Lecture 8	Problems based on topics covered in above three lectures and discussions.
Tutorial	
	Water
Lecture 1	Introduction, Sources of water, Specifications of Drinking Water.
Lecture 2	Steps for Purification of water, Screening Process, Sedimentation, Sedimentation with Coagulation.

Lecture 3	Filtration and Disinfection. Difference between Disinfection and Sterilization.
Lecture 4	Break Point Chlorination, Hardness: Units and Disadvantages.
Tutorial	Problems based on topics covered in above three lectures and discussions.
Lecture 5	Scale and Sludge formation: Disadvantages, Prevention (Internal &External Treatments), Caustic Embrittlement.
Lecture 6	Boiler Corrosion, Priming and Foaming.
Lecture 7	Softening Methods: Lime-Soda Processes (cold and hot both).
Lecture 8	Zeolite Process, Ion-Exchange Process.
Tutorial	Numerical problems based on Lime-Soda Processes and water analysis
	Materials
Lecture 1	Polymer: Introduction, Nomenclature, Functionality, Types of Polymerization, Mechanism of Addition Polymerization.
Lecture 2	Thermosetting &Thermoplastic Polymers, Methods of Moulding of Plastics. Thermoplastic
Lecture 3	Resins: Polyethylene, Polypropylene, Polyvinylchloride, Polyvinyl Acetate, Polystyrene, PolymethylMethacrylate.
Lecture 4	PolytetrafluoroEthylene, Nylon-6:6, Kevlar. Thermosetting Resins, Polyurethane, Epoxy Resin, Alkydes etc.
Tutorial	Problems based on topics covered in above three lectures and discussions.
Lecture 5	Bakelite, Silicone Resins, Polymer Composites. Rubber: Classification, Vulcanization, Synthetic Rubbers (Buna-S, Buna-N), PANVC, ABS etc.
Lecture 6	Cement: Introduction, Classification, Raw Materials, Gypsum, Manufacture of Portland Cement (Both Wet and Dry Process).
Lecture 7	Chemical Composition of Cement, Chemical Constitution of Cement, Setting and Hardening of Cement.
Lecture 8	Special Cements: Aluminous Cement, High Early Strength Cement, White Portland Cement, Water Proof Cement, Physical Requirements of Cement, Introduction of Concrete and RCC.
Tutorial	Problems based on topics covered in above three lectures and discussions.
	CORROSION AND ITS CONTROL
Lecture 1	Introduction and Mechanism of Chemical and Electrochemical Corrosion. Galvanic
Lecture 2	Corrosion, Concentration Cell Corrosion, Passivity, Soil Corrosion.
Lecture 3	Pitting Corrosion, Intergranular Corrosion, Waterline Corrosion, Stress Corrosion.
Lecture 4	Galvanic Series, Factors influencing Corrosion, Ways to protect against Corrosion.
Tutorial	Problems based on topics covered in above three lectures and discussions.
Lecture 5	Introduction of Protective Coatings, Metallic Coatings.
Lecture 6	Introduction of Anodic and Cathodic Coatings, Methods of application of Metal coatings. Objectives and theory of Electroplating.
Lecture 7	Chemical Conversion Coatings, Paints, Varnishes and Enamels.
Lecture 8	Problems based on topics covered in above three lectures and discussions.
Tutorial	

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: I	Academic Year: 2025-26 onwards
Name of Course	**Basic Electrical & Electronics Engineering**			
Course Code	**EE1108**			
Core / Elective / Other	**Core**			
Concerned Department/ Section/Centre	Electrical Engineering			

Credits	4	Periods per week	L	T	P
			3	1	0

Prerequisite:	
	Engineering Physics
Course Outcomes: At the end of the course, the student will be able to:	
1.	**Understand** and **analyse** basic AC and DC circuits.
2.	**Remember**&**Apply** knowledge regarding the various laws and principles associated with electrical systems.
3.	**Understand** and **analyse** the construction and principle of operation of single-phase transformer & DC machines.
4.	**Apply** knowledge regarding various types of semiconductor devices.
Description of Contents in brief:	
1.	D.C. circuit fundamentals, KCL, KVL, loop and nodal equations, Network theorems. Star Delta transformations, Simple series and parallel circuits.
2.	Introduction to AC Circuits, Waveforms and RMS Value, phase, phase difference Power and Power factor in A.C. circuits, Series A.C. circuits, resonance.
3.	Electrical machines, Faraday's law of electromagnetic induction, Transformers, construction, principle of operation, phasor diagrams, equivalent circuit, tests on transformer, losses and efficiency, Introduction to DC machines.
4.	Semiconductor devices and applications, Characteristics of PN Junction Diode, Zener Effect, Zener Diode and its characteristics ,Half wave and Full wave rectifiers, ripple factor, efficiency.
5.	Bipolar Junction Transistor, Principle of operation of transistors, Input/output & transfer characteristics of BJT in CB, CE, CC configurations.
List of Text Books:	
1.	Basic Electrical Engineering, III Edition, TMH - D.P. Kothari & I.J. Nagrath
2.	Basic Electrical Engineering, TMH - V.N. Mittle
3.	Basic Electrical Engineering - V.K. Mehta & Rohit Mehta
4.	Electronic Devices and Circuit Theory - Robert Boylestad& Louis Nashelsky
List of Reference Books:	
1.	Electrical Circuits- Schaum's Outline Series
2.	Electronicsprinciples - Albert Malvino
3.	Basic Electrical Engineering -S.N.Singh
URLs:	
1.	https://nptel.ac.in/courses/117106108, https://nptel.ac.in/courses/108108112
Lecture No	**Topic**
L1	Introduction and Overview of Subject & Syllabus, Basic Concepts related to Electric and magnetic circuits, EMI, law's of EMI
L2	A.C and D.C circuits, differentiation between them, A.C. fundamentals, Gen. of Alternating voltage and current, A.C. terminology, diff. forms of alt. voltages
L3	Peak value, RMS value and Avg value, form factor, peak factor
L4	Complex waveforms, phasor representation and phase difference, Addition and subs traction of alt. quantities, numericals
L5	Various powers in AC circuits, Concept of power & power factor; expression of power in complex notation,

L6	A.C. circuit containing pure R, L and C, Series A.C. Circuits, numerical, concepts of reactance, impedance and their representation in complex forms using 'j' operator
L7	R-L , R-C series circuits , Impedance triangle, true and reactive power, Q-factor &numericals
L8	R-L-C series circuits, Resonance in AC ckts& problems
L9	Introduction to parallel AC ckts, Resonance in series and parallel circuits
L10	DC circuits: Basic concepts; concepts of linear, nonlinear, active, passive, unilateral and bilateral elements: ideal and practical voltage & current sources -conversion from one from the other.
L11	Kirchhoff's laws statements & explanation with numericals
L12	Mesh current method – definition of mesh & loop, illustrative example. Node voltage method – Definition of a node, illustrative example
L13	Delta-Star & Star-Delta conversion; necessity, illustration with example
L14	Thevenin's theorem – statement, explanation & illustration with examples. Norton's theorem – concept of duality; explanation & illustration with examples.
L15	Mini Test
L16	Superposition principle – statement, explanation & illustration with examples
L17	Maximum Power Transfer Theorem – statement, explanation & illustration with examples.
L18	Dependent Source based Problems
L19	Introduction, Classification, Principle of Operation of Machines, Constructional features of DC Machine
L20	Principle of operation and EMF equation of Elec. M/c& problems based on it
L21	Speed control methods of DC motor &numericals
L22	Construction, principle of operation and EMF equation of Transformer
L23	Classification and types of X-mer, working of transformer under no load& loaded conditions
L24	Concept of Practical transformer, Phosor diagrams under no load& loaded conditions
L25	Equivalent circuits of Transformer
	Mid-term Exam
L26	O.C.& S.C. tests illustrative example
L27	Losses & efficiency, condition for maximum efficiency, illustrative examples,
	Efficiency & Regulation of Transformer - definition & importance; derivation of expression , illustrative example
L28	Semiconductor Fundamentals PN Junction Diodes Introduction and Operation, Characteristic of PN Junction Diodes
L29	Zener diode and its characteristics, special purpose diodes
L30	Regulated Power Supply ,Rectifier and Its Classification
L31	Half Wave Rectifier- Working , Derivation of Rectification Efficiency and ripple factor problem
L33	Full Wave Rectifier- Working, Derivation of Rectification Efficiency and ripple factor problem
L34	Bipolar Junction Transistor — Introduction ,Construction and Working of BJT
L35	Modes of operation of BJT and configuration
L36	CB,CC and CE configuration , Characteristics and problems
L37	Clarification of doubts and numericals

Name of Program	**B.Tech. & Dual Degree**	**Year: First Year**	**Semester I**		**Academic Year: 2025-26 onwards**
Name of Course	**Manufacturing Science**				
Course Code	**ME 1109**				
Core / Elective / Other	**Core**				
Concerned Department/ Section/Centre	Mechanical Engineering Department				
Credits	**01**	**Periods per week**	**L**	**T**	**P**
			1	**0**	**0**

Prerequisite if any: Nil	
Course Outcomes:	
1.	Comprehend the safety measures required to be taken while using the tools
2.	Understand the operations of machine tools
3.	Select the appropriate tools required for specific operations.
4.	To provide knowledge of job materials in various shops
Description of Contents in brief:	
Unit 1.	FITTING SHOP Introduction. Classification of Metals. Clamping tools. Vices and V-blocks. Surface plate, Try square, Files, Chisels, Hack saw, Single scribing block of surface gauge. Punches, Hammers, Calipers – outside and inside, Dividers, Drills and Taps. Principle of Micrometres. Verniercallipers. Principle of vernier caliper. Reading and least count of the Vernier. Vernier depth gauge, Vernier height gauge, Micrometer depth gauge. Processes: Marking, chipping, sawing, filing, etc.
Unit 2.	WELDING SHOP Introduction. Classification of welding processes. Concept of weld. Electric arc welding. Arc welding principle. Arc blow. Arc welding equipment. Use of A.C. and D.C. for welding. Electrodes, selection of electrodes.
Unit 3.	CARPENTRY SHOP Introduction. Applications and methods of using carpentry tools – saws, planer, chisels, hammers, marking gauge, vice, try square, rule, etc. Types of woods and their applications. Types of carpentry hardware and their uses. Carpentry operations such as marking, sawing, planning, chiselling, grooving, boring, joining, etc. Safety precautions in carpentry shop.
Unit 4.	FOUNDRY SHOP Introduction. Foundry tools and equipment. Elementary ideas of patterns. Pattern Making, Types of patterns, Pattern allowances. Various types of moulding sand, Types of moulds. Step involved in making a mould. Moulding boxes, hand tools used for mould making. Moulding processes. Allowances and Types of allowances.
List of Text Books:	
1.	Hajra Choudhury S.K., Hajra Choudhury A.K., and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I (2008) and Vol. II (2010), Media Promoters and Publishers Private Limited, Mumbai.
2.	B. S. Raghuwanshi, A Course in Workshop Technology, DhanpatRai and Co. Pvt. Ltd., India
3.	P N Rao, “Manufacturing Process” Vol. I & Vol. II, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
URLs:	
1.	https://nptel.ac.in/courses/112107144/
2.	https://nptel.ac.in/courses/112105127/1
List of Reference Books:	
1.	John A. Schey, Introduction to Manufacturing Processes, 3 edition, McGraw Hill Education, 2012

2.	G. K. Lal and S. K. Choudhury, Fundamentals of Manufacturing Process, 2009. Boca Raton, FL: CRC Press, 2011.	
Lecture Plan (about 40-50 Lectures):		
*Lecture No.	Topic	Remarks
1.	Introduction to fitting shop, Classification of metals	
2.	Clamping tools (Vices, V-blocks), Surface plate, Try square, Marking tools	
3.	Files, Chisels, Hacksaw, Calipers (outside & inside), Dividers, Drills, Taps	
4.	Vernier caliper, Micrometer, Vernier depth/height gauge, Marking & filing	
5.	Introduction, Classification of welding processes, Concept of weld	
6.	Arc welding principle, Arc blow, Arc welding equipment	
7.	A.C. vs D.C. in welding, Electrodes and their selection	
8.	Introduction, Carpentry tools (saws, planer, chisels, etc.)	
9.	Types of woods, Carpentry hardware and their uses	
10.	Carpentry operations: marking, sawing, chiseling, boring, joining	
11.	Safety precautions in carpentry shop	
12.	Introduction, Foundry tools and equipment	
13.	Patterns: types and allowances	
14.	Moulding sand: types and uses, Types of moulds	
15.	Mould making steps, Moulding boxes and hand tools	
16.	Revision of all units, Doubt clearing, Quiz/Oral assessment	

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester I	Academic Year: 2025-26 onwards		
Name of Course	Environmental Science					
Course Code	CY1110/ CY1210					
Core / Elective / Other	CORE					
Concerned Department/ Section/Centre	Department of Chemistry					
Credits	2	Periods per week		L	T	P
				2	0	0
Prerequisite:						
1.	Student should have basic understanding of environment and its components.					
2.	Knowledge of essential chemical reactions is required.					
3.	Concept of pollution, its basic sources and need for its prevention should be clear.					

Course Outcomes:	
1.	Identify the major challenges in environmental issues and evaluate possible solutions.
2.	Develop analytical skills, critical thinking and demonstrate socio-economic skills for sustainable development.
3.	Analyze an overall impact of specific issues and develop environmental management plan.
Description of Contents in brief:	
1.	Natural resources and associated problems Renewable and Non-renewable Resources and problems associated with them (Forest, Water, Mineral, Food, Energy and Land)
2.	Air pollution Concept of spheres of Atmosphere, Photochemical Smog, Sources and effects of Air Pollutants, Ozone Depletion. Methods of control of Gaseous and Particulates Pollutants
3.	Water pollution Hydrosphere and its importance, Point and Nonpoint sources of Water Pollution, Classification and effects of Water Pollutants, Prevention and Control of Water Pollution, Preliminary, Primary and Secondary Steps of Wastewater Treatment, Water Quality Tests.
4.	Auxiliary pollutions Sources, effects and control of Soil Pollution, Noise Pollution, Thermal Pollution and Radioactive Pollution, Solid Waste Management
5.	Environmental management Carbon Footprint, Life Cycle Assessment, Methodology, Role and Limitations of Environmental Impact Assessment, Important Environmental Laws, Basic principles and importance of Green Chemistry, Sustainability and its ten commandments
List of Text Books:	
1.	Textbook of Environmental Chemistry by BalramPani
2.	Environmental Chemistry by Stanley E. Manahan
3.	Environmental Chemistry by B.K.Sharma
4.	Environmental Chemistry by A.K.De
List of Reference Books:	
1.	"Wastewater Engineering Treatment and Reuse" by MetCalf& Eddy ,McGraw-Hill Education
2.	"Chemistry for Environmental Engineering and science" by Sawyer, McCarty and Parkin, McGraw Hill Education; 5 edition
3.	"Environmental Engineering" - by Howard S. Peavy, Donald R. Rowe and George Tchobanoglous. McGraw Hill Education; First edition

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester I	Academic Year: 2025-26 onwards		
Name of Course	**Biology for Engineers**					
Course Code	**BS1111**					
Core / Elective / Other	**Core**					
Concerned Department/ Section/Centre	Biological Science & Engineering					
Credits	**2**	**Periods per week**		**L**	**T**	**P**
				2	**0**	**0**
Prerequisite:						
Course Outcomes: At the end of the course, the student will be able to:						
1.	Understand cell structure, organelles, growth, division, and related biomolecular disorders.					
2.	Explain major human physiological systems and their engineering relevance.					
3.	Demonstrate genetic engineering tools and applications in health and biotechnology.					
4.	Apply biology in industries: biofuels, tissue engineering, bioprinting, and bioremediation.					
5.	Integrate biology and engineering concepts to design innovative solutions.					
Description of Contents in brief:						
1.	Cell as foundations of life, cell theory, structure and functions of cell organelles, cell types, cell growth and cell division, biomolecules and associated disorders.					
2.	Human Physiology Ergonomics: Digestive systems, Respiratory system, Excretory systems, Skeletal systems, Cardiovascular System, Nervous system, Engineering aspect in Physiology.					
3.	Genetic engineering: Introduction to recombinant DNA technology and cloning, Gene therapy, cell therapy, biochips, vaccine antibodies and transgenic plants and animals.					
4.	Applications of principles of biology in industries, biofuels, tissue engineering and bioengineering (artificial limbs, joints, And body parts Bio printing, Bioremediation, biomolecules and their industrial applications					
List of Text Books:						
1.	Cell and Molecular Biology- P.K. Gupta					
2.	Cell Biology-Verma and Agarwal					
3.	Cell Biology-Rastogi					
4.	N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, “Biology: A global approach”, Pearson Education Ltd, 2018.					
5.	T Johnson, Biology for Engineers, CRC press, 2011 Molecular Biology and Biotechnology 2nd ed. J.M. Walker and E.B. Gingold. Panima Publications. PP 434.					
List of Reference Books:						
1.	AlbertsEt.Al. The molecular biology of the cell, 6/e, Garland Science, 2014					
2.	Principles of Biochemistry. 2nd ed. 1993. A.L. Lehninger, D.L. Nelson. M.Cox. Paniama Publications. PP. 1090.					
3.	Harper’s biochemistry. 1988. R.K. Murray. D.K. Granner, P.A. Mayes. Printice Hall International.					
4.	Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022					
5.	Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.					
6.	Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008.					
7.	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.					

8.	Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N Geetha A C Udayashankar Lambert Academic Publishing, 2019.
9.	Blood Substitutes, Robert Winslow, Elsevier, 2005
10.	Electronic Noses and Tongues in Food Science, Maria Rodriguez Mende, Academic Press, 2016 01062022
11.	3D Bioprinting: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 2016.
DETAILED LECTURE PLAN	
Lecture	Topics
	NATURAL RESOURCES AND ASSOCIATED PROBLEMS
Lecture 1 Lecture 2 Lecture 3 Lecture 4 Lecture 5 Lecture 6 Lecture 7 Lecture 8 Lecture 9 Lecture 10 Lecture 11	Forest Resources: Deforestation, Timber extraction, mining, dams and their effects on forests and tribal people Water Resources: Use and overutilization of surface and ground water, floods, drought, conflicts over water, Dams – benefits and problems. Cases for Self-study and discussions: SardarSarovar Project Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources, Case Study: Sariska Tiger Reserve, Rajasthan Food Resources: World food problems, Changes in land-use by agriculture and grazing, Effects of modern agriculture, Fertilizer/ pesticide problems, Water logging and salinity, loss of genetic diversity. Energy Resources: a) Renewable Sources: Solar energy, Wind energy, and Hydropower b) Tidal energy, Geothermal energy, Biomass energy, Biogas and Hydrogen as a fuel Non-Renewable sources: Coal, Petroleum, Natural Gas and Nuclear Energy. Causes of increasing energy needs. Cases for Self-study and discussions: Rewa Ultra Mega Solar Park, India, Muppandalwindfarm, TN, India, Cases for Self-study and discussions: Sihwa Lake Tidal Power Station, South Korea, Geysers Geothermal Complex, USA. Land resources: land degradation, soil erosion desertification and man-induced land-slides. Role of an individual in the conservation of Natural Resources.
	AIR POLLUTION
Lecture 1 Lecture 2 Lecture 3 Lecture 4 Lecture 5 Lecture 6 Lecture 7 Lecture 8	Concept of spheres of atmosphere and lapse rate; Photochemical Smog Natural and Man-made Sources of Air Pollution: a) origin, functioning and effects of Particulate, Carbon Monoxide and Oxides of Sulphur, b) origin, functioning and effects of Oxides of Nitrogen, Ozone and Hydrocarbons Effect of Air Pollutants on humans, animals, plants, materials and climate, Problems of Ozone Depletion. Cases for Self-study and discussion: Bhopal Gas Tragedy, Ozone Hole over Antarctica Methods of control of gaseous pollutants: a) Absorption (Equipment like Gas scrubber, Venturi scrubber, Cyclone Scrubber), Adsorption (Equipment like Fixed bed adsorber and moving bed adsorber), b) Combustion (Equipment like Direct/Thermal/Catalytic incinerator), Condensation (Equipment like Spray tower, Packed bed tower, Bubble cap tower) Methods for Control of Particulate Emission- Wet Scrubbers, Electrostatic Precipitators, Fabric filters etc.
	WATER POLLUTION

Lecture 1	Introduction of Hydrosphere and its importance
Lecture 2	Point and Nonpoint sources of water pollution: Domestic, Municipal, Industrial, and Agricultural
Lecture 3	Classification of Water Pollutants: a) Sewage, Pathogens, Plant nutrients,
Lecture 4	b) Organic chemicals, Inorganic minerals, Sediments, Heat, Radioactivity
Lecture 5	Effect of Water Pollution on humans, animals and plants.
Lecture 6	Cases for Self-study and discussion: Minamata Tragedy, BP oil spill in the Gulf of Mexico.
Lecture 7	Prevention and Control of water pollution, Water Conservation and Rainwater
Lecture 8	Harvesting
Lecture 9	Preliminary, Primary and Secondary Steps of Wastewater Treatment Water quality tests: Physical, Chemical and Bacteriological Tests
	AUXILIARY POLLUTIONS
Lecture 1	Soil Pollution: Concept of Lithosphere, Causes, Effects and Control measures
Lecture 2	Noise Pollution: Sources, effects and control of noise pollution
Lecture 3	Thermal Pollution: sources of surplus heat, hazardous effect on aquatic system and ways of control
Lecture 4	Radioactive Pollution: sources, effects and control of radioactive pollution
Lecture 5	Solid waste management: classification and origin, methods of waste disposal
Lecture 6	Cases for Self-study and discussion: Chernobyl Nuclear Disaster
	ENVIRONMENTAL MANAGEMENT
Lecture 1	Carbon Footprint: Analysis and ways of minimization
Lecture 2	Life Cycle Assessment (LCA): Procedure and importance
Lecture 3	Environmental Impact Assessment (EIA): a) Methodology,
Lecture 4	b) Role of EIA in Sustainable Development, Limitation of EIA,
Lecture 5	c) Case for Self-study and discussion: Silent Valley Hydroelectric Project
Lecture 6	Important Environmental Laws: Salient features of The Forest Conservation Act, 1980; The Water (Prevention and Control of Pollution) Act, 1974 and 1977; The Air (Prevention and Control of Pollution) Act, 1981 and The Environment (Protection) Act, 1986.
Lecture 7	Basic principles and importance of Green Chemistry
Lecture 8	Sustainability and its ten commandments

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: I	Academic Year: 2025-26 onwards
Name of Course	Basic Electrical and Electronics Engineering Lab			
Course Code	EE1125			
Core / Elective / Other	Core			
Concerned Department/ Section/Centre	Electrical Engineering			
Credits	1	Periods per week	L: 0	T: 0 / P: 2
Prerequisite:				
	NA			
Course Outcomes: At the end of the Lab course, the student will be able to:				
1.	Apply the fundamental laws of Electricity- Kirchhoff's current law and Kirchhoff's voltage law-to analyze the circuits.			
2.	Analyze the working principles of transformers and evaluation of losses and efficiencies.			
3.	Evaluate the resistances of various windings and controlling of Speed of DC machine.			
4.	Study and understand the electronic components along with their applications.			
Description of Contents in brief:				
1.	These experiments focus on verifying fundamental principles of electrical engineering suchas Ohm's law, Kirchhoff's current law and Kirchhoff's voltage law. The experiments related to calculation of losses and efficiency of the transformers are included in this laboratory. The practical setups for calculation of armature winding, series field winding and shunt field winding of DC machine in addition to its speed control are available. Experiments related to applications of different electronics components in circuits are available.			
List of Text Books:				
1.	D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition,2020			
2.	Electric Machines and Electromechanics, Schaum's Outline, Second Edition.			
List of Reference Books:				
1.	Edward Hughes; John Hiley, Keith Brown, Ian McKenzie Smith, "Electrical and Electronic Technology",10th edition, Pearson Education Limited, Year: 2008.			
URLs:				
1.	https://onlinecourses.nptel.ac.in/noc22_ee109/preview			

List of Experiments

Experiment No.	Experiment
1.	Verification of Kirchhoff's current law
2.	Verification of Kirchhoff's Voltage law
3.	Measurement of power and power factor of single phase AC circuit.
4.	Measurement of resistance of armature winding, series field winding and shunt field winding
5.	Speed control of DC shunt motor
6.	Load Test on Single phase transformer
7.	Open circuit test on single phase transformer
8.	Short circuit test on single phase transformer
9.	Study of electronic components and to demonstrate have wave and full wave rectifier.
10.	To study the input and output characteristics of NPN and PNP transistors in CB, CC and CE configurations

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester I	Academic Year: 2025-26 onwards		
Name of Course	Chemistry Practical					
Course Code	CY1126					
Core / Elective / Other	CORE					
Concerned Department/ Section/Centre	Department of Chemistry					
Credits	1	Periods per week		L	T	P
				0	0	2
Prerequisite:						
1.	Student should be capable of handling glass-wares like burette, pipette etc., and minor equipment's like pH meter, weighing balance etc.					
2.	Student should understand the sensitivity of working in the chemistry lab with utmost care so that no harm should come to him or others.					
3.	Knowledge of basic mathematics is required.					

Course Outcomes:	
1.	Upon successful completion of the course the student will be able to: Acquire basic analytical and technical skills to work effectively in the various fields of chemistry.
2.	Gain the ability to perform accurate quantitative measurements with an understanding of the theory.
3.	Able to present scientific and technical information resulting from laboratory experimentation in both written and oral formats.
4.	Acquire knowledge and understanding of the issues of safety regulations.
Description of Contents in brief:	
1.	Oxidation - Reduction Titrations Estimation of percentage of iron using potassium dichromate by internal indicator method Estimation of percentage of iron using potassium dichromate by external indicators
2.	Iodometric Titrations Iodometric titration of copper sulphate by hypo. Iodometric titration of potassium dichromate by hypo.
3.	Water Analysis Determination of alkalinity of water sample by acid method. Determination of total hardness in water using EDTA titrations Determination of pH of tap water sample (Demonstration)
4.	Lubricant Testing Determination of viscosity and viscosity-index of lubricating oil by a. Red Wood Viscometer Number 1 b. Red Wood Viscometer number 2 Determination of cloud point and pour point of lubricating oil. Determination of drop point of semi solid lubricant. Determination of consistency of semi solid lubricant.
5.	Determination of Flash and Fire point of liquid fuel and lubricants by a. Cleaveland's Open Cup Method b. Abel's Flash Point Apparatus c. Pensky Martin's Flash Point Apparatus
List of Text Books:	
1.	"A Textbook of Experiments and Calculations in Engineering Chemistry" by S.S. Dara
2.	Practical Engineering Chemistry" by A.Mittal, J.Mittal and H.L.Kapoor
List of Reference Books:	
1.	Laboratory manual on Engineering Chemistry" by Sudha Rani
2.	Theory and Practicals of Engineering Chemistry by Shashi Chawla

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester I	Academic Year: 2025-26 onwards
Name of Course	Manufacturing Science Laboratory			
Course Code	ME 1127			
Core / Elective / Other	Core			
Concerned Department/ Section/Centre	Mechanical Engineering Department			

Credits	1	Periods per week	L	T	P
			0	0	2

Course Outcomes:	
1	Comprehend the safety measures required to be taken while using the tools.
2	Understand the operations of various Tools used in Workshop.
3	Select the appropriate tools required for specific operations.
4	To gain the knowledge of job materials in various shops.

Description of Contents in brief:	
1st week	Introduction and safety guideline
2nd week	Introduction session on carpentry tools and types of joints, etc.
3rd week	Make an L-shaped joint using the wooden work pieces and carpentry tools
4th week	Make a T-shaped joint using the wood work pieces and carpentry tools
5th week	Introduction session for Fitting tools, and types of operations etc.
6th week	Process of making and joining corner joints of mild steel work piece
7th week	Process for cutting an exact square piece of 20×20 mm from a mild steel plate
8th week	Introduction session for welding, classification of welding and types of joints, etc.
9th week	Preparation of butt joints from mild steel plates by Arc welding process
10th week	Making T-shaped joints from mild steel plates by Arc welding process
11th week	Introduction session on Foundry, Types of Casting, Mould, Pattern, etc.
12th week	Crank's mold cavity preparation process using green sand and wooden pattern
13th week	Process of preparing mould cavity of CAM using green sand and wooden pattern

List of Text Books:	
1.	Hajra Choudhury S.K., Hajra Choudhury A.K., and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I (2008), Media Promoters and Publishers Private Limited, Mumbai.
2.	B. S. Raghuwanshi, “A Course in Workshop Technology”, Vol. I, DhanpatRai and Co. Pvt. Ltd., India
3.	P N Rao, “Manufacturing Process” Vol. I & Vol. II, Tata McGraw Hill Publishing Co. Ltd., New Delhi.

List of Reference Books:	
1.	John A. Schey, Introduction to Manufacturing Processes, 3 edition, McGraw Hill Education, 2012
2.	G. K. Lal and S. K. Choudhury, Fundamentals of Manufacturing Process, 2009. Boca Raton, FL: CRC Press, 2011.

URLs:	
1.	https://nptel.ac.in/courses/112107144/
2.	https://nptel.ac.in/courses/112105127/1

Name of Program	**B.Tech**	**Semester: I**	**Year: 2025**		
Name of Course	**Language Laboratory**				
Course Code	**HS1128**				
Core	**Core**				
Concerned Department/ Section/Centre	**Humanities and Social Sciences**				
Credits	**1**	**Periods per week**	**L**	**T**	**P**
			0	**0**	**2**

Prerequisite:	
1.	To succeed in this course, students should have a foundational understanding of parts of speech, sentence structure, and everyday vocabulary.
2.	The students should be familiar with the theoretical aspects of communication and grammar before engaging in language lab exercises.
3.	The students should be able to read and understand short passages, news articles, or textbook materials.
Course Outcomes:	
1.	**Apply** correct pronunciation, intonation, and stress patterns in spoken English using phonetic transcription and practice.
2.	**Demonstrate** effective listening skills by comprehending audio inputs like lectures, interviews, and discussions.
3.	**Develop** clear and coherent oral communication through role-plays, JAM (Just a Minute) sessions, and group discussions.
Description of Contents in brief:	
1.	Unit I: Introduction to Language Lab Importance and objectives of Language Lab, Language lab manual, Orientation to language lab equipment/software, Self-assessment of speaking and listening skills
2.	Unit II: Phonetics and Pronunciation Introduction to phonetics: vowels, consonants, diphthongs. Phonetic symbols (IPA), Pronunciation and accent neutralization drills, Word stress, Accent, Intonation, Rhythm, Common mispronunciations and regional influences
3.	Unit III: Listening and Speaking Skills Listening for gist and specific information, Listening to conversations, interviews, and announcements, Exercises using audio/video materials (TED Talks, news, etc.), Group discussions and debates, Interviews, Formal and informal speech, JAM sessions, Extempore speaking and storytelling, Conversation practice (asking questions, giving opinions, etc.)
4.	Unit IV: Developing Other Skills Reading skills, Writing skills and grammar, Role plays (interviews, customer service, formal meetings), Elevator pitch practice, Voice modulation, body language, eye contact, Listening tests, Assignments, Practice sessions with peer feedback
List of Text Books:	
1.	Direct Language Lab – English Interactive Coursebook. Direct Language Lab. 2025
2.	Communication Skills for Engineers and Scientists. Binod Mishra &Sangeeta. Sharma. PHI Learning Pvt. Ltd, 2023
3.	English (with Lab Manual) – Khanna Publishing House. 2024
List of Reference Books:	
1.	Better English Pronunciation. J.D. O'Connor. 1998
2.	English Language Communication Skills: Lab Manual. KiranmaiDutt, GeetaRajeevan, C. L. Prakash. Cambridge University Press. 2007
3.	A Course in Phonetics: Peter Ladefoged& Keith Johnson. Cengage Learning. 2020
URLs:	
1.	https://nptel.ac.in/courses/109/105/109105110
2.	https://nptel.ac.in/courses/109/105/109105117
3.	https://nptel.ac.in/courses/109/104/109104115

Name of Program	B.Tech.	Year: First Year	Semester: I	Academic Year: 2025-26 onwards		
Name of Course	National Service Scheme (NSS)					
Course Code	SA1143					
Core / Elective / Other	Elective					
Concerned Department/ Section/Centre	Energy Centre					
Credits	1	Periods per week		L	T	P
				0	0	2
Prerequisite:						

Course Outcomes: At the end of the course, the student will be able to:	
1.	Participate actively in community engagement and extension activities addressing health, hygiene, education, and environment.
2.	Demonstrate teamwork, leadership, and organizational skills in planning and executing NSS projects.
3.	Apply practical knowledge of disaster management, social responsibility, and sustainable practices in real-life contexts.
4.	Document, reflect, and present field experiences through reports, journals, and presentations to assess social impact.
Description of Contents in brief:	
1.	**Orientation & Induction** • Introduction to NSS philosophy, motto, and objectives • Ice-breaking and team-building activities • Campus survey for possible NSS activities
2.	**Campus Cleaning & Plantation Drive** • Cleanliness of campus/public places • Tree plantation and green campus initiative
3.	**Community Survey & Social Mapping** • Visit to adopted village/slum area • Data collection on literacy, sanitation, health, etc.
4.	**Health & Hygiene Awareness** • Organizing an awareness campaign on sanitation • Distribution of pamphlets/posters in community
5.	**Blood Donation & Health Check-up Camp** • Coordinating with NGOs/hospitals • Volunteer participation and record maintenance
6	**Swachh Bharat & Waste Management Drive** • Plastic-free campus/community • Segregation of waste and awareness programs
7	**Education & Literacy Support** • Volunteering in local schools • Teaching support/awareness on digital literacy
8	**Gender Equality & Social Justice Awareness** • Street play/poster campaign on women empowerment • Workshop on inclusivity and human rights
9	**Environmental Conservation Activities** • Energy saving and renewable energy awareness • Awareness rally on climate change
10	**Road Safety & Traffic Awareness** • Collaboration with traffic police • Awareness drive on safe driving practices

11	**Disaster Management Training** • First aid and fire safety training • Mock drill on earthquake/flood safety
12	**Health & Wellness Program** • Yoga and meditation session for community • Campaign on mental health awareness
List of Text Books:	
1.	Ministry of Youth Affairs & Sports, Govt. of India – NSS Manual
2.	Dr. S. Sivasankari – National Service Scheme: A Handbook for Students, Bharathidasan University Press
List of Reference Books:	
1.	Y.C. Damle – Youth in Action: National Service Scheme, Govt. of India Publication
2.	N.R. Madan – Rural Development and NSS, Deep & Deep Publications
3.	Official NSS Guidelines and Reports, Ministry of Youth Affairs & Sports

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: I	Academic Year: 2025-26 onwards
Name of Course	**YOGA**			
Course Code	**SA1144**			
Core / Elective / Other	**ELECTIVE**			
Concerned Department/ Section/Centre	Physical Education & Sports Section			
Credits	**1**	**Periods per week**	**L**	**T**	**P**
			0	**0**	**2**

Prerequisite:	
	Basic concept of yoga
Course Outcomes: At the end of the course, the student will be able to:	
1.	Understand Real Concept Of Yoga
2.	Application Of Aparigraha Toward Daily Life
3.	Importance Of Sudhi Kriyas In Digestion
4.	Improve Moral Discipline
Description of Contents in brief:	
1.	Basics of Yoga, History of Yoga, Concepts of Yoga, Aims And Objectives of Yoga New Trends in Yoga
2.	Ashtang Yoga Asanas , Pranayama, Suryanamaskar, Classification Of Yoga, Hath Yoga Power Yoga
3.	Yoga And Mental Health Self Study Learning Control Through Learning Yourself Self Control Through Yoga Meditation Kriya Unit
4.	Research Review (Minimum Eight) Related To Asanas, Pranayama, Kriya, Meditation
5.	Course Related Practical Work, Field Work Record Book
List Of Text Books:	
1.	The Yoga Sutra of Patanjali By Sri Swami Satchidananda
2.	Ashtanga Yoga The Practice Manual (Spiral Bound) By David Swenson
List Of Reference Books:	
	Yoga And Mental Health & Beyond By Rs Bhogal
	Pranayama By Swami Kuvalayananda
	The Heart Of Yoga Developing A Personal Practice By T.K.V. Desikachar
	Asana Pranayama Mudra Bandha By Swami Satyananda Saraswati
	Yoga Anatomy (2nd Edition) By Leslie Kaminoff And Amy Mattews
	The Key Poses Of Yoga Scientific Keys, Volume Ii By Ray Long
	Light On Yoga By B.K.S Lyengar
	Raja Yoga By Swami Vivekananda
	Living Your Yoga Finding The Spiritual In Everyday Life (Paper Back) By Judith Hanson Lasater
	The Yoga Tradition Its History, Literature, Philosophy And Practise By Georg Feuerstein
	The Key Muscles Of Yoga By Ray Long
URLs: https://yogaiyain.tinyemails.com/c/eyJ1Ijo0MTAzNSwibSI6MzE5MTI0MDc2LCJsIjoxMzYxNzUwfQ.9h15qa_auf8vM2-rNnYO6Ksgv5rfxtn5hCkymmMJKLE.html	

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: I	Academic Year: 2025-26 onwards
Name of Course	Universal Human Values and Professional Ethics			
Course Code	SA1145			
Core / Elective / Other				
Concerned Department/ Section/Centre	Mechanical Engineering			

Credits	1	Periods per week	L	T	P
			0	0	2

Prerequisite:	
Course Outcomes: At the end of the course, the student will be able to:	
1.	Evaluate the significance of value inputs in formal education and start applying them in their life and profession.
2.	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
3.	Analyze the value of harmonious relationship based on trust and respect in their life and profession and examine the role of a human being in ensuring harmony in society and nature.
4.	Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession.
Description of Contents in brief:	
1.	Introduction-Basic Human Aspiration, its fulfillment through All-encompassing Resolution: The basic human aspirations and their fulfillment through Right understanding and Resolution, Right understanding and Resolution as the activities of the Self, Self being central to Human Existence; All-encompassing Resolution for a Human Being, its details and solution of problems in the light of Resolution.
2.	Right Understanding (Knowing)- Knower, Known & the Process: The domain of right understanding starting from understanding the human being (the knower, the experiencer and the doer) and extending up to understanding nature/existence – its interconnectedness and co-existence; and finally understanding the role of human being in existence (human conduct).
3.	Understanding Human Being: Understanding the human being comprehensively as the first step and the core theme of this course; human being as co-existence of the self and the body; the activities and potentialities of the self; Basis for harmony/contradiction in the self.
4.	Understanding Nature and Existence: A comprehensive understanding (knowledge) about the existence, Nature being included; the need and process of inner evolution (through self-exploration, self-awareness and self-evaluation), particularly awakening to activities of the Self: Realization, Understanding and Contemplation in the Self (Realization of Co-Existence, Understanding of Harmony in Nature and Contemplation of Participation of Human in this harmony/ order leading to comprehensive knowledge about the existence).
5.	Understanding Human Conduct, All-encompassing Resolution & Holistic Way of Living: Understanding Human Conduct, different aspects of All-encompassing Resolution (understanding, wisdom, science etc.), Holistic way of living for Human Being with All-encompassing Resolution covering all four dimensions of human endeavor viz., realization, thought, behavior and work (participation in the larger order) leading to harmony at all levels from Self to Nature and entire Existence
List of Text Books:	
1.	R R Gaur, R Asthana, G P Bagaria, 2019 (2nd Revised Edition), A Foundation Course in Human Values and Professional Ethics. ISBN 978-93-87034-47-1, Excel Books, New Delhi.
2.	Premvir Kapoor, Professional Ethics and Human Values, Khanna Book Publishing, New Delhi, 2022.
List of Reference Books:	
1.	Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2.	E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3.	Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991

4.	Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.
5.	A Nagraj, 1998, JeevanVidyaekParichay, Divya Path Sansthan, Amarkantak.
6.	PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Purblishers.
7.	A.N. Tripathy, 2003, Human Values, New Age International Publishers.
8.	SubhasPalekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) KrishiTantraShodh, Amravati.
9.	E G Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists &Engineers, Oxford University Press
10.	M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
11.	B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
12.	B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008

Relevant websites, movies and documentaries and URLs:

1.	Value Education websites, http://uhv.ac.in , http://www.uptu.ac.in
2.	Story of Stuff, http://www.storyofstuff.com
3.	Al Gore, An Inconvenient Truth, Paramount Classics, USA
4.	Charlie Chaplin, Modern Times, United Artists, USA
5.	IIT Delhi, Modern Technology – the Untold Story
6.	Gandhi A., Right Here Right Now, Cyclewala Productions

Lecture Plan (about 40-50 Lectures):

Lecture No.	Topic
Lecture 1	The basic human aspirations and their fulfillment through Right understanding and Resolution
Lecture 2	Right understanding as the activities of the Self
Lecture 3	Right Resolution as the activities of the Self
Lecture 4	Self being central to Human Existence
Lecture 5	All-encompassing Resolution for a Human Being
Lecture 6	Its details and solution of problems in the light of Resolution.
Lecture 7	The domain of right understanding starting from understanding the human being (the knower)
Lecture 8	The domain of right understanding starting from understanding the human being (the experiencer and the doer)
Lecture 9	Extending up to understanding nature/existence - its interconnectedness
Lecture 10	Extending up to understanding nature/existence - its co-existence
Lecture 11	Understanding the role of human being in existence (human conduct).
Lecture 12	Understanding the human being comprehensively as the first step
Lecture 13	The core theme of this course; human being as co-existence of the self and the body
Lecture 14	The activities and potentialities of the self
Lecture 15	Basis for harmony/contradiction in the self
Lecture 16	A comprehensive understanding (knowledge) about the existence
Lecture 17	Nature being included
Lecture 18	The need and process of inner evolution (through self-exploration)
Lecture 19	The need and process of inner evolution (through self-awareness)
Lecture 20	The need and process of inner evolution (through self-evaluation)
Lecture 21	Particularly awakening to activities of the Self: Realization, Understanding
Lecture 22	Contemplation in the Self (Realization of Co-Existence)
Lecture 23	Contemplation in the Self (Understanding of Harmony in Nature)
Lecture 24	Contemplation in the Self (Contemplation of Participation of Human in this harmony/ order leading to comprehensive knowledge about the existence).
Lecture 25	Understanding Human Conduct

Lecture 26	Different aspects of All-encompassing Resolution (understanding, wisdom, science etc.),
Lecture 27	Holistic way of living for Human Being with All encompassing
	Resolution covering all four dimensions of human endeavor viz., realization, thought, behavior and work (participation in the larger order) leading to harmony at all levels from Self to Nature and entire Existence

***

Scheme and Syllabus
Session 2025-26 Onwards
First Year B. Tech./B.Tech.-M.Tech. (Dual Degree)
Scheme

Second Semester

(Section A,B,C,D& E)/(Section F, G, H, I & J)

Course Code	Course Name	Periods per week			Credits
		L	T	P	
MC1201	Mathematics II	3	1	-	4
CY1207/PY1202	Engineering Chemistry/Physics	3	-	-	3
EE1208/CE1203	Basic Electrical & Electronics Engineering/ Engineering Mechanics	3	**1**	-	4
ME1209/ME1204	Manufacturing Science/ Engineering Graphics	1	-	-	1
CY1210/CS1205	Environmental Science /Computer Programming & Problem Solving	2	-	-	2
BS1211/HS1206	Biology for Engineers/ Communication Skill	2/1	-	-	2/1
EE1225/CE1221	Basic Electrical & Electronics Engineering Laboratory / Engineering Mechanics Laboratory				
CY1226/ PY1222	Engineering Chemistry Laboratory / Physics Laboratory	-	-	2	1
ME1227/ME1223	Manufacturing Science Engineering Laboratory /Graphics Laboratory	-	-	2	1
HS1228/CS1224	Language Laboratory/ Computer Programming Laboratory	-	-	2	1
SA1243 or SA1244 or SA1245 / SA1241or SA1242	NSS or Yoga or Universal Human Values and Professional Ethics / Life Skill Management or Physical Education	-	-	2	1
Total Hours = 26/25		**14/13**	**2**	**10**	**21/20**
NC1252*	National Cadet Corps II	**1**	**1**	**-**	**2**

* Not to be counted in SGPA/ CGPA calculations

Syllabus

Sections A to E (Sem- II)

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: II	Academic Year: 2025-26 onwards
Name of Course	Mathematics-2			
Course Code	MC 1201			
Core / Elective / Other	Core			
Concerned Department/ Section/Centre	Department of Mathematics, Bioinformatics and Computer Applications			

Credits	4	Periods per week	L	T	P
			3	1	0

Prerequisite:	
Course Outcomes: At the end of the course, the student will be able to:	
1.	Demonstrate the ability to solve linear systems and perform matrix operations, including determining the rank, eigenvalues, and eigenvectors.
2.	Apply the Cayley-Hamilton theorem to solve matrix-related problems.
3.	Solve ordinary differential equations using Laplace transforms and interpret inverse Laplace transforms for engineering applications.
4.	Develop proficiency in Fourier series and Fourier transforms and their application in signal analysis.
5.	Analyze and solve partial differential equations (PDEs), including boundary value problems for heat and wave equations.
Description of Contents in brief:	
1.	**Module 1: Matrices (9** Lectures + 3 Tutorials**)**
2.	**Module 2: Laplace Transforms (7** Lectures + 2 Tutorials**)**
3.	**Module 3: Fourier Series and Transforms (7** Lectures + 2 Tutorials**)**
4.	**Module 4: Partial Differential Equations (PDEs) (8** Lectures + 2 Tutorials**)**
5.	**Module 5: Boundary Value Problems of PDEs** (6 **Lectures + 2 Tutorials**)
List of Text Books:	
1.	Advanced engineering Mathematics by Erwin Kreyszig
2.	Higher engineering Mathematics by B V Ramnna
List of Reference Books:	
1.	Higher engineering Mathematics by John Bird
URLs:	

Lecture Plan (about 40-50 Lectures):

Lecture No.	Topic
Lecture 1	Introduction to Matrices and Echelon Form
Lecture 2	Row Reduced Echelon Form
Lecture 3	Rank of a Matrix
Tutorial 1	Problems on Echelon Forms and Rank
Lecture 4	Solution of Linear Systems of Equations (Direct Methods)
Lecture 5	Solution of Linear Systems of Equations (Iterative Methods)
Lecture 6	Eigenvalues and Eigenvectors (Introduction)
Tutorial 2	Solving Linear Systems and Introduction to Eigenvalues

Lecture 7	Properties of Eigenvalues and Eigenvectors
Lecture 8	Cayley-Hamilton Theorem
Lecture 9	Application of Cayley-Hamilton Theorem
Tutorial 3	Numerical Problems on Eigenvalues, Eigenvectors and Cayley-Hamilton Theorem
Lecture 10	Introduction to Laplace Transforms
Lecture 11	Properties of Laplace Transforms
Lecture 12	Common Laplace Transformations
Tutorial 4	Practice Problems on Laplace Transforms
Lecture 13	Inverse Laplace Transforms
Lecture 14	Convolution Theorem
Lecture 15 & 16	Solving ODEs using Laplace Transforms
Tutorial 5	Solving Differential Equations using Laplace Transforms
Lecture 17	Introduction to Fourier Series
Lecture 18 & 19	Fourier Series for Periodic Functions
Tutorial 6	Problems on Fourier Series
Lecture 20	Fourier Transform: Concept and Definition
Lecture 21 & 22	Properties of Fourier Transform
Lecture 23	Inverse Fourier Transform and Applications
Tutorial 7	Practice Problems on Fourier Transforms
Lecture 24	Introduction to PDEs
Lecture 25	Linear PDEs of First Order
Lecture 26	Non-Linear PDEs of First Order
Tutorial 08	Solving First-Order PDEs
Lecture 27	Homogeneous Linear PDEs of Higher Order
Lecture 28 & 29	Non-Homogeneous Linear PDEs of Higher Order
Lecture 30 & 31	Separation of Variables: Methodology and Applications
Tutorial 09	Practice Problems on Separation of Variables
Lecture 32	Boundary Value Problems: Introduction and Types
Lecture 33	Classification of PDEs: Elliptic, Parabolic, and Hyperbolic
Lecture 34	Separation of Variables: Fundamentals and Methodology
Tutorial 10	Practice Problems on Classification and Separation of Variables
Lecture 35	Wave Equation: Derivation and Solutions
Lecture 36 & 37	Heat Equation: Derivation and Solutions
Tutorial 11	Practice Problems on Wave and Heat Equations

Name of Program	**B.Tech. & Dual Degree**	**Year: First Year**	**Semester: II**	**Academic Year: 2025-26 onwards**		
Name of Course	**Engineering Chemistry**					
Course Code	**CY1207**					
Core / Elective / Other	**CORE**					
Concerned Department/ Section/Centre	Department of Chemistry					
Credits	**3**	**Periods per week**	**L**	**T**	**P**	
			3	**0**	**0**	

Prerequisite:	
1.	Student should have sound knowledge of basics of chemistry, like atomic structure, bonding , chemical reactions, periodic table, their properties etc.
2.	Student should have the capability to understand how chemistry can explain various concepts of technology.
3.	Basic mathematics for doing calculations and numerical problems is desired.
Course Outcomes:	
1.	Upon successful completion of the course the student will be able to: Select lubricants for various purposes and can apply accordingly.
2.	Understand the importance of fuel in modern world scenario.
3.	Describe impurities present in water, boiler troubles, removal of impurities.
4.	Apply corrosion technology methods that are useful to know about the protection of metals from corrosion by various technologies.
5.	Describe advanced polymer materials and their industrial applications.
Description of Contents in brief:	
1.	LUBRICANTS- Role and Effects of Friction, Functions of Lubricants, Mechanisms of Lubrication – Thick Layer, Thin layer and Extreme Pressure Lubrication. Liquid, Solid and Semi-solid Lubricants: their Physical and Chemical Properties, Importance and Testing; Examples and Their Structures; Lubricating Emulsions; Cutting Fluids; Selection of Lubricants for light and heavy machinery
2.	FUELS- Calorific value, Classification and Characteristic of a Good Fuel, Comparison between Solid, Liquid and Gaseous Fuels, Determination of Gross and Net Calorific Value by Bomb Calorimeter. Classification, Selection Criteria, Proximate and Ultimate Analysis of Coal, Pulverized Coal. Classification of Petroleum, Types of Cracking, Knocking, Octane and Cetane Number. Numerical problems related to caloric value and ultimate analysis.
3.	WATER- Sources of water, Specifications of Drinking Water, Step-wise procedure for Purification of water, Difference between Disinfection and Sterilization. Classification and Disadvantages of Hardness, Caustic Embrittlement, Boiler Corrosion, Priming and Foaming, Scale and Sludge formation: Prevention (Internal &External Treatments). Softening Methods: Lime-Soda Processes (cold and hot both), Zeolite Process, Ion-Exchange Process. Numerical problems related to purification of water.
4.	MATERIALS Types of Polymerization, Mechanism of Addition Polymerization and coordination polymerization, Molecular weight determination of Polymers, Thermosetting &Thermoplastic Polymers, Methods of Moulding of Plastics, Preparation, Properties and Uses of Thermoplastic Resins, Thermosetting Resins and Synthetic Rubbers. Classification and Vulcanization of Rubber, Polymer Composites, Polymers for biomedical applications. Classification, Raw Materials, Gypsum, Manufacture of Portland Cement (Both Wet and Dry Process), Chemical Composition and Constitution of Cement, Setting and Hardening of Cement, Significance of lime saturation factor and silica modulus. Special Cements: Aluminous Cement, High Early Strength Cement, White Portland Cement, Water Proof Cement. Concrete and RCC

5.	CORROSION AND ITS CONTROL Mechanism of Chemical and Electrochemical Corrosion, Galvanic Corrosion, Concentration Cell Corrosion, Passivity, Soil Corrosion, Pitting Corrosion, Inter-granular Corrosion, Waterline Corrosion, Stress Corrosion, Galvanic Series, Factors influencing Corrosion, Ways to protect against Corrosion. Protective Coatings, Anodic and Cathodic Coatings.
List of Text Books:	
1.	Engineering Chemistry by Jain and Jain
2.	Engineering Chemistry by S.S. Dara
3.	Engineering Chemistry by B.K. Sharma
4.	Engineering Chemistry by Shashi Chawla
List of Reference Books:	
1.	Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015 edition.
2.	Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition (second).
3.	Engineering Chemistry by PrasanthRath, Cengage Learning, 2015 edition.
4.	Applied Chemistry by H.D. Gesser, Springer Publishers
5.	B. Siva Shankar, “Engineering Chemistry”, Tata McGraw Hill Publishing Limited, 3rd Edition, 2015.
6.	C. V. Agarwal, C. P. Murthy, A. Naidu, “Chemistry of Engineering Materials”, Wiley India, 5th Edition, 2013.
7.	R. P. Mani, K. N. Mishra, “Chemistry of Engineering Materials”, Cengage Learning, 3rd Edition, 2015.
Lecture Plan (about 42 Lectures):	
Lecture No.	Topic
	LUBRICANTS
Lecture 1	Introduction, Role and Effects of Friction, Functions of Lubricants.
Lecture 2	Mechanism of Lubrication – Thick Layer, Thin layer and Extreme Pressure Lubrication.
Lecture 3	Physical and Chemical Properties of oils, Their Importance and Testing.
Lecture 4	Physical and Chemical Properties of oils, Their Importance and Testing.
Tutorial	Problems based on topics covered in above four lectures and discussions.
Lecture 5	Liquid Lubricants: Detailed classification of Vegetable Oils, Animal Oils, Mineral Oils, Blended and Synthetic Oils.
Lecture 6	Semi-solid Lubricants: Examples, Physical and Chemical Properties, Their Importance and Testing.
Lecture 7	Solid Lubricants: Examples and Their Structures, Biodegradable Lubricants.
Lecture 8	Lubricating Emulsions; Cutting Fluids; Selection of Lubricants.
Tutorial	Problems based on topics covered in above three lectures and discussions
	Fuels
Lecture 1	Introduction, Classification, Calorific value, Characteristic of a Good Fuel, Comparison
Lecture 2	between Solid, Liquid and Gaseous Fuels. Numerical Problems based on Calorific Value. Bomb Calorimeter, Numerical Problems based on calorimeter.
Lecture 3	Coal: Classification, Selection Criteria, Proximate Analysis, Numerical Problems based on
Lecture 4	Proximate Analysis. Problems based on topics covered in above three lectures and discussions.
Tutorial	Ultimate Analysis of coal, Numerical Problems based on Ultimate Analysis.
Lecture 5	Pulverized Coal. Petroleum: Classification and separation. Types of Cracking.
Lecture 6	Knocking, Octane and Cetane Number.
Lecture 7	LPG, Natural Gas, Producer Gas, Water Gas, Bio Gas.
Lecture 8	Problems based on topics covered in above three lectures and discussions.
Tutorial	
	Water
Lecture 1	Introduction, Sources of water, Specifications of Drinking Water.
Lecture 2	Steps for Purification of water, Screening Process, Sedimentation, Sedimentation with Coagulation.
Lecture 3	Filtration and Disinfection. Difference between Disinfection and Sterilization.
Lecture 4	Break Point Chlorination, Hardness: Units and Disadvantages.

Tutorial	Problems based on topics covered in above three lectures and discussions.
Lecture 5	Scale and Sludge formation: Disadvantages, Prevention (Internal &External Treatments), Caustic Embrittlement.
Lecture 6	Boiler Corrosion, Priming and Foaming.
Lecture 7	Softening Methods: Lime-Soda Processes (cold and hot both).
Lecture 8	Zeolite Process, Ion-Exchange Process.
Tutorial	Numerical problems based on Lime-Soda Processes and water analysis
	Materials
Lecture 1	Polymer: Introduction, Nomenclature, Functionality, Types of Polymerization, Mechanism of Addition Polymerization.
Lecture 2	Thermosetting &Thermoplastic Polymers, Methods of Moulding of Plastics. Thermoplastic
Lecture 3	Resins: Polyethylene, Polypropylene, Polyvinylchloride, Polyvinyl Acetate, Polystyrene, PolymethylMethacrylate.
Lecture 4	PolytetrafluoroEthylene, Nylon-6:6, Kevlar. Thermosetting Resins, Polyurethane, Epoxy Resin, Alkydes etc.
Tutorial	Problems based on topics covered in above three lectures and discussions.
Lecture 5	Bakelite, Silicone Resins, Polymer Composites. Rubber: Classification, Vulcanization, Synthetic Rubbers (Buna-S, Buna-N), PANVC, ABS etc.
Lecture 6	Cement: Introduction, Classification, Raw Materials, Gypsum, Manufacture of Portland Cement (Both Wet and Dry Process).
Lecture 7	Chemical Composition of Cement, Chemical Constitution of Cement, Setting and Hardening of Cement.
Lecture 8	Special Cements: Aluminous Cement, High Early Strength Cement, White Portland Cement, Water Proof Cement, Physical Requirements of Cement, Introduction of Concrete and RCC.
Tutorial	Problems based on topics covered in above three lectures and discussions.
	CORROSION AND ITS CONTROL
Lecture 1	Introduction and Mechanism of Chemical and Electrochemical Corrosion. Galvanic
Lecture 2	Corrosion, Concentration Cell Corrosion, Passivity, Soil Corrosion.
Lecture 3	Pitting Corrosion, Intergranular Corrosion, Waterline Corrosion, Stress Corrosion.
Lecture 4	Galvanic Series, Factors influencing Corrosion, Ways to protect against Corrosion.
Tutorial	Problems based on topics covered in above three lectures and discussions.
Lecture 5	Introduction of Protective Coatings, Metallic Coatings.
Lecture 6	Introduction of Anodic and Cathodic Coatings, Methods of application of Metal coatings. Objectives and theory of Electroplating.
Lecture 7	Chemical Conversion Coatings, Paints, Varnishes and Enamels.
Lecture 8	Problems based on topics covered in above three lectures and discussions.
Tutorial	

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: II	Academic Year: 2025-26 onwards
Name of Course	**Basic Electrical & Electronics Engineering**			
Course Code	**EE1208**			
Core / Elective / Other	**Core**			
Concerned Department/ Section/Centre	Electrical Engineering			

Credits	4	Periods per week	L	T	P
			3	1	0

Prerequisite:	
	Engineering Physics
Course Outcomes: At the end of the course, the student will be able to:	
1.	**Understand** and **analyse** basic AC and DC circuits.
2.	**Remember**&**Apply** knowledge regarding the various laws and principles associated with electrical systems.
3.	**Understand** and **analyse** the construction and principle of operation of single-phase transformer & DC machines.
4.	**Apply** knowledge regarding various types of semiconductor devices.
Description of Contents in brief:	
1.	D.C. circuit fundamentals, KCL, KVL, loop and nodal equations, Network theorems. Star Delta transformations, Simple series and parallel circuits.
2.	Introduction to AC Circuits, Waveforms and RMS Value, phase, phase difference Power and Power factor in A.C. circuits, Series A.C. circuits, resonance.
3.	Electrical machines, Faraday's law of electromagnetic induction, Transformers, construction, principle of operation, phasor diagrams, equivalent circuit, tests on transformer, losses and efficiency, Introduction to DC machines.
4.	Semiconductor devices and applications, Characteristics of PN Junction Diode, Zener Effect, Zener Diode and its characteristics ,Half wave and Full wave rectifiers, ripple factor, efficiency.
5.	Bipolar Junction Transistor, Principle of operation of transistors, Input/output & transfer characteristics of BJT in CB, CE, CC configurations.
List of Text Books:	
1.	Basic Electrical Engineering, III Edition, TMH - D.P. Kothari & I.J. Nagrath
2.	Basic Electrical Engineering, TMH - V.N. Mittle
3.	Basic Electrical Engineering - V.K. Mehta & Rohit Mehta
4.	Electronic Devices and Circuit Theory - Robert Boylestad& Louis Nashelsky
List of Reference Books:	
1.	Electrical Circuits- Schaum's Outline Series
2.	Electronicsprinciples - Albert Malvino
3.	Basic Electrical Engineering -S.N.Singh
URLs:	
1.	https://nptel.ac.in/courses/117106108, https://nptel.ac.in/courses/108108112
Lecture No	**Topic**
L1	Introduction and Overview of Subject & Syllabus, Basic Concepts related to Electric and magnetic circuits, EMI, law's of EMI
L2	A.C and D.C circuits, differentiation between them, A.C. fundamentals, Gen. of Alternating voltage and current, A.C. terminology, diff. forms of alt. voltages
L3	Peak value, RMS value and Avg value, form factor, peak factor
L4	Complex waveforms, phasor representation and phase difference, Addition and subs traction of alt. quantities, numericals
L5	Various powers in AC circuits, Concept of power & power factor; expression of power in complex notation,

L6	A.C. circuit containing pure R, L and C, Series A.C. Circuits, numerical, concepts of reactance, impedance and their representation in complex forms using 'j' operator
L7	R-L , R-C series circuits , Impedance triangle, true and reactive power, Q-factor &numericals
L8	R-L-C series circuits, Resonance in AC ckts& problems
L9	Introduction to parallel AC ckts, Resonance in series and parallel circuits
L10	DC circuits: Basic concepts; concepts of linear, nonlinear, active, passive, unilateral and bilateral elements: ideal and practical voltage & current sources -conversion from one from the other.
L11	Kirchhoff's laws statements & explanation with numericals
L12	Mesh current method – definition of mesh & loop, illustrative example. Node voltage method – Definition of a node, illustrative example
L13	Delta-Star & Star-Delta conversion; necessity, illustration with example
L14	Thevenin's theorem – statement, explanation & illustration with examples. Norton's theorem – concept of duality; explanation & illustration with examples.
L15	Mini Test
L16	Superposition principle – statement, explanation & illustration with examples
L17	Maximum Power Transfer Theorem – statement, explanation & illustration with examples.
L18	Dependent Source based Problems
L19	Introduction, Classification, Principle of Operation of Machines, Constructional features of DC Machine
L20	Principle of operation and EMF equation of Elec. M/c& problems based on it
L21	Speed control methods of DC motor &numericals
L22	Construction, principle of operation and EMF equation of Transformer
L23	Classification and types of X-mer, working of transformer under no load& loaded conditions
L24	Concept of Practical transformer, Phosor diagrams under no load& loaded conditions
L25	Equivalent circuits of Transformer
	Mid-term Exam
L26	O.C.& S.C. tests illustrative example
L27	Losses & efficiency, condition for maximum efficiency, illustrative examples,
	Efficiency & Regulation of Transformer - definition & importance; derivation of expression , illustrative example
L28	Semiconductor Fundamentals PN Junction Diodes Introduction and Operation, Characteristic of PN Junction Diodes
L29	Zener diode and its characteristics, special purpose diodes
L30	Regulated Power Supply ,Rectifier and Its Classification
L31	Half Wave Rectifier- Working , Derivation of Rectification Efficiency and ripple factor problem
L33	Full Wave Rectifier- Working, Derivation of Rectification Efficiency and ripple factor problem
L34	Bipolar Junction Transistor — Introduction ,Construction and Working of BJT
L35	Modes of operation of BJT and configuration
L36	CB,CC and CE configuration , Characteristics and problems
L37	Clarification of doubts and numericals

Name of Program	**B.Tech. & Dual Degree**	**Year: First Year**	**Semester II**	**Academic Year: 2025-26 onwards**		
Name of Course	**Manufacturing Science**					
Course Code	**ME1209**					
Core / Elective / Other	**Core**					
Concerned Department/ Section/Centre	Mechanical Engineering Department					
Credits	**01**	**Periods per week**	**L**	**T**	**P**	
			1	**0**	**0**	
Prerequisite if any: Nil						
Course Outcomes:						
1.	Comprehend the safety measures required to be taken while using the tools					
2.	Understand the operations of machine tools					
3.	Select the appropriate tools required for specific operations.					
4.	To provide knowledge of job materials in various shops					
Description of Contents in brief:						
Unit 1.	FITTING SHOP Introduction. Classification of Metals. Clamping tools. Vices and V-blocks. Surface plate, Try square, Files, Chisels, Hack saw, Single scribing block of surface gauge. Punches, Hammers, Calipers – outside and inside, Dividers, Drills and Taps. Principle of Micrometres. Verniercallipers. Principle of vernier caliper. Reading and least count of the Vernier. Vernier depth gauge, Vernier height gauge, Micrometer depth gauge. Processes: Marking, chipping, sawing, filing, etc.					
Unit 2.	WELDING SHOP Introduction. Classification of welding processes. Concept of weld. Electric arc welding. Arc welding principle. Arc blow. Arc welding equipment. Use of A.C. and D.C. for welding. Electrodes, selection of electrodes.					
Unit 3.	CARPENTRY SHOP Introduction. Applications and methods of using carpentry tools – saws, planer, chisels, hammers, marking gauge, vice, try square, rule, etc. Types of woods and their applications. Types of carpentry hardware and their uses. Carpentry operations such as marking, sawing, planning, chiselling, grooving, boring, joining, etc. Safety precautions in carpentry shop.					
Unit 4.	FOUNDRY SHOP Introduction. Foundry tools and equipment. Elementary ideas of patterns. Pattern Making, Types of patterns, Pattern allowances. Various types of moulding sand, Types of moulds. Step involved in making a mould. Moulding boxes, hand tools used for mould making. Moulding processes. Allowances and Types of allowances.					
List of Text Books:						
1.	Hajra Choudhury S.K., Hajra Choudhury A.K., and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I (2008) and Vol. II (2010), Media Promoters and Publishers Private Limited, Mumbai.					
2.	B. S. Raghuwanshi, A Course in Workshop Technology, DhanpatRai and Co. Pvt. Ltd., India					
3.	P N Rao, “Manufacturing Process” Vol. I & Vol. II, Tata McGraw Hill Publishing Co. Ltd., New Delhi.					
URLs:						
1.	https://nptel.ac.in/courses/112107144/					
2.	https://nptel.ac.in/courses/112105127/1					
List of Reference Books:						

1.	John A. Schey, Introduction to Manufacturing Processes, 3 edition, McGraw Hill Education, 2012	
2.	G. K. Lal and S. K. Choudhury, Fundamentals of Manufacturing Process, 2009. Boca Raton, FL: CRC Press, 2011.	
Lecture Plan (about 40-50 Lectures):		
*Lecture No.	Topic	Remarks
1.	Introduction to fitting shop, Classification of metals	
2.	Clamping tools (Vices, V-blocks), Surface plate, Try square, Marking tools	
3.	Files, Chisels, Hacksaw, Calipers (outside & inside), Dividers, Drills, Taps	
4.	Vernier caliper, Micrometer, Vernier depth/height gauge, Marking & filing	
5.	Introduction, Classification of welding processes, Concept of weld	
6.	Arc welding principle, Arc blow, Arc welding equipment	
7.	A.C. vs D.C. in welding, Electrodes and their selection	
8.	Introduction, Carpentry tools (saws, planer, chisels, etc.)	
9.	Types of woods, Carpentry hardware and their uses	
10.	Carpentry operations: marking, sawing, chiseling, boring, joining	
11.	Safety precautions in carpentry shop	
12.	Introduction, Foundry tools and equipment	
13.	Patterns: types and allowances	
14.	Moulding sand: types and uses, Types of moulds	
15.	Mould making steps, Moulding boxes and hand tools	
16.	Revision of all units, Doubt clearing, Quiz/Oral assessment	

Name of Program	**B.Tech. & Dual Degree**	**Year: First Year**	**Semester II**	**Academic Year: 2025-26 onwards**		
Name of Course	**Environmental Science**					
Course Code	**CY1210**					
Core / Elective / Other	**CORE**					
Concerned Department/ Section/Centre	**Department of Chemistry**					
Credits	**2**	**Periods per week**		**L**	**T**	**P**
				2	**0**	**0**
Prerequisite:						
1.	Student should have basic understanding of environment and its components.					
2.	Knowledge of essential chemical reactions is required.					
3.	Concept of pollution, its basic sources and need for its prevention should be clear.					
Course Outcomes:						
1.	Identify the major challenges in environmental issues and evaluate possible solutions.					
2.	Develop analytical skills, critical thinking and demonstrate socio-economic skills for sustainable development.					
3.	Analyze an overall impact of specific issues and develop environmental management plan.					
Description of Contents in brief:						
1.	Natural resources and associated problems Renewable and Non-renewable Resources and problems associated with them (Forest, Water, Mineral, Food, Energy and Land)					
2.	Air pollution Concept of spheres of Atmosphere, Photochemical Smog, Sources and effects of Air Pollutants, Ozone Depletion. Methods of control of Gaseous and Particulates Pollutants					
3.	Water pollution Hydrosphere and its importance, Point and Nonpoint sources of Water Pollution, Classification and effects of Water Pollutants, Prevention and Control of Water Pollution, Preliminary, Primary and Secondary Steps of Wastewater Treatment, Water Quality Tests.					
4.	Auxiliary pollutions Sources, effects and control of Soil Pollution, Noise Pollution, Thermal Pollution and Radioactive Pollution, Solid Waste Management					
5.	Environmental management Carbon Footprint, Life Cycle Assessment, Methodology, Role and Limitations of Environmental Impact Assessment, Important Environmental Laws, Basic principles and importance of Green Chemistry, Sustainability and its ten commandments					
List of Text Books:						
1.	Textbook of Environmental Chemistry by BalramPani					
2.	Environmental Chemistry by Stanley E. Manahan					
3.	Environmental Chemistry by B.K.Sharma					
4.	Environmental Chemistry by A.K.De					
List of Reference Books:						
1.	“Wastewater Engineering Treatment and Reuse” by MetCalf& Eddy ,McGraw-Hill Education					
2.	“Chemistry for Environmental Engineering and science” by Sawyer, McCarty and Parkin, McGraw Hill Education; 5 edition					
3.	“Environmental Engineering” - by Howard S. Peavy, Donald R. Rowe and George Tchobanoglous. McGraw Hill Education; First edition					

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester II	Academic Year: 2025-26 onwards		
Name of Course	**Biology for Engineers**					
Course Code	**BS1211**					
Core / Elective / Other	**Core**					
Concerned Department/ Section/Centre	Biological Science & Engineering					
Credits	**2**	**Periods per week**		**L**	**T**	**P**
				2	**0**	**0**
Prerequisite:						

Course Outcomes: At the end of the course, the student will be able to:	
1.	Understand cell structure, organelles, growth, division, and related biomolecular disorders.
2.	Explain major human physiological systems and their engineering relevance.
3.	Demonstrate genetic engineering tools and applications in health and biotechnology.
4.	Apply biology in industries: biofuels, tissue engineering, bioprinting, and bioremediation.
5.	Integrate biology and engineering concepts to design innovative solutions.
Description of Contents in brief:	
1.	Cell as foundations of life, cell theory, structure and functions of cell organelles, cell types, cell growth and cell division, biomolecules and associated disorders.
2.	Human Physiology Ergonomics: Digestive systems, Respiratory system, Excretory systems, Skeletal systems, Cardiovascular System, Nervous system, Engineering aspect in Physiology.
3.	Genetic engineering: Introduction to recombinant DNA technology and cloning, Gene therapy, cell therapy, biochips, vaccine antibodies and transgenic plants and animals.
4.	Applications of principles of biology in industries, biofuels, tissue engineering and bioengineering (artificial limbs, joints, And body parts Bio printing, Bioremediation, biomolecules and their industrial applications
List of Text Books:	
1.	Cell and Molecular Biology- P.K. Gupta
2.	Cell Biology-Verma and Agarwal
3.	Cell Biology-Rastogi
4.	N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, “Biology: A global approach”, Pearson Education Ltd, 2018.
5.	T Johnson, Biology for Engineers, CRC press, 2011 Molecular Biology and Biotechnology 2nd ed. J.M. Walker and E.B. Gingold. Panima Publications. PP 434.
List of Reference Books:	
1.	AlbertsEt.Al. The molecular biology of the cell, 6/e, Garland Science, 2014
2.	Principles of Biochemistry. 2nd ed. 1993. A.L. Lehninger, D.L. Nelson. M.Cox. Paniama Publications. PP. 1090.
3.	Harper’s biochemistry. 1988. R.K. Murray. D.K. Granner, P.A. Mayes. Printice Hall International.
4.	Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022
5.	Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
6.	Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008.
7.	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.

8.	Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N Geetha A C Udayashankar Lambert Academic Publishing, 2019.
9.	Blood Substitutes, Robert Winslow, Elsevier, 2005
10.	Electronic Noses and Tongues in Food Science, Maria Rodriguez Mende, Academic Press, 2016 01062022
11.	3D Bioprinting: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 2016.
DETAILED LECTURE PLAN	
Lecture	Topics
	NATURAL RESOURCES AND ASSOCIATED PROBLEMS
Lecture 1 Lecture 2 Lecture 3 Lecture 4 Lecture 5 Lecture 6 Lecture 7 Lecture 8 Lecture 9 Lecture 10 Lecture 11	Forest Resources: Deforestation, Timber extraction, mining, dams and their effects on forests and tribal people Water Resources: Use and overutilization of surface and ground water, floods, drought, conflicts over water, Dams – benefits and problems. Cases for Self-study and discussions: SardarSarovar Project Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources, Case Study: Sariska Tiger Reserve, Rajasthan Food Resources: World food problems, Changes in land-use by agriculture and grazing, Effects of modern agriculture, Fertilizer/ pesticide problems, Water logging and salinity, loss of genetic diversity. Energy Resources: a) Renewable Sources: Solar energy, Wind energy, and Hydropower b) Tidal energy, Geothermal energy, Biomass energy, Biogas and Hydrogen as a fuel Non-Renewable sources: Coal, Petroleum, Natural Gas and Nuclear Energy. Causes of increasing energy needs. Cases for Self-study and discussions: Rewa Ultra Mega Solar Park, India, Muppandalwindfarm, TN, India, Cases for Self-study and discussions: Sihwa Lake Tidal Power Station, South Korea, Geysers Geothermal Complex, USA. Land resources: land degradation, soil erosion desertification and man-induced land-slides. Role of an individual in the conservation of Natural Resources.
	AIR POLLUTION
Lecture 1 Lecture 2 Lecture 3 Lecture 4 Lecture 5 Lecture 6 Lecture 7 Lecture 8	Concept of spheres of atmosphere and lapse rate; Photochemical Smog Natural and Man-made Sources of Air Pollution: a) origin, functioning and effects of Particulate, Carbon Monoxide and Oxides of Sulphur, b) origin, functioning and effects of Oxides of Nitrogen, Ozone and Hydrocarbons Effect of Air Pollutants on humans, animals, plants, materials and climate, Problems of Ozone Depletion. Cases for Self-study and discussion: Bhopal Gas Tragedy, Ozone Hole over Antarctica Methods of control of gaseous pollutants: a) Absorption (Equipment like Gas scrubber, Venturi scrubber, Cyclone Scrubber), Adsorption (Equipment like Fixed bed adsorber and moving bed adsorber), b) Combustion (Equipment like Direct/Thermal/Catalytic incinerator), Condensation (Equipment like Spray tower, Packed bed tower, Bubble cap tower) Methods for Control of Particulate Emission- Wet Scrubbers, Electrostatic Precipitators, Fabric filters etc.
	WATER POLLUTION

Lecture 1	Introduction of Hydrosphere and its importance
Lecture 2	Point and Nonpoint sources of water pollution: Domestic, Municipal, Industrial, and Agricultural
Lecture 3	Classification of Water Pollutants: a) Sewage, Pathogens, Plant nutrients,
Lecture 4	b) Organic chemicals, Inorganic minerals, Sediments, Heat, Radioactivity
Lecture 5	Effect of Water Pollution on humans, animals and plants.
Lecture 6	Cases for Self-study and discussion: Minamata Tragedy, BP oil spill in the Gulf of Mexico.
Lecture 7	Prevention and Control of water pollution, Water Conservation and Rainwater
Lecture 8	Harvesting
Lecture 9	Preliminary, Primary and Secondary Steps of Wastewater Treatment Water quality tests: Physical, Chemical and Bacteriological Tests
	AUXILIARY POLLUTIONS
Lecture 1	Soil Pollution: Concept of Lithosphere, Causes, Effects and Control measures
Lecture 2	Noise Pollution: Sources, effects and control of noise pollution
Lecture 3	Thermal Pollution: sources of surplus heat, hazardous effect on aquatic system and ways of control
Lecture 4	Radioactive Pollution: sources, effects and control of radioactive pollution
Lecture 5	Solid waste management: classification and origin, methods of waste disposal
Lecture 6	Cases for Self-study and discussion: Chernobyl Nuclear Disaster
	ENVIRONMENTAL MANAGEMENT
Lecture 1	Carbon Footprint: Analysis and ways of minimization
Lecture 2	Life Cycle Assessment (LCA): Procedure and importance
Lecture 3	Environmental Impact Assessment (EIA): a) Methodology,
Lecture 4	b) Role of EIA in Sustainable Development, Limitation of EIA,
Lecture 5	c) Case for Self-study and discussion: Silent Valley Hydroelectric Project
Lecture 6	Important Environmental Laws: Salient features of The Forest Conservation Act, 1980; The Water (Prevention and Control of Pollution) Act, 1974 and 1977; The Air (Prevention and Control of Pollution) Act, 1981 and The Environment (Protection) Act, 1986.
Lecture 7	Basic principles and importance of Green Chemistry
Lecture 8	Sustainability and its ten commandments

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: II	Academic Year: 2025-26 onwards
Name of Course	Basic Electrical and Electronics Engineering Lab			
Course Code	EE1225			
Core / Elective / Other	Core			
Concerned Department/ Section/Centre	Electrical Engineering			

Credits	1	Periods per week	L	T	P
			0	0	2

Prerequisite:	
	NA
Course Outcomes: At the end of the Lab course, the student will be able to:	
1.	Apply the fundamental laws of Electricity- Kirchhoff's current law and Kirchhoff's voltage law-to analyze the circuits.
2.	Analyze the working principles of transformers and evaluation of losses and efficiencies.
3.	Evaluate the resistances of various windings and controlling of Speed of DC machine.
4.	Study and understand the electronic components along with their applications.
Description of Contents in brief:	
1.	These experiments focus on verifying fundamental principles of electrical engineering suchas Ohm's law, Kirchhoff's current law and Kirchhoff's voltage law. The experiments related to calculation of losses and efficiency of the transformers are included in this laboratory. The practical setups for calculation of armature winding, series field winding and shunt field winding of DC machine in addition to its speed control are available. Experiments related to applications of different electronics components in circuits are available.
List of Text Books:	
1.	D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition,2020
2.	Electric Machines and Electromechanics, Schaum's Outline, Second Edition.
List of Reference Books:	
1.	Edward Hughes; John Hiley, Keith Brown, Ian McKenzie Smith, "Electrical and Electronic Technology",10th edition, Pearson Education Limited, Year: 2008.
URLs:	
1.	https://onlinecourses.nptel.ac.in/noc22_ee109/preview

List of Experiments

Experiment No.	Experiment
1.	Verification of Kirchhoff's current law
2.	Verification of Kirchhoff's Voltage law
3.	Measurement of power and power factor of single phase AC circuit.
4.	Measurement of resistance of armature winding, series field winding and shunt field winding
5.	Speed control of DC shunt motor
6.	Load Test on Single phase transformer
7.	Open circuit test on single phase transformer
8.	Short circuit test on single phase transformer
9.	Study of electronic components and to demonstrate have wave and full wave rectifier.
10.	To study the input and output characteristics of NPN and PNP transistors in CB, CC and CE configurations

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: II	Academic Year: 2025-26 onwards		
Name of Course	Chemistry Practical					
Course Code	CY1226					
Core / Elective / Other	CORE					
Concerned Department/ Section/Centre	Department of Chemistry					
Credits	1	Periods per week		L	T	P
				0	0	2
Prerequisite:						

1.	Student should be capable of handling glass-wares like burette, pipette etc., and minor equipment's like pH meter, weighing balance etc.
2.	Student should understand the sensitivity of working in the chemistry lab with utmost care so that no harm should come to him or others.
3.	Knowledge of basic mathematics is required.

Course Outcomes:	
1.	Upon successful completion of the course the student will be able to: Acquire basic analytical and technical skills to work effectively in the various fields of chemistry.
2.	Gain the ability to perform accurate quantitative measurements with an understanding of the theory.
3.	Able to present scientific and technical information resulting from laboratory experimentation in both written and oral formats.
4.	Acquire knowledge and understanding of the issues of safety regulations.
Description of Contents in brief:	
1.	Oxidation - Reduction Titrations Estimation of percentage of iron using potassium dichromate by internal indicator method Estimation of percentage of iron using potassium dichromate by external indicators
2.	Iodometric Titrations Iodometric titration of copper sulphate by hypo. Iodometric titration of potassium dichromate by hypo.
3.	Water Analysis Determination of alkalinity of water sample by acid method. Determination of total hardness in water using EDTA titrations Determination of pH of tap water sample (Demonstration)
4.	Lubricant Testing Determination of viscosity and viscosity-index of lubricating oil by a. Red Wood Viscometer Number 1 b. Red Wood Viscometer number 2 Determination of cloud point and pour point of lubricating oil. Determination of drop point of semi solid lubricant. Determination of consistency of semi solid lubricant.
5.	Determination of Flash and Fire point of liquid fuel and lubricants by a. Cleaveland's Open Cup Method b. Abel's Flash Point Apparatus c. Pensky Martin's Flash Point Apparatus
List of Text Books:	
1.	"A Textbook of Experiments and Calculations in Engineering Chemistry" by S.S. Dara
2.	Practical Engineering Chemistry" by A.Mittal, J.Mittal and H.L.Kapoor
List of Reference Books:	
1.	Laboratory manual on Engineering Chemistry" by Sudha Rani
2.	Theory and Practicals of Engineering Chemistry by Shashi Chawla

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: II	Academic Year: 2025-26 onwards
Name of Course	Manufacturing Science Laboratory			
Course Code	1227			
Core / Elective / Other	Core			
Concerned Department/ Section/Centre	Mechanical Engineering Department			

Credits	1	Periods per week	L	T	P
			0	0	2

Course Outcomes:	
1	Comprehend the safety measures required to be taken while using the tools.
2	Understand the operations of various Tools used in Workshop.
3	Select the appropriate tools required for specific operations.
4	To gain the knowledge of job materials in various shops.

Description of Contents in brief:	
1st week	Introduction and safety guideline
2nd week	Introduction session on carpentry tools and types of joints, etc.
3rd week	Make an L-shaped joint using the wooden work pieces and carpentry tools
4th week	Make a T-shaped joint using the wood work pieces and carpentry tools
5th week	Introduction session for Fitting tools, and types of operations etc.
6th week	Process of making and joining corner joints of mild steel work piece
7th week	Process for cutting an exact square piece of 20×20 mm from a mild steel plate
8th week	Introduction session for welding, classification of welding and types of joints, etc.
9th week	Preparation of butt joints from mild steel plates by Arc welding process
10th week	Making T-shaped joints from mild steel plates by Arc welding process
11th week	Introduction session on Foundry, Types of Casting, Mould, Pattern, etc.
12th week	Crank's mold cavity preparation process using green sand and wooden pattern
13th week	Process of preparing mould cavity of CAM using green sand and wooden pattern

List of Text Books:	
1.	Hajra Choudhury S.K., Hajra Choudhury A.K., and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I (2008), Media Promoters and Publishers Private Limited, Mumbai.
2.	B. S. Raghuwanshi, “A Course in Workshop Technology”, Vol. I, DhanpatRai and Co. Pvt. Ltd., India
3.	P N Rao, “Manufacturing Process” Vol. I & Vol. II, Tata McGraw Hill Publishing Co. Ltd., New Delhi.

List of Reference Books:	
1.	John A. Schey, Introduction to Manufacturing Processes, 3 edition, McGraw Hill Education, 2012
2.	G. K. Lal and S. K. Choudhury, Fundamentals of Manufacturing Process, 2009. Boca Raton, FL: CRC Press, 2011.

URLs:	
1.	https://nptel.ac.in/courses/112107144/
2.	https://nptel.ac.in/courses/112105127/1

Name of Program	**B.Tech**	**Semester: II**	**Year: 2025**		
Name of Course	**Language Laboratory**				
Course Code	**HS1228**				
Core	**Core**				
Concerned Department/ Section/Centre	**Humanities and Social Sciences**				
Credits	**1**	**Periods per week**	**L**	**T**	**P**
			0	**0**	**2**

Prerequisite:	
1.	To succeed in this course, students should have a foundational understanding of parts of speech, sentence structure, and everyday vocabulary.
2.	The students should be familiar with the theoretical aspects of communication and grammar before engaging in language lab exercises.
3.	The students should be able to read and understand short passages, news articles, or textbook materials.
Course Outcomes:	
1.	**Apply** correct pronunciation, intonation, and stress patterns in spoken English using phonetic transcription and practice.
2.	**Demonstrate** effective listening skills by comprehending audio inputs like lectures, interviews, and discussions.
3.	**Develop** clear and coherent oral communication through role-plays, JAM (Just a Minute) sessions, and group discussions.
Description of Contents in brief:	
1.	Unit I: Introduction to Language Lab Importance and objectives of Language Lab, Language lab manual, Orientation to language lab equipment/software, Self-assessment of speaking and listening skills
2.	Unit II: Phonetics and Pronunciation Introduction to phonetics: vowels, consonants, diphthongs. Phonetic symbols (IPA), Pronunciation and accent neutralization drills, Word stress, Accent, Intonation, Rhythm, Common mispronunciations and regional influences
3.	Unit III: Listening and Speaking Skills Listening for gist and specific information, Listening to conversations, interviews, and announcements, Exercises using audio/video materials (TED Talks, news, etc.), Group discussions and debates, Interviews, Formal and informal speech, JAM sessions, Extempore speaking and storytelling, Conversation practice (asking questions, giving opinions, etc.)
4.	Unit IV: Developing Other Skills Reading skills, Writing skills and grammar, Role plays (interviews, customer service, formal meetings), Elevator pitch practice, Voice modulation, body language, eye contact, Listening tests, Assignments, Practice sessions with peer feedback
List of Text Books:	
1.	Direct Language Lab – English Interactive Coursebook. Direct Language Lab. 2025
2.	Communication Skills for Engineers and Scientists. Binod Mishra &Sangeeta. Sharma. PHI Learning Pvt. Ltd, 2023
3.	English (with Lab Manual) – Khanna Publishing House. 2024
List of Reference Books:	
1.	Better English Pronunciation. J.D. O'Connor. 1998
2.	English Language Communication Skills: Lab Manual. KiranmaiDutt, GeetaRajeevan, C. L. Prakash. Cambridge University Press. 2007
3.	A Course in Phonetics: Peter Ladefoged& Keith Johnson. Cengage Learning. 2020
URLs:	
1.	https://nptel.ac.in/courses/109/105/109105110
2.	https://nptel.ac.in/courses/109/105/109105117
3.	https://nptel.ac.in/courses/109/104/109104115

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: II	Academic Year: 2025-26 onwards		
Name of Course	**YOGA**					
Course Code	**SA1244**					
Core / Elective / Other	**ELECTIVE**					
Concerned Department/ Section/Centre	Physical Education & Sports Section					
Credits	**1**	**Periods per week**		**L**	**T**	**P**
				0	**0**	**2**

Prerequisite:	
	Basic concept of yoga
Course Outcomes: At the end of the course, the student will be able to:	
1.	Understand Real Concept Of Yoga
2.	Application Of Aparigraha Toward Daily Life
3.	Importance Of Sudhi Kriyas In Digestion
4.	Improve Moral Discipline
Description of Contents in brief:	
1.	Basics of Yoga, History of Yoga, Concepts of Yoga, Aims And Objectives of Yoga New Trends in Yoga
2.	Ashtang Yoga Asanas , Pranayama, Suryanamaskar, Classification Of Yoga, Hath Yoga Power Yoga
3.	Yoga And Mental Health Self Study Learning Control Through Learning Yourself Self Control Through Yoga Meditation Kriya Unit
4.	Research Review (Minimum Eight) Related To Asanas, Pranayama, Kriya, Meditation
5.	Course Related Practical Work, Field Work Record Book
List Of Text Books:	
1.	The Yoga Sutra of Patanjali By Sri Swami Satchidananda
2.	Ashtanga Yoga The Practice Manual (Spiral Bound) By David Swenson
List Of Reference Books:	
	Yoga And Mental Health & Beyond By Rs Bhogal
	Pranayama By Swami Kuvalayananda
	The Heart Of Yoga Developing A Personal Practice By T.K.V. Desikachar
	Asana Pranayama Mudra Bandha By Swami Satyananda Saraswati
	Yoga Anatomy (2nd Edition) By Leslie Kaminoff And Amy Mattews
	The Key Poses Of Yoga Scientific Keys, Volume Ii By Ray Long
	Light On Yoga By B.K.S Lyengar
	Raja Yoga By Swami Vivekananda
	Living Your Yoga Finding The Spiritual In Everyday Life (Paper Back) By Judith Hanson Lasater
	The Yoga Tradition Its History, Literature, Philosophy And Practise By Georg Feuerstein
	The Key Muscles Of Yoga By Ray Long
URLs: https://yogaiyain.tinyemails.com/c/eyJ1Ijo0MTAzNSwibSI6MzE5MTI0MDc2LCJsIjoxMzYxNzUwfQ.9h15qa_auf8vM2-rNnYO6Ksgv5rfxtn5hCkymmMJKLE.html	

Name of Program	B.Tech.	Year: First Year	Semester: II	Academic Year: 2025-26 onwards
Name of Course	National Service Scheme (NSS)			
Course Code	SA1243			
Core / Elective / Other	Elective			
Concerned Department/ Section/Centre	Energy Centre			

Credits	1	Periods per week	L	T	P
			0	0	2

Prerequisite:	
Course Outcomes: At the end of the course, the student will be able to:	
1.	Participate actively in community engagement and extension activities addressing health, hygiene, education, and environment.
2.	Demonstrate teamwork, leadership, and organizational skills in planning and executing NSS projects.
3.	Apply practical knowledge of disaster management, social responsibility, and sustainable practices in real-life contexts.
4.	Document, reflect, and present field experiences through reports, journals, and presentations to assess social impact.
Description of Contents in brief:	
1.	**Orientation & Induction** • Introduction to NSS philosophy, motto, and objectives • Ice-breaking and team-building activities • Campus survey for possible NSS activities
2.	**Campus Cleaning & Plantation Drive** • Cleanliness of campus/public places • Tree plantation and green campus initiative
3.	**Community Survey & Social Mapping** • Visit to adopted village/slum area • Data collection on literacy, sanitation, health, etc.
4.	**Health & Hygiene Awareness** • Organizing an awareness campaign on sanitation • Distribution of pamphlets/posters in community
5.	**Blood Donation & Health Check-up Camp** • Coordinating with NGOs/hospitals • Volunteer participation and record maintenance
6	**Swachh Bharat & Waste Management Drive** • Plastic-free campus/community • Segregation of waste and awareness programs
7	**Education & Literacy Support** • Volunteering in local schools • Teaching support/awareness on digital literacy
8	**Gender Equality & Social Justice Awareness** • Street play/poster campaign on women empowerment • Workshop on inclusivity and human rights
9	**Environmental Conservation Activities** • Energy saving and renewable energy awareness • Awareness rally on climate change
10	**Road Safety & Traffic Awareness** • Collaboration with traffic police • Awareness drive on safe driving practices

11	**Disaster Management Training** • First aid and fire safety training • Mock drill on earthquake/flood safety
12	**Health & Wellness Program** • Yoga and meditation session for community • Campaign on mental health awareness
List of Text Books:	
1.	Ministry of Youth Affairs & Sports, Govt. of India – NSS Manual
2.	Dr. S. Sivasankari – National Service Scheme: A Handbook for Students, Bharathidasan University Press
List of Reference Books:	
1.	Y.C. Damle – Youth in Action: National Service Scheme, Govt. of India Publication
2.	N.R. Madan – Rural Development and NSS, Deep & Deep Publications
3.	Official NSS Guidelines and Reports, Ministry of Youth Affairs & Sports

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: II	Academic Year: 2025-26 onwards
Name of Course	Universal Human Values and Professional Ethics			
Course Code	SA1245			
Core / Elective / Other	Elective			
Concerned Department/ Section/Centre	Mechanical Engineering			

Credits	1	Periods per week	L	T	P
			0	0	2

Prerequisite:	
Course Outcomes: At the end of the course, the student will be able to:	
1.	Evaluate the significance of value inputs in formal education and start applying them in their life and profession.
2.	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
3.	Analyze the value of harmonious relationship based on trust and respect in their life and profession and examine the role of a human being in ensuring harmony in society and nature.
4.	Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession.
Description of Contents in brief:	
1.	Introduction-Basic Human Aspiration, its fulfillment through All-encompassing Resolution: The basic human aspirations and their fulfillment through Right understanding and Resolution, Right understanding and Resolution as the activities of the Self, Self being central to Human Existence; All-encompassing Resolution for a Human Being, its details and solution of problems in the light of Resolution.
2.	Right Understanding (Knowing)- Knower, Known & the Process: The domain of right understanding starting from understanding the human being (the knower, the experiencer and the doer) and extending up to understanding nature/existence – its interconnectedness and co-existence; and finally understanding the role of human being in existence (human conduct).
3.	Understanding Human Being: Understanding the human being comprehensively as the first step and the core theme of this course; human being as co-existence of the self and the body; the activities and potentialities of the self; Basis for harmony/contradiction in the self.
4.	Understanding Nature and Existence: A comprehensive understanding (knowledge) about the existence, Nature being included; the need and process of inner evolution (through self-exploration, self-awareness and self-evaluation), particularly awakening to activities of the Self: Realization, Understanding and Contemplation in the Self (Realization of Co-Existence, Understanding of Harmony in Nature and Contemplation of Participation of Human in this harmony/ order leading to comprehensive knowledge about the existence).
5.	Understanding Human Conduct, All-encompassing Resolution & Holistic Way of Living: Understanding Human Conduct, different aspects of All-encompassing Resolution (understanding, wisdom, science etc.), Holistic way of living for Human Being with All-encompassing Resolution covering all four dimensions of human endeavor viz., realization, thought, behavior and work (participation in the larger order) leading to harmony at all levels from Self to Nature and entire Existence
List of Text Books:	
1.	R R Gaur, R Asthana, G P Bagaria, 2019 (2nd Revised Edition), A Foundation Course in Human Values and Professional Ethics. ISBN 978-93-87034-47-1, Excel Books, New Delhi.
2.	Premvir Kapoor, Professional Ethics and Human Values, Khanna Book Publishing, New Delhi, 2022.
List of Reference Books:	
1.	Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2.	E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3.	Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991

4.	Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.
5.	A Nagraj, 1998, JeevanVidyaekParichay, Divya Path Sansthan, Amarkantak.
6.	PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Purblishers.
7.	A.N. Tripathy, 2003, Human Values, New Age International Publishers.
8.	SubhasPalekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) KrishiTantraShodh, Amravati.
9.	E G Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists &Engineers, Oxford University Press
10.	M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
11.	B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
12.	B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008

Relevant websites, movies and documentaries and URLs:

1.	Value Education websites, http://uhv.ac.in , http://www.uptu.ac.in
2.	Story of Stuff, http://www.storyofstuff.com
3.	Al Gore, An Inconvenient Truth, Paramount Classics, USA
4.	Charlie Chaplin, Modern Times, United Artists, USA
5.	IIT Delhi, Modern Technology – the Untold Story
6.	Gandhi A., Right Here Right Now, Cyclewala Productions

Lecture Plan (about 40-50 Lectures):

Lecture No.	Topic
Lecture 1	The basic human aspirations and their fulfillment through Right understanding and Resolution
Lecture 2	Right understanding as the activities of the Self
Lecture 3	Right Resolution as the activities of the Self
Lecture 4	Self being central to Human Existence
Lecture 5	All-encompassing Resolution for a Human Being
Lecture 6	Its details and solution of problems in the light of Resolution.
Lecture 7	The domain of right understanding starting from understanding the human being (the knower)
Lecture 8	The domain of right understanding starting from understanding the human being (the experiencer and the doer)
Lecture 9	Extending up to understanding nature/existence - its interconnectedness
Lecture 10	Extending up to understanding nature/existence - its co-existence
Lecture 11	Understanding the role of human being in existence (human conduct).
Lecture 12	Understanding the human being comprehensively as the first step
Lecture 13	The core theme of this course; human being as co-existence of the self and the body
Lecture 14	The activities and potentialities of the self
Lecture 15	Basis for harmony/contradiction in the self
Lecture 16	A comprehensive understanding (knowledge) about the existence
Lecture 17	Nature being included
Lecture 18	The need and process of inner evolution (through self-exploration)
Lecture 19	The need and process of inner evolution (through self-awareness)
Lecture 20	The need and process of inner evolution (through self-evaluation)
Lecture 21	Particularly awakening to activities of the Self: Realization, Understanding
Lecture 22	Contemplation in the Self (Realization of Co-Existence)
Lecture 23	Contemplation in the Self (Understanding of Harmony in Nature)
Lecture 24	Contemplation in the Self (Contemplation of Participation of Human in this harmony/ order leading to comprehensive knowledge about the existence).
Lecture 25	Understanding Human Conduct

Lecture 26	Different aspects of All-encompassing Resolution (understanding, wisdom, science etc.),
Lecture 27	Holistic way of living for Human Being with All encompassing
	Resolution covering all four dimensions of human endeavor viz., realization, thought, behavior and work (participation in the larger order) leading to harmony at all levels from Self to Nature and entire Existence

Sections F to J (Sem- II)

Name of Program	**B.Tech. & Dual Degree**	**Year: First Year**	**Semester: II**	**Academic Year: 2025-26 onwards**		
Name of Course	**Mathematics-2**					
Course Code	**MC 1201**					
Core / Elective / Other	**Core**					
Concerned Department/ Section/Centre	Department of Mathematics, Bioinformatics and Computer Applications					
Credits	**4**	**Periods per week**		**L**	**T**	**P**
				3	**1**	**0**

Prerequisite:	
Course Outcomes: At the end of the course, the student will be able to:	
1.	Demonstrate the ability to solve linear systems and perform matrix operations, including determining the rank, eigenvalues, and eigenvectors.
2.	Apply the Cayley-Hamilton theorem to solve matrix-related problems.
3.	Solve ordinary differential equations using Laplace transforms and interpret inverse Laplace transforms for engineering applications.
4.	Develop proficiency in Fourier series and Fourier transforms and their application in signal analysis.
5.	Analyze and solve partial differential equations (PDEs), including boundary value problems for heat and wave equations.
Description of Contents in brief:	
1.	**Module 1: Matrices (9** Lectures + 3 Tutorials**)**
2.	**Module 2: Laplace Transforms (7** Lectures + 2 Tutorials**)**
3.	**Module 3: Fourier Series and Transforms (7** Lectures + 2 Tutorials**)**
4.	**Module 4: Partial Differential Equations (PDEs) (8** Lectures + 2 Tutorials**)**
5.	**Module 5: Boundary Value Problems of PDEs** (6 **Lectures + 2 Tutorials**)
List of Text Books:	
1.	Advanced engineering Mathematics by Erwin Kreyszig
2.	Higher engineering Mathematics by B V Ramnna
List of Reference Books:	
1.	Higher engineering Mathematics by John Bird
URLs:	

Lecture Plan (about 40-50 Lectures):	
Lecture No.	**Topic**
Lecture 1	Introduction to Matrices and Echelon Form
Lecture 2	Row Reduced Echelon Form
Lecture 3	Rank of a Matrix
Tutorial 1	Problems on Echelon Forms and Rank
Lecture 4	Solution of Linear Systems of Equations (Direct Methods)
Lecture 5	Solution of Linear Systems of Equations (Iterative Methods)
Lecture 6	Eigenvalues and Eigenvectors (Introduction)
Tutorial 2	Solving Linear Systems and Introduction to Eigenvalues
Lecture 7	Properties of Eigenvalues and Eigenvectors
Lecture 8	Cayley-Hamilton Theorem

Lecture 9	Application of Cayley-Hamilton Theorem
Tutorial 3	Numerical Problems on Eigenvalues, Eigenvectors and Cayley-Hamilton Theorem
Lecture 10	Introduction to Laplace Transforms
Lecture 11	Properties of Laplace Transforms
Lecture 12	Common Laplace Transformations
Tutorial 4	Practice Problems on Laplace Transforms
Lecture 13	Inverse Laplace Transforms
Lecture 14	Convolution Theorem
Lecture 15 & 16	Solving ODEs using Laplace Transforms
Tutorial 5	Solving Differential Equations using Laplace Transforms
Lecture 17	Introduction to Fourier Series
Lecture 18 & 19	Fourier Series for Periodic Functions
Tutorial 6	Problems on Fourier Series
Lecture 20	Fourier Transform: Concept and Definition
Lecture 21 & 22	Properties of Fourier Transform
Lecture 23	Inverse Fourier Transform and Applications
Tutorial 7	Practice Problems on Fourier Transforms
Lecture 24	Introduction to PDEs
Lecture 25	Linear PDEs of First Order
Lecture 26	Non-Linear PDEs of First Order
Tutorial 08	Solving First-Order PDEs
Lecture 27	Homogeneous Linear PDEs of Higher Order
Lecture 28 & 29	Non-Homogeneous Linear PDEs of Higher Order
Lecture 30 & 31	Separation of Variables: Methodology and Applications
Tutorial 09	Practice Problems on Separation of Variables
Lecture 32	Boundary Value Problems: Introduction and Types
Lecture 33	Classification of PDEs: Elliptic, Parabolic, and Hyperbolic
Lecture 34	Separation of Variables: Fundamentals and Methodology
Tutorial 10	Practice Problems on Classification and Separation of Variables
Lecture 35	Wave Equation: Derivation and Solutions
Lecture 36 & 37	Heat Equation: Derivation and Solutions
Tutorial 11	Practice Problems on Wave and Heat Equations

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: II	Academic Year: 2025-26 onwards
Name of Course	Physics			
Course Code	PY 1202			
Core / Elective / Other	Core			
Concerned Department/ Section/Centre	Physics			

Credits	3	Periods per week	L	T	P
			3	0	0

Prerequisite:	
	Students must have the basic knowledge of physics with emphasis on optics, types of static/dynamic forces, Newton's law of motions, basic semiconductor devices, nuclear physics and knowledge of Engineering mathematics involving differentiation and integration.
Course Outcomes: Upon successful completion of the course the student will be able to:	
1.	**Understand basic physical fundamentals and the key vocabulary to describe them:** Interference and Diffraction of light, Energy band gaps, Quantum effect, Particle accelerator, Fission & Fusion, LASER, Fiber optics communication, Theory of Relativity and Electron ballistics.
2.	Apply an understanding of these concepts to various systems and devices.
3.	Acquire problem solving skills, mathematical techniques, and the ability to apply conceptual understanding of the Physics to general real-world situations.
4.	To design and conduct new experiments and to analyze the data interpretation.
Description of Contents in brief:	
1.	**Wave Optics:** Interference and Diffraction, Michelson's interferometer
2.	**Solid State and Semi-Conductor Physics:** Energy bands in solids, Electron and hole mobility, Hall effect, PN junction transistor, Transistor parameters, Photo cell and Solar cell
3.	**Quantum Mechanics:** Schrodinger wave equation, Particle in a box, Harmonic oscillator, Tunnel effect
4.	**Nuclear Physics:** Nuclear properties, Nuclear models, Particle accelerator, Fission & Fusion, Chain reaction, Nuclear reactor, Particle detectors
5.	**Laser and Fiber Optics:** Laser phenomena, Ruby and He-Ne laser and applications, laser holography, Types of optical fibers, Attenuation, Fiber losses, Fiber optics communication
6.	**Theory of Relativity:** Transformation equations, Time dilation mass energy equation
7.	**Electron ballistics:** Motion of charged particles in electric and magnetic field, Electron microscope, Mass spectrographs
List of Text Books:	
1.	Engineering Physics: M.N. Avadhanulu, P.G.Kshirsagar, T V S Arun Murthy, (S. Chand)
2.	Engineering Physics: Hitendra K Malik, A. K. Singh, (Tata McGraw-Hill)
3.	Concepts of Modern Physics: Arther Beiser (McGraw-Hill)
4.	Principles of Optics: Brijlal Subramanyam (S. Chand)
List of Reference Books:	
1.	Modern Physics: Kenneth Krane, (John Wiley Eastern)
2.	Modern Physics: Paul A. Tipler & Ralph A. Llewellyn, (W. H. Freeman)
3.	Quantum Mechanics Concepts and Applications: Nouredine Zettili (Wiley)
4.	Optics: Ajoy K. Ghatak, (Tata McGraw-Hill Education)
5.	Fiber Optics & Lasers The Two Revolutions: Ajoy Ghatak & K. Thyagarajan , (Macmillan India Limited)

6.	Quantum Mechanics Concepts and Applications: Nouredine Zettili (Wiley)
7.	Quantum Mechanics Concepts and Applications: Nouredine Zettili (Wiley)
8.	Essentials of Quantum Mechanics by Fozia Z. Haque (Asian Books)
9.	University Physics: H.D. Young, Roger A Freedman, (Pearson)
10.	Solid State Electronics: B. G. Streetman, (Prentice Hall India)
11.	Solid State Physics: S. O. Pillai, (New Age International Publishers)
12.	A Textbook of Optics: N Subrahmanyam, Brij Lal & M N Avadhanulu, (S. Chand)
URLs:	
	https://www.youtube.com/watch?v=i_CijGuk7fw
	https://www.youtube.com/watch?v=Kp-jS6NHsB8

Lecture Plan (about 40-50 Lectures):

Lecture No.	Topic
Lecture 1	Introduction to syllabus, Interference: Introduction, Coherence, Types of Interference, Interference in thin (parallel surfaced) films
Lecture 2	Wedge shaped film, Newton's rings Experiment, Numerical Problems
Lecture 3	Michelson's Interferometer: Theory and applications, Numerical Problems
Lecture 4	Diffraction: definition, types and diffraction, Single slit diffraction
Lecture 5	Double slit diffraction p, missing order
Lecture 6	Diffraction through n-slit, Transmission Grating, Numerical Problems
Lecture 7	Tutorial of wave optics
Lecture 8	Semiconductor Physics: Free electron theory, Band theory of solids
Lecture 9	Fermi Energy and Fermi Energy level in Intrinsic and Extrinsic Semiconductors
Lecture 10	Charge carrier concentration in intrinsic semiconductor, electron hole mobility and conductivity, Numerical Problems
Lecture 11	P- N junction diode, Photocell
Lecture 12	Solar cell and its applications
Lecture 13	Hall effect and its applications, Numerical Problems
Lecture 14	Introduction to transistor: CE, CB and CC mode.
Lecture 15	Transistor parameters (α, β, γ and their relation), Numerical Problems
Lecture 16	Tutorial of semiconductor Physics
Lecture 17	Quantum Mechanics: Introduction to Quantum Mechanics, de-Broglie hypothesis, Concept of wave packet, Heisenberg's uncertainty principle, Postulates of Quantum Mechanics
Lecture 18	Properties of matter wave, Probabilistic interpretation of wave function
Lecture 19	Schrodinger's time dependent and time independent wave equation.
Lecture 20	Particle in a box (1D and 3D), Tunnel effect (α-decay)
Lecture 21	Harmonic Oscillator, Zero-point energy, Numerical Problems
Lecture 22	Tutorial of quantum mechanics
Lecture 23	Nuclear Physics: Nuclear properties, Mass defect, Semi-empirical mass formula, binding energy and Numerical Problems
Lecture 24	Nuclear Models: Liquid drop model and its success & failure
Lecture 25	Shell model
Lecture 26	Particle accelerators: Cyclotron, synchro-cyclotron, Numerical Problems
Lecture 27	Betatron and Numerical Problems
Lecture 28	Nuclear fission and fusion, Chain reaction and Nuclear reactor
Lecture 29	Nuclear particle detectors (GM counter), Numerical problems
Lecture 30	Mass Spectrographs (Bainbridge and Aston)
Lecture 31	Tutorial of Nuclear Physics
Lecture 32	LASER: Absorption and Emission process, Einstein's A & B coefficient

Lecture 33	Pumping Scheme and its types, component of LASER
Lecture 34	Ruby laser and He-Ne Laser
Lecture 35	Laser Holography and applications
Lecture 36	Fibre Optics: Introduction to optical fibre, Acceptance angle.
Lecture 37	Types of fibre, V-number, Losses in optical fibre, Uses & applications of fibre
Lecture 38	Tutorial of LASER and optical fibre
Lecture 39	Theory of Relativity: Introduction, Michelson-Morley Experiment, Postulates of special theory of relativity
Lecture 40	Galilean transformation and Lorentz transformation equation
Lecture 41	Length contraction and time dilation
Lecture 42	Theorem of addition of velocities, Principle of simultaneity
Lecture 43	Mass energy equivalence relation, Relativistic mass, Numerical problems
Lecture 44	Tutorial of theory of relativity
Lecture 45	Electron Ballistic: Motion of charged particle (electron) in uniform electric field when the field is parallel, perpendicular and at an angle to velocity of electron
Lecture 46	Motion of charged particle (electron) in uniform magnetic field when the field is parallel, perpendicular and at an angle to velocity of electron
Lecture 47	Electron Optics: Bethe's law, electrostatic lens
Lecture 48	CRT, Electron microscope and Numerical Problems
Lecture 49	Tutorial of electron ballistic

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: II	Academic Year: 2025-26 onwards
Name of Course	Engineering Mechanics			
Course Code	CE1203			
Core / Elective / Other	Core			
Concerned Department/ Section/Centre	Civil Engineering			

Credits	4	Periods per week	L	T	P
			3	1	0

Prerequisite:

Course Outcomes: At the end of the course, the student will be able to:

1.	Apply concept forces in equilibrium in a static rigid body.
2.	Analyse trusses using method of joints and section.
3.	Determine centroid and moment of inertia of a planar surface
4.	Draw shear force and bending moment diagram for determinate beams
5.	Apply kinematics of particle and rigid bodies in various conditions

Description of Contents in brief:

1.	Force and Equilibrium:
2.	Vector representation of forces and moments- Vector operations, Planar Force system, composition of concurrent forces in plane free body diagram, reduction of force system to a force and a couple, equilibrium of Rigid bodies in two and three dimensions.
3.	Analysis of Trusses:
4.	Basics, classification of the force system, combination of forces and moments, method of joints, method of section, method of Tension coefficient and graphical approach.
5.	Centroid and Moment of Inertia:
6.	Centroid and Moment of Inertia for areas, Principal moment of inertia, Parallel axis theorem, Perpendicular axis theorem, Moment of Inertia for composite area.

List of Text Books:

1.	Timoshenko, S., Young D.H., Rao, J.V., and Pati, Sukumar, Engineering Mechanics (In SI Units), McGraw Hill Publishers.
2.	Meriam, J.L., Kraige, L.G. and Bolton, J.N., Engineering Mechanics (Statics and Dynamics) Wiley India.

List of Reference Books:

1.	Hibbeler, R. C., Engineering Mechanics (statics and dynamics) (SI Edition), Pearson publication

URLs:

1.	https://nptel.ac.in/
2.	https://swayam.gov.in/

Lecture Plan (about 40-50 Lectures):

Lecture No.	Topic
1-5	Force and Equilibrium Vector representation of forces and moments- Vector operations, Planar Force system, composition of concurrent forces in plane free body diagram, reduction of force system to a force and a couple, equilibrium of Rigid bodies in two and three dimensions.
6-11	Analysis of Trusses Basics, classification of the force system, combination of forces and moments, method of joints, method of section, method of Tension coefficient and graphical approach.
12-17	Centroid and Moment of Inertia Centroid and Moment of Inertia for areas, Principal moment of inertia, Parallel axis theorem, Perpendicular axis theorem, Moment of Inertia for composite area.
18-26	Analysis of determinate beams Shear force and bending moment diagrams for simply supported beams, cantilever beams and over hanged beams, Load vs shear force vs bending moment relationship

27-32	Friction Friction, Coulombs laws of dry friction, Limiting friction, Problems on Wedge friction, Belt Friction-problems.
33-40	Plane Kinematics and Kinetics of a rigid body Relative velocity and Acceleration, Instantaneous centre of zero velocity, Rotating axis, Force, Mass and Acceleration, Work & Energy, Impulse & Momentum; Introduction to three-dimensional kinematics and kinetics of rigid body, Coriolis force.
40	Total No. of Lectures

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: II	Academic Year: 2025-26 onwards
Name of Course	Engineering Graphics (Theory)			
Course Code	ME1204			
Core / Elective / Other	Core			
Concerned Department/ Section/Centre	Mechanical Engineering			

Credits	01	Periods per week	L	T	P
			1	0	0

Prerequisite: Basic Knowledge of working on computer software and Geometry

Course Outcomes: At the end of the course, the student will be able to:

1.	Apply the accepted conventions and abbreviations of engineering graphics so that they can draw clearly for those familiar with the subject
2.	Visualize and create the drawing with the aid of CAD software.
3.	Design the objects in 2D and 3D projections

Description of Contents in brief:

1.	Basic Concepts-Introduction to engineering drawing, types of lines, dimensioning, title block, Basic drawing tools and commands of Computer Aided Drafting software, Theory of Projections, Reference planes, Types of Projection methods, Orthographic projection. Projection of points in different orientations.
2.	Projection of Straight lines, Projection of Planes, Projections using auxiliary planes method.
3.	Projection of solids- Projection of polyhedrons, Prisms, and pyramids, Projection of solids of revolution in different positions.
4.	Section of solids- cutting planes, auxiliary planes, frustum, and truncated parts of solids.
5.	Development of solids- principle of development, parallel line method, radial line method.

List of Text Books:

1.	Varghese, P. I. (2013). Engineering Graphics. McGraw Hill Education.
2.	Bhatt, N.D. (2014). Engineering Drawing (53rd Edition). Charotar Publishing House.
3.	French, T.E., Vierck, C.J., Foster, R.J. Engineering Drawing and Graphic Technology. McGraw-Hill International.

List of Reference Books:

1.	Shah, M.B. Rana, B.C (2009). Engineering Drawing (2nd Ed.). Pearson Education India.
2.	Dhananjay, J.A. (2017). Engineering Drawing with an Introduction to AutoCAD. McGraw Hill Education.
3.	Gill, P.S. (2013). Engineering Drawing. S.K. Kataria& Sons

URLs:

1.	https://nptel.ac.in/courses/112104172/

Lecture Plan (about 20-30 Lectures):

Lecture No.	Topics
Lecture 1	Basic Concepts-Introduction to Engineering Drawing, Dimensioning and Labelling.
Lecture 2	Theory of Projections, Reference planes, Types of projection methods
Lecture 3	Projection of Points
Lecture 4	Orthographic projection
Lecture 5	Orientation of Straight Lines, Trace of Lines, Projection of Lines parallel and perpendicular to reference planes
Lecture 6	Projection of Lines inclined to reference planes, Miscellaneous Problems
Lecture 7	Orientation of Planes, Trace of Planes, Projection of Planes parallel to reference planes
Lecture 8	Projection of Planes perpendicular to reference planes, parallel to profile planes

Lecture 9	Projection of Planes inclined to reference planes, Miscellaneous Problems
Lecture 10	Classification and Orientation of Solids, Projection of Solids with axis perpendicular to reference planes
Lecture 11	Projection of Solids with axis parallel to reference planes, Miscellaneous Problems
Lecture 12	Projection of Solids with axis inclined to either of one of the reference planes
Lecture 13	Projection of Solids with axis inclined to both the reference planes, Miscellaneous Problems
Lecture 14	Terminologies used, Types of Section Planes, Projection of Section of Solids by Plane Perpendicular to reference planes
Lecture 15	Projection of Section of Solids by Plane Perpendicular to both the reference planes
Lecture 16	Section of Solids by Plane inclined to the reference planes, Projection of the True shape of Section
Lecture 17	Miscellaneous Problems - Projection of frustum and truncated parts of solids
Lecture 18	Classification of Surfaces and Different Methods of Development
Lecture 19	Development of Prism, Cylinder.
Lecture 20	Development of Cones, Pyramids, and Spheres.

Name of Program	B.Tech.	Year: First Year	Semester: II	Academic Year: 2025-26 onwards
Name of Course	Computer Programming and Problem Solving			
Course Code	CS1205			
Core / Elective / Other	Core			
Concerned Department/ Section/Centre	Department of Computer Science			

Credits	2	Periods per week	L	T	P
			2	0	0

Prerequisite:	
1	There are no prerequisites to learn C programming.
2	Just a bit of logical skills should be enough.
Course Outcomes: At the end of the course, the student will be able to:	
1.	Identify situations where computational methods and computers would be useful. Given a computational problem, identify and abstract the programming task involved.
2.	Design algorithm and illustrate flowchart for a given problem.
3.	Write the program on a computer, edit, compile, debug, correct, recompile and run it.
4.	Identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.
5.	Learn the basics of the Internet of Things and its applications. Understand Arduino Architecture, programming and interfacing with sensors.
Description of Contents in brief:	
1.	Introduction to Computer and its organization.
2.	Problem solving using Computers by Flowchart and Algorithms.
3.	Developing and running computer programs in C.
4.	C programming using conditions, loop, array, functions, pointers and structures.
5.	Introduction to IoT using Arduino.
List of Text Books:	
1.	E. Balaguruswamy, “Programming in ANSI C”, Tata McGraw-Hill.
2.	Suresh Kumar Srivastava, “C in Depth”, BPB Publication.
3.	R. G. Dromey, "How to Solve It By Computer", Pearson
4.	K R Venugopal, “Mastering C”, Tata McGraw-Hill.
List of Reference Books:	
1.	Yashavant P. Kanetkar, “Let us C”, BPB Publication
2.	A.R. Bradley, "Programming for Engineers", Springer
3.	Schildt Herbert, “C- The Complete Reference” ,Tata McGraw-Hill.
4.	Dan Gookin,”Begin programming with C for Dummies”, Wiley
URLs:	
1.	https://nptel.ac.in/courses/106/105/106105171/
2.	https://www.nptel.ac.in/courses/106/104/106104128/

Lecture Plan (about 24-30 Lectures):	
Lecture No.	**Topic**
1	Fundamentals of Computing, Evolution of Computer Hardware and Moore’s Law, Organization of Computing Systems - Input/Output devices, Memory,Instructions, Program,Software, Operating System
2-3	Problem solving using Computers- Writing algorithms
4	Problem solving using Computers- Flowcharting technique,
5	Assembler, Compiler, Interpreter, Debugger, Editor, Program execution, Phases of developing a running computer program in C
6-7	Constants, Variables, Expressions,Statements: Declarations, Input-Output Statements,Operators,Operator precedence in C. Data types, size and values, Char, Unsigned and Signed data types, Overflow
8	Number systems and representations.
9-10	Selection Statements & Compound statements

11-12	Repetitive statements - While loop
13-14	Do-while loop
15-16	For loop
17	Arrays
18	Sorting problem: Bubble Sort, Search problem: Linear search
19	Multidimensional Arrays and Matrices -I
20	Functions: The prototype declaration, Function definition, Function call: Passing arguments to a function by value
21	Pointers: Pointer variables, Declaring and dereferencing pointer variables, Function call: Passing arguments to a function by reference
22	Accessing arrays through pointers
23	Scope of variable, Recursive function call
24	Pointer arithmetic, Pointer Types , Strings: String operations in C
25	Structures and Union in C, Typedef Structures.
26	File input-output in C. Opening, closing and reading from files
27	Introduction to the Internet of Things and Arduino. Sensors. Interfacing with LED with an Arduino board and ON/OFF the LED.
28	Interfacing with different sensors with an Arduino board and displaying their reading - I

Name of Program	**B.Tech**	**Semester: II**	**Year: 2025**		
Name of Course	**Communication Skills**				
Course Code	**HS1206**				
Core	**Core**				
Concerned Department/ Section/Centre	**Humanities and Social Sciences**				
Credits	**1**	**Periods per week**	**L**	**T**	**P**
			1	**0**	**0**

Prerequisite:	
1.	To succeed in this course, the students should have basic knowledge of English grammar
2.	They should be able to frame sentences in English using appropriate vocabulary and grammar, and apply them in their social and professional life
3.	The students should also have the ability to analyse communication behaviours
Course Outcomes:	
1.	On successful completion of this course, undergraduate students will be able to comprehend and communicate in English through exposure to the theory and practice of communication skills.
2.	They will be able to apply the basic grammatical skills of English Language through intensive practice.
3.	The students will also be able to write, organise, comprehend, and present short and long-form technical work effectively.
Description of Contents in brief:	
1.	Unit I: Communication Communication Skills: Introduction, Significance, Communication process, Barriers to communication, Verbal and non-verbal communication, Body language
2.	Unit II: Oral and Written Communication Oral presentations, Multimedia presentation, Communication styles, Voice modulation, Group discussion, Paragraph writing, Letter writing, Report writing
3.	Unit III: Soft Skills Interpersonal skills: emotional and social skills, Critical thinking and problem solving, Positive attitude, Time management, Leadership, SWOT analysis, Stress management
4.	Unit IV: Developing Other Skills Reading styles and strategies, Vocabulary, Idioms and phrases, Functional grammar and Common errors,
List of Text Books:	
1.	English Language Communication Skills. UrmilaRai. Himalaya Publishing House (2024)
2.	Communication Skills for Engineers and Scientists. Binod Mishra &Sangeeta. Sharma. PHI Learning Pvt. Ltd, 2023
3.	The Essence of Effective Communication – Ron Ludlow and Fergus Panton (PH). 1992
List of Reference Books:	
1.	A Textbook of Communicative English. Dr. Nisheeth Srivastava. The Hospitality Press (2023)
2.	Soft Skills for Everyone. Jeff Butterfield.
3.	Improving Your English Skills: The Ideal Companion for English Improvement.
URLs:	
1.	https://nptel.ac.in/courses/109/105/109105110
2.	https://nptel.ac.in/courses/109/105/109105117
3.	https://nptel.ac.in/courses/109/104/109104115

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: II	Academic Year: 2025-26 onwards
Name of Course	Engineering Mechanics Lab			
Course Code	CE1221			
Core / Elective / Other	Core			
Concerned Department/ Section/Centre	Civil Engineering			

Credits	1	Periods per week	L	T	P
			0	0	2

Prerequisite:

Course Outcomes: At the end of the course, the student will be able to:

1.	Apply the fundamental laws of mechanics—triangle, parallelogram, and polygon laws—to analyze force systems in equilibrium.
2.	Demonstrate the principles of moments, support reactions, and axial forces in structural members through experimental setups.
3.	Analyze the behavior of physical systems under static and dynamic conditions, including friction, motion, and energy conservation.
4.	Evaluate the centroid and moment of inertia of mechanical elements to support engineering design and structural analysis.

Description of Contents in brief:

1.	These experiments focus on verifying fundamental principles of engineering mechanics such as force equilibrium (triangle, polygon, and parallelogram laws), moments, and support reactions. They include practical setups like the bell crank lever, trusses, simply supported beams, and 3D force systems to observe real-time mechanical responses. Frictional behavior and energy conservation are studied through motion experiments and inclined planes. Additionally, geometric and mass properties like centroids and moment of inertia are experimentally determined to reinforce theoretical understanding.

List of Text Books:

1.	Timoshenko, S., Young D.H., Rao, J.V., and Pati, Sukumar, Engineering Mechanics (In SI Units), McGraw Hill Publishers.
2.	Meriam, J.L., Kraige, L.G. and Bolton, J.N., Engineering Mechanics (Statics and Dynamics) Wiley India.

List of Reference Books:

1.	Hibbeler, R. C., Engineering Mechanics (statics and dynamics) (SI Edition), Pearson publication

URLs:

1.	https://nptel.ac.in/
2.	https://swayam.gov.in/

List of Experiments

Experiment.	Experiment
1.	Verification of triangle law and parallelogram law of forces
2.	Verification of polygon law of forces
3.	Verification of principle of moments using the bell crank lever apparatus
4.	Verification of support reactions of a simply supported beam
5.	Verification of condition of equilibrium of a system of forces
6.	Verification of axial forces in the members of a truss
7.	Verification of equilibrium of three dimensional forces
8.	Determination of coefficient of friction between two surfaces
9.	Verification of centroid of different laminae
10.	Determination of moment of inertia of a flywheel
11.	Verification of Newton’s law of motion
12.	Verification of motion parameters using conservation of energy

Name of Program	B.Tech.	Year: First Year	Semester: II	Academic Year: 2025-26
Name of Course	**Physics Laboratory**			
Course Code	**PY 1222**			
Core / Elective / Other	**Core**			
Concerned Department/ Section/Centre	Physics			

Credits	02	Periods per week	L	T	P
			2	0	0

Prerequisite:	
	The knowledge of physics with special reference to concept of light, types of static/dynamic forces, Newton's law of motions, basic semiconductor devices and knowledge of Engineering mathematics involving differentiation and integration.

Course Outcomes: At the end of the course, the student will be able to:

Upon successful completion of the course the student will be able:

1.	To design and conduct simple experiments as well as analyze and interpret data.
2.	Develop skills in observation, interpretation, reasoning, synthesis, generalizing, predicting, and questioning as a way to learn new knowledge.
3.	To apply conceptual understanding of the physics to general real-world situations.

Description of Contents in brief:

1.	To plot the characteristics curves of a p-n junction diode and calculate its resistance.
2.	To plot the characteristics curves of PNP transistors in CE mode.
3.	To determine frequency of AC mains using an electrical vibrator.
4.	To determine the radius of curvature of a lens by Newton's ring method.
5.	To determine the refractive index and dispersive power of the material of the prism for various colors of mercury light using prism and spectrometer.
6.	To determine the wavelength of different colors of mercury light using a plane transmission grating.
7.	To determine percentage of transmission of light for a semitransparent film using Lummer-Brodhum photometer.
8.	To study diffraction at multi-slit using He-Ne laser.
9.	To determine the wavelength of He-Ne laser by Michelson Interferometer.
10.	To determine Hall Potential and Hall Coefficient.
11.	To verify the formula for the combination of lenses and to determine the cardinal points of the combination using Nodal Slide assembly.
12.	To measure resistivity of a semiconductor by Four Probe method at different temperatures and determine the Band-gap.
13.	To determine the Plank's Constant using LED.
14.	To study the characteristic of Photoconductive material.

List of Text Books:

1.	Engineering Physics: M.N. Avadhanulu, P.G.Kshirsagar, T V S Arun Murthy, (S. Chand).
2.	Concepts of Modern Physics: ArtherBeiser (McGraw-Hill).
3.	Principles of Optics: Brijlal Subramanyam (S. Chand).

List of Reference Books:

1.	Concepts of Modern Physics: ArtherBeiser (McGraw-Hill).
2.	Text Book on Advanced Practical Physics by Chauhan & Singh.
3.	Laboratory Manual of MANIT Physics Lab.

URLs:	
1.	https://www.manit.ac.in/sites/default/files/documents/BTech%20I%20Yr%20Physics%20Lab%20Mannuals%20hindi-english%20%282%29.pdf
2.	https://www.vlab.co.in/broad-area-physical-sciences

List of experiments: 14	
experiments No.	**Experiments name**
1	P-N Junction Diode
2	Transistor
3	AC Mains
4	Newton's Rings
5	Refractive Index & Dispersive Power
6	Transmission Grating
7	L-B Photometer
8	Multi slit Experiment
9	Michelson Interferometer
10	Hall Effect
11	Nodal slide Assembly
12	Four Probe
13	Planck's Constant
14	Photo Conductivity

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: II	Academic Year: 2025-26 onwards
Name of Course	**Engineering Graphics Laboratory**			
Course Code	**ME1223**			
Core / Elective / Other	**Core**			
Concerned Department/ Section/Centre	Mechanical Engineering			
Credits	**01**	**Periods per week**	**L** / **0**	**T** / **0** / **P** / **2**

Prerequisite: Basic Knowledge of working on computer software and Geometry

Course Outcomes: At the end of the course, the student will be able to:

1.	Apply the accepted conventions and abbreviations of engineering graphics so that they can draw clearly for those familiar with the subject
2.	Visualize and create the drawing with the aid of CAD software.
3.	Design the objects in 2D and 3D projections

Description of Contents in brief:

Experiment No. 1	To describe the basic features and tools of CAD software.
Experiment No. 2	To draw 2D sketches of different geometrical shapes.
Experiment No. 3	To convert a 3D view of different solid models into 2D views using Orthographic Projection.
Experiment No. 4	To draw projections of points in four angle projections.
Experiment No. 5	To draw a projection of straight lines in simple positions.
Experiment No. 6	To draw a projection of straight lines inclined to both the reference planes.
Experiment No. 7	To draw a projection of planes in different orientations.
Experiment No. 8	To draw a projection of regular 3D objects.
Experiment No. 9	To draw a sectional view of regular 3D objects, including Auxiliary Cutting Planes.
Experiment No. 10	To develop the surface of regular 3D objects using parallel lines and radial line methods.

List of Text Books:

1.	Varghese, P. I. (2013). Engineering Graphics. McGraw Hill Education.
2.	Bhatt, N.D. (2014). Engineering Drawing (53rd Edition). Charotar Publishing House.
3.	French, T.E., Vierck, C.J., Foster, R.J. Engineering Drawing and Graphic Technology. McGraw-Hill International.

List of Reference Books:

1.	Shah, M.B. Rana, B.C (2009). Engineering Drawing (2nd Ed.). Pearson Education India.
2.	Dhananjay, J.A. (2017). Engineering Drawing with an Introduction to AutoCAD. McGraw Hill Education.
3.	Gill, P.S. (2013). Engineering Drawing. S.K. Kataria& Sons

URLs:

1.	https://nptel.ac.in/courses/112104172/

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: II	Academic Year: 2025-26 onwards
Name of Course	Problem Solving & C Programming			
Course Code	CS 1224			
Core / Elective / Other	Core			
Concerned Department/ Section/Centre	Computer Science and Engineering			

Credits	01	Periods per week	L	T	P
			0	0	2

Prerequisite:	
	NIL
Course Outcomes:	
Upon successful completion of the course the student will have:	
1.	Understanding of fundamentals of C programming
2.	Ability to choose appropriate loops/decision constructs while writing C programs.
3.	Ability to modularize C programs through functions
4	Understanding of pointers and their usage
5.	Ability to implement different operations on arrays
Description of Contents in brief:	
1.	Mobile Application development without the use of programming constructs
2.	Programs to understand the basics of C Programming language (variables, constants, operators, expression evaluation, managing input and output)
3.	Programs for implementing decision making statements
4.	Programs to understand the working of looping construct in C (1D and 2D)
5.	Programs to implement the concept of functions for modularizing C programs
6.	Programs to understand the working of pointers
7.	Programs to understand the application of arrays for solving computational problems
8.	Simulation of Arduino Sensor interfacing
List of Text Books:	
1.	E. Balaguruswamy, “Programming in ANSI C”, Tata McGraw-Hill.
2.	K R Venugopal, “Mastering C”, Tata McGraw-Hill.
3.	Yashavant P. Kanetkar, “Let us C”, BPB Publication
List of Reference Books:	
1.	Schildt Herbert, “C- The Complete Reference”, Tata McGraw-Hill.
2.	The C Programming Language, 2e, by Brian W. Kernighan & Dennis M. Ritchie, PHI/Pearson Education
3.	Programming with C by Gottfried, Tata McGraw Hill (Schaum’s Series)
URLs:	
1.	https://appinventor.mit.edu/
2.	https://wokwi.com/
List of experiments: 9	

Experiment No.	Experiments name
1	Design your own mobile app (without using any programming) by using the MIT APP Inventor portal.

2	a	Write a C program that calculates the total interest income on amount Rupees 5 lakhs in a period of 10 years. Show the results for simple interest, compounded interest when the compounding is done annually, semi-annually, quarterly, monthly and daily. Assume that the interest rate is 3.5% per year.
	b	Write a C program that reads two values from the keyboard, swaps their values and prints the result.
	c	Write a C program to find the sum of individual digits of a 3 digit number.
	d	If a four digit number is input through the keyboard, write a program to obtain the sum of the first and last digit of the number.
	e	Write a program to calculate roots of a quadratic equation.x=(-b±√(b^2-4ac))/2a. The roots are real −b±√D 2a if the discriminant D = b2 −4ac is non-negative. If the discriminant is negative, then the roots are complex conjugate −b 2a ± √−D 2a i. The program proceeds in the following steps. (a) It accepts the values of a,b and c from the keyboard. (b) No solution if both a and b are zero. The program finishes with appropriate message. (c) Linear equation if a = 0 but b 6= 0 and the root is −c/b. The program prints out the root with appropriate message and the program finishes. (d) Calculates the discriminant D and determines the corresponding roots. (e) Prints out the roots with appropriate message and the program finishes.

3	a	Write a C program that calculates the absolute difference between an input number and 50, if the input number is greater than 20, double the absolute difference.
	b	Write a C program that verifies an input number is divisible by 3 or 7 and falls between 100 and 500. If the condition is satisfied the program should print 1 otherwise it should print 0
	c	A gym offers a special discount on membership renewal based on attendance. To qualify for the discount, a member must meet the following criteria: • Attend at least 80% of their scheduled sessions. • Have no outstanding payments or dues. • Have been a member for at least 6 months. Write a C program that takes the following inputs from a gym member: Scheduled Sessions, Attended Sessions, Any Outstanding Payments (1 for Yes 0 for No), No. of months as a member The program should then display the following message if the member is eligible for discount: Congratulations! You qualify for the special discount on membership renewal. OR if the member is not eligible for discount, then the program should display the following message Print Sorry, you do not qualify for the special discount on membership renewal. (Reason for not qualifying should also be printed)
	d	Write a C program that takes three numbers as input. If all numbers are distinct, output the difference between the second highest and lowest. If all three numbers are equal, output the sum of all. If any two numbers are equal, print the sum of the lowest and highest
	e	Write a C program to calculate the electricity bill (accept number of units from the user) according to the following criteria: • First 50 units Rs. 0.0 per unit and service charge Rs. 0.30 per unit. • Next 50 units Rs. 1.50 per unit and service charge Rs. 0.40 per unit. • Next 100 units Rs. 2.50 per unit and service charge Rs. 0.50 per unit. • After 200 units Rs. 3.75 per unit and service charge Rs. 0.60 per unit.
4	a	Write a C program to print multiplication table till 10 for the given number.
	b	Population of a state is increased steadily at the rate of 5% growth per year for the last four years. Write a C program that takes a population figure (positive Integer) as input and prints population at the end of each year for the four years.
	c	Write a C program to calculate overtime pay of 10 employees. Overtime is paid at the rate of Rs. 12.00 per hour for every hour worked above 40 hours. Assume that employees do not work for fractional part of an hour.
	d	Write a C program that asks the user to input 10 integers and then print the sum of the largest odd and smallest even numbers.
	e	Write a C program that takes a number ‘n’, with four or more than 4-digits as input. The program should find and print the mid digits of number ‘N’ entered by the user and calculate the mid digits product. Mid digits imply all the digits of the number excluding first and last digit. If a number having less than four digits is entered, the program should display a message as Entered number is not a 4 or more than 4-digit number. Use only conditional and looping statements to write the code.

5	a	Write a C program that asks the user to enter a positive integer n less than 10. If the user enters an invalid input, the code repeats the command of asking the user for a positive integer less than 10 until the input is correct. It then prints out the sum of the first n terms of the series 14 +24 +44 +74 +114 +⋯+m4 and terminates.
	b	Write a C program that prints out the prime numbers between 1 and 100. The output should be such that each row contains a maximum of 7 prime numbers.
	c	Write a C program to print the following pattern * * * * * * * * * * * * * * * *
	d	Write a C program to print the following pattern ***** **** *** ** *
	e	Write a C program to print the following pattern ********* ******* ***** *** *
6	a	Write a C program that invokes a function power(a, b) to calculate and print the value of a raised to b. Do not use any library function/operator.
	b	Write a C program that takes an integer from the user and invokes a function to compute and print the binary equivalent of the integer.
	c	Write a C program that invokes two functions for swapping the value of two variables. The first function (swap_by_value) should demonstrate call by value principle while the second function (swap_by_reference) should demonstrate call by reference principle. The program should print the following in the given order: a. Value of variables in main() before calling any function b. Value of variables after swapping in swap_by_value function c. Value of variables in main() after calling swap_by_value function d. Value of variables after swapping in swap_by_reference function e. Value of variables in main() after calling swap_by_reference function
	d	Given three variables x, y, z write a C program that invokes a function to circularly shift their values to right. In other words if x = 5, y = 8, z = 10, after circular shift x = 10, y = 5, z = 8. Call the function with variables a, b, c to circularly shift values. The new values of the variables should be printed in the main function after the function call.
	e	A computer game to ascend a building with a specified number of floors. You have three different facilities for each floor to reach the top: the elevator (1), the escalator (2), and walking up the stairs (3). Each facility has its own scoring rule. Assume the initial score is zero. • Elevator (1): Score increments to the next even number. • Escalator (2): Score increments to the next odd number. • Walk (3): Score increments to the next prime number. Write a C program to display the score to ascend a building. Create different functions for incrementing score according to the facility.

7	a	Write a C program to copy the contents of one array into another in the reverse order.
	b	Write a C program to find the second largest number in an array entered by the user.
	c	Write a C program which mergers two different arrays and prints the result in sorted (ascending) order. If a number is duplicate, it should appear only once in the sorted array.
	d	Write a C program which performs the following tasks: • Initialize an integer array of 10 elements in main( ) • Pass the entire array to a function modify( ) • In modify( ) multiply each element of array by 3 • Return the control to main( ) and print the new array elements in main( )
	e	Write a C program to with a user defined function having the following signature: int perfect_squares(int *userList, int *finalList) where userList is a pointer to an array of integers entered by a user and finalList is an empty array. The function should extract the perfect squares from the original array and copy it in finalList array. The program should then display the finalList array. A perfect square is an integer that is a square of another integer. For example, 25 is a perfect square as 5 square is 25.
8	a	Write a C program to check if two integers have opposite signs.
	b	Write a C program to check whether the given integer is odd or even.
	c	Write a C program to set the nth bit of an integer.
	d	Write a C program to toggle the nth bit of an integer.
	e	Write a C program to swap two numbers without using arithmetic operator.
9	Explore different types of sensors and simulate their interfacing with arduino board	

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: I	Academic Year: 2025-26 onwards
Name of Course	Life Skills Management			
Course Code	SA 1141			
Core / Elective / Other	Elective			
Concerned Department/ Section/Centre	Humanities and Social Sciences			

Credits	01	Periods per week	L	T	P
			0	0	2

Prerequisite:	
1	To enhance one's ability to be fully self-aware by helping oneself to overcome all fears and insecurities and to grow fully from inside out and outside in.
2	To increase one's knowledge and awareness of emotional competency and emotional intelligence at place of study/work.
3	To provide opportunity for realizing one's potential through practical experience.
4	To develop interpersonal skills and adopt good leadership behaviour for empowerment of self and others.
5	To set appropriate goals, manage stress and time effectively.
6	To manage competency- mix at all levels for achieving excellence with ethics.
Course Outcomes:	
1	This course is designed for imparting skill-based education that would address the issues in day-to-day life, to face the challenges of the new millennium, ruled by globalization and market forces.
2	To familiarize students in theoretical foundation in Life Skills Education, prepare students in training methodologies, enable students to apply Life Skills in various spheres, develop professionals in Life Skills Management and enhance the ability to contribute as youth workers specialized in the area of Life Skills Management.
3	To help others to make informed decisions, solving problems, thinking creatively and critically, building healthy relationships through effective communication and further, deal with risk situations.
4	To foster the social responsibility of the students and enhance their positive and healthy behaviour.
5	After undergoing the course in Life Skills Education, students are enhanced with employability skills to be absorbed in Corporate/HR set ups, NGO's and Community Organisations, Adolescent Health Medical Counselling Centre's, Health Organisations and Government Organisations as well as self- employment.
Course Content in Brief:	
1	Introduction to Life Skills: What are the life skills, who needs, life skills development
2	Self-awareness: Definition, Importance, Dimensions, Components, strategies for nurturing the self-awareness
3	Effective Communication: Assertiveness, Effective Listening, Negotiation Techniques & Process, Barriers of Communication, Presentation Skills
4	Interpersonal Relationship: Definition, Factors Affecting Relationships, Ending relationship constructively
5	Thinking Skills: Critical Thinking: Analytical Thinking, Strategies to enhance Critical Thinking
6	Creative Thinking: Out-of-the box thinking, Stages of Creative Thinking, Factors hindering creative thinking, Characteristics of Creative thinkers
7	Decision Making: Definition, Informed Decision Making, Consequences of Decision Making and Models of Decision Making
8	Coping with Stress: Definition, Types, Sources of Stress, Strategies to Manage Stress
9	Concept and strategies to promote Healthy Life Style Skills
10	Leadership Skills

11	Skill of building Self-confidence and Self-Motivation
12	Preventing suicide, Skills to prevent abuse: physical, sexual, & emotional abuse
13	Study Skills and Memory Techniques
14	Life Skills and Career: goal setting; career planning

Methods of Transaction
Discussion, Debate, Role Play, Simulation Exercises, Case Study, Demonstration, Team Work, Question & Answer, Games

List of Text Books:

1. Adolescence and Life Skills (2003) Commonwealth Youth Programme Asia Centre, Tata McGraw- Hill
2. Darkar Framework for Action, Education for All: Meeting our Collective Commitments, (April 2000), Dakar, Senegal.
3. Family Health International, NACO, USAID (2007), Life Skills Education tool kit for Orphans and vulnerable children in India
4. Hilgard, E, Atkinson R C & Atkinson R L (1976), Introduction to Psychology (6th Ed), IBH Publishing Co.,Pvt Ltd. New Delhi.
5. Life Skills Resource Manual, Schools Total Health Program, (2006), Health Education and Promotion International Inc., Chennai.
6. Global Evaluation of Life Skills Education Programmes Final Report, United Nations
7. Children's Fund, New York, 2012
8. Kumar .J. Keval, (2008), Mass Communication in India, Jaico Publication India Pvt. Ltd
9. Mangal S.K. (2008), An Introduction to Psychology, Sterling Publishers Pvt. Ltd., New Delhi.
10. Morgan and King,(1993)Introduction to Psychology ,Tata McGraw-Hill Publishing Company Ltd, New Delhi.
11. Nair V. R. (2010). Life Skills Personality and Leadership. RGNIYD, Tamilnadu
12. Rao P.L. (2008) Enriching Human Capital Through Training and Development, Excel Books, Delhi.
13. RGNIYD. (2008). Facilitators Manual on Enhancing Life Skills. Tamil Nadu
14. Singh Madhu, (2003), Understanding Life Skills, Background paper prepared for Education for All: The Leap to Equality
15. Stella Cottrell, (2008), The Study Skills Handbook, Palgrave Macmillan Ltd. (3rd Ed), New York
16. UNESCO and Indian National Commission for Co-operation with UNESCO (2001): Life Skills in Non-formal Education: A Review
17. Wallace R. Masters, (2001) Personal Development for Life and Work: UK, South Western.
18. YUVA School Life Skills Programme: Handbook for Teachers, Vol. I – IV, (2008), Department of Education and State Council of Educational Research and Training, Delhi.

Web Sites:

- UNESCO – http://www.unesco.org/
- UNFPA - http://www.unfpa.org/
- UNICEF - http://www.unicef.org/
- United Nations - http://www.un.org/
- WHO - http://www.who.int/en/
- India Portal - www.indiaportal.gov.in
- http://hhd.org/sites/hhd.org/files/paho_lifeskills.pdf
- http://www.who.int/school_youth_health/media/en/sch_skills4health_03.pdf
- http://wikieducator.org/Introduction_to_life_skills_education
- https://www2.ed.gov/offices/OVAE/AdultEd/OCE/LifeSkills/intro.html
- https://www.britishcouncil.gr/sites/default/files/life-skills-developing-active-citizens-en.pdf
- http://www.macmillanenglish.com/uploadedFiles/wwwmacmillanenglishcom/Content/Campa
- igns/life-skills/The-Life-Skills-Handbook.pdf
- https://www.unodc.org/pdf/youthnet/action/message/escap_peers_07.pdf

Name of Program	B.Tech. & Dual Degree	Year: First Year	Semester: II	Academic Year: 2025-26 onwards
Name of Course	Physical and Health Education			
Course Code	SA1242			
Core / Elective / Other	Elective			
Concerned Department/ Section/Centre	Physical Education & Sports Section			

Credits	1	Periods per week	L	T	P
			0	0	2

Prerequisite:

Course Outcomes: At the end of the course, the student will be able to:

1.	To understand knowledge of Health , Wellness and Personal Fitness Management
2.	To know the mental and psychological aspects of health
3.	To know about obesity and body weight control fundamentals
4.	To know about modules of training and fundamentals of nutrition.

Description of Contents in brief:

1.	Introduction to Health, Wellness & Personal Fitness Introduction to Fitness and Training Benefits of Exercise ii. Components of Physical Fitness & Fitness through Nature play iii.Principles of Exercise training to improve personal fitness iv. Introduction to Health, Wellness and it's dimensions. v. Development of physical Fitness (Cardiovascular Endurance, Muscular Strength, Muscular endurance, Flexibility, Body composition), vi. Exercise prescription for Obesity and Weight control
2.	Exercise & Nutrition: Nutrition & Balanced Diet Hydration and Dehydration Sports Drinks Obesity & Body Weight control, measuring Body Fat Body Mass Index (BMI) and calculation,
3.	Exercise Physiology and Sports Injuries Oxygen debt and second wind Effect of exercise on Cardio Respiratory system Effect of exercise on Musculoskeletal System Effect of exercise on central nervous system First Aid - Aims and Objectives Sports Injuries Classification (Abrasion,Contusion, Laceration, Incision, Sprain & Strain), Chronic injuries Tennis elbow, Rotator cuff injury, Football knee Injuries, football ankle Injuries etc)
4.	Exercise Psychology and Psychological Health Concept of Exercise Psychology Motivation & its types Personality, Attitude & Self Esteem Healthy Aging & Longevity Aggression, Anxiety , Depression & Stress
5.	Course Related Practical Work & Field Work Gait, Jogging and Running technique Warming up & Cooling down Weight Training & Strengthening Exercises Exercises for Backache, cervical spondylosis Stretching & Flexibility Exercises Core Strength & Stability Exercises First Aid for different sports injuries Postural Deformities and remedies (a) Kyphosis (b) Lordosis c) Knock – knees (d) Flat-foot (e) Scoliosis.

	Hydrotherapy, Cryotherapy, Contrast Bath Yoga Sutras & Pranayama practice Yoga Nidra and Meditation
List of Text Books:	
1.	Greenberg, Dintiman, Oakes. Physical fitness & wellness (3rd Ed.). IL: Human Kinetics (2004)
2.	Thomas Fahey and Paul Insel and Walton Roth, "Fit & Well: Core Concepts and Labs in Physical Fitness and Wellness" (14" Ed.). Boston: McGraw Hill co". 2016
List of Reference Books:	
1.	Keleher, H and Mac, Dougall, C. Understanding health (No. Ed. Oxford University Press 2015.
2.	Weinberg Robert and Gould Daniel. Foundation of Sports and Exercise Psychology 7th edition. Human Kinetics USA (2018)
URLs:	
Lecture Plan (about 40-50 Lectures):	
Lecture No.	Topic
Lecture 1	Introduction to Fitness and Training Benefits of Exercise
Lecture 2	Components of Physical Fitness & Fitness through Nature play
Lecture 3	Principles of Exercise training to improve personal fitness

***