DAV UNIVERSITY JALANDHAR

Scheme & Syllabus

For

B.Sc. (HONOUR SCHOOL) PHYSICS

(Program ID-)

1st to 8th SEMESTER
Examinations 2023–24 Session

Syllabi Applicable For Admissions in 2023 onwards

DAV UNIVERSITY, JALANDHAR

Scheme of Courses- Bachelor of Physics

Credit Details			
S.No.	**Course Category**	**Course Category Abbreviation**	**3-Yr B.Sc (Credits)**
1.1	Discipline Specific Courses-Core	DSC	60
1.2	Discipline Specific-Skill Enhancement Courses-Core	DS-SEC	2
1.3	Discipline Specific-Value Added Courses-Core	DS-VAC	-
Total of Discipline Specific Core Courses			62
2.1	Minor Courses	MC	-
OR			
2.2	Interdisciplinary Courses	IDC	24
3	Multidisciplinary Courses	MDC	9
4	Ability Enhancement Course- Common	AEC-C	8
5	Value Added Courses-Common	VAC-C	6
6.1	Skill Enhancement Courses- Common	SEC-C	7
6.2	Skill Enhancement Courses-Summer Internship	SEC-SI	4
Total of Skill Enhancement Courses			
Total Credits			**120**

DAV UNIVERSITY, JALANDHAR

Scheme of Courses- Bachelor of Physics

Credit Details				
S.No.	**Course Category**	**Course Category Abbreviation**	**4-Yr B.Sc. (Hons.)/.. (Credits)**	**4-Yr B.Sc. (Hons/.. (Hons. with Res.) (Credits)**
1.1	Discipline Specific Courses-Core	DSC	96	88
1.2	Discipline Specific-Skill Enhancement Courses-Core	DS-SEC	2	2
1.3	Discipline Specific-Value Added Courses-Core	DS-VAC	-	-
	Total of Discipline Specific Core Courses		98	90
2.1	Minor Courses	MC	-	-
OR				
2.2	Interdisciplinary Courses	IDC	28	24
3	Multidisciplinary Courses	MDC	9	9
4	Ability Enhancement Course-Common	AEC-C	8	8
5	Value Added Courses-Common	VAC-C	6	6
6.1	Skill Enhancement Courses-Common	SEC-C	7	7
6.2	Skill Enhancement Courses-Summer Internship	SEC-SI	4	4
6.3	Skill Enhancement Courses-Research Project/Dissertation	SEC-RP	-	12
Total of Skill Enhancement Courses				
Total Credits			**160**	**160**

DAV UNIVERSITY, JALANDHAR

Semester 1

			In hours				
S.No	**Paper Code**	**Course Title**	**L**	**T**	**P**	**Cr.**	**Course Category**
1	PHS101	Mechanics	3	0	2	4	DSC
2	PHS102	Electricity and Magnetism	3	0	2	4	DSC
3		Organic Chemistry	3	0	2	4	IDC
4		Multidisciplinary Courses	-	-	-	3	MDC
5		Ability Enhancement Course- Common	-	-	-	2	AEC- C
6		Skill Enhancement Courses-Common	-	-	-	2	SEC-C
7		Value Added Courses-Common	-	-	-	3	VAC-C
						22	

L- Lectures T- Tutorial P- Practical Cr.- Credits

DAV UNIVERSITY, JALANDHAR

Semester 2

			In hours				
S.No	**Paper Code**	**Course Title**	**L**	**T**	**P**	**Cr.**	**Course Category**
1	PHS103	Analog systems and Applications	3	0	2	4	DSC
2		Matrices and Infinite series	3	0	0	3	IDC
3		Multidisciplinary Courses	-	-	-	3	MDC
4		Ability Enhancement Course-Common	-	-	-	2	AEC- C
5		Skill Enhancement Courses-Common	-	-	-	3	SEC-C
6		Value Added Courses-Common	-	-	-	3	VAC-C
						18	

L- Lectures T- Tutorial P- Practical Cr.- Credits

DAV UNIVERSITY, JALANDHAR

Semester 3

			In hours				
S.No	**Paper Code**	**Course Title**	**L**	**T**	**P**	**Cr.**	**Course Category**
1	PHS201	Vibrations and Waves	3	0	2	4	DSC
2	PHS202	Digital systems and applications	3	0	2	4	DSC
3		Inorganic Chemistry	3	0	2	4	IDC
4		Multidisciplinary Courses	-	-	-	3	MDC
5		Ability Enhancement Course- Common	-	-	-	2	AEC- C
6		Skill Enhancement Courses- Common	-	-	-	2	SEC-C
						19	

L- Lectures T- Tutorial P- Practical Cr.- Credits

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Semester 4

			In hours				
S.No	**Paper Code**	**Course Title**	**L**	**T**	**P**	**Cr.**	**Course Category**
1	PHS203	Optics	3	0	2	4	DSC
2	PHS204	Thermal and Statistical Physics	3	0	2	4	DSC
3	PHS205	Mathematical Physics	3	0	0	3	DSC
4	PHS206	Elements of Modern Physics	3	0	0	3	DSC
5	PHS207	Weather Forecasting	2	0	0	2	DSC
6		Calculus and Geometry	3	0	0	3	IDC
7		Ability Enhancement Course- Common	-	-	-	2	AEC- C
						21	

L- Lectures T- Tutorial P- Practical Cr.- Credits

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Semester 5

			In hours				
S.No	**Paper Code**	**Course Title**	**L**	**T**	**P**	**Cr.**	**Course Category**
1	PHS301	Solid State Physics	3	0	2	4	DSC
2	PHS302	Quantum Physics	3	0	2	4	DSC
		Physical Chemistry	3	0	2	4	IDC
4		Differential equations and Fourier Series	3	0	0	3	IDC
5		Internship	-	-	-	4	SEC-SI
6		Discipline Specific-Skill Enhancement Courses- Core	2	0	0	2	DS-SEC
						21	

L- Lectures T- Tutorial P- Practical Cr.- Credits

Discipline Specific-Skill Enhancement Courses- Core

S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	PHS303	Renewable Energy and Energy harvesting	2	0	0	2
2	PHS304	Space weather	2	0	0	2
3	PHS305	Radiation Safety	2	0	0	2

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Semester 6

			In hours				
S.No	**Paper Code**	**Course Title**	**L**	**T**	**P**	**Cr.**	**Course Category**
1	PHS306	Electromagnetic Theory	4	0	0	4	DSC
2	PHS307	Nuclear Physics	3	0	2	4	DSC
3	PHS308	Particle Physics	3	0	2	4	DSC
4	PHS309	Numerical Methods	3	0	2	4	DSC
5		Integral transform and complex analysis	3	0	0	3	IDC
6		Spectroscopy	3	0	2	4	IDC(Compulsory non-credit course)
						19	

L- Lectures T- Tutorial P- Practical Cr.- Credit

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Semester 7

			In hours				
S.No	**Paper Code**	**Course Title**	**L**	**T**	**P**	**Cr.**	**Course Category**
1	PHS401	Classical Mechanics	4	0	0	4	DSC
2	PHS402	Quantum Mechanics-I	4	0	0	4	DSC
3	PHS403	Advanced Analog Electronics	4	0	0	4	DSC
4	PHS404	Advanced Physics Lab	0	0	9	4	DSC
5	PHS405	Experimental Techniques	4	0	0	4	DSC
	OR						
5		Skill Enhancement Courses- Research Project/Dissertation-I	-	-	0	4	SEC-RP
						20	

L- Lectures T- Tutorial P- Practical Cr.- Credits

The Student doing B.Sc(Hons.) Physics will study Experimental Techniques of 4 credits. Whereas student doing B.Sc(Hons.) Physics with research will do **Skill Enhancement Courses- Research Project/Dissertation-I** of 4 credits.

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Semester 8

			In hours				
S.No	**Paper Code**	**Course Title**	**L**	**T**	**P**	**Cr.**	**Course Category**
1	PHS406	Quantum Mechanics-II	4	0	0	4	DSC
2	PHS407	Advanced Mathematical Physics	4	0	0	4	DSC
3	PHS408	Atomic and Molecular Spectroscopy	4	0	0	4	DSC
4	PHS409	MATLAB	2	0	4	4	DSC
		Chemistry of Materials	4	0	0	4	IDC
	OR						
4		Skill Enhancement Courses-Research Project/Dissertation-II	-	-	0	8	SEC-RP
						20	

L- Lectures T- Tutorial P- Practical Cr.- Credits

The Student doing B.Sc(Hons.) Physics will study **MATLAB** and **Chemistry of Materials** of 4 credits each. Whereas student doing B.Sc(Hons.) Physics with research will do **Skill Enhancement Courses- Research Project/Dissertation-II** of 8 credits.

In hours			
L	**T**	**P**	**Credit**
3	0	2	4

Course Code	PHS101						
Course Title	Mechanics						
Course Outcomes	CO1: To enable the students to understand different types of reference frames, Galilean Transformations, concept of collision and non-inertial systems. CO2: To enable the students to understand rotational dynamics and motion of a particle under inverse square central forces, CO3: Students will gain information about Special theory relativity. They will be able to learn concept of relativistic mass and some of its consequences. CO4: Students will be able to verify some of the concepts learnt in the theory courses. They will be trained in performing experiments of Mechanics.						
Examination Mode	Theory+ Practical						
Assessment Tools	**Quiz**	**Assignment**	**ABL/PBL**	**Lab Performance**	**MSE**	**MSP**	**ESE**	**ESP**
Weightage	**10**	**-**	**5**	**-**	**25**	**-**	**35**	**25**
Syllabus								**CO Mapping**
Unit 1	**Fundamentals of Dynamics**							
	Fundamentals of Dynamics: Inertial frames; Galilean transformations; Galilean invariance. Centre of mass. Principle of conservation of momentum. Conservative and non-conservative forces. Potential Energy. Force as gradient of potential energy. Collisions: Elastic and inelastic collisions between particles. Centre of mass and laboratory frames. Various relations between lab and centre of mass frames. **Non-Inertial Systems:** Non-inertial frames and fictitious forces. Uniformly rotating frame, Centrifugal force, Coriolis force and its applications.							1
Unit 2	**Rotational Dynamics and Central force motion**							
	Rotational Dynamics: Angular momentum of a particle and system of particles. Torque. Principle of conservation of angular momentum. Rotation about a fixed axis. Moment of Inertia. Calculation of moment of inertia for rectangular, cylindrical and spherical bodies. **Central force motion:** Central forces, Law of conservation of angular momentum for central forces, Two-body problem and its reduction to equivalent one-body problem and its solution, Concept of effective potential energy and stability of orbits for central potentials of the form kr^n for n = 2 and -1 using energy diagram, discussion on trajectories for n= −2. Solution of Kepler's problem, Kepler's laws for planetary motion, orbit for artificial satellites							2

Unit 3	**Special Theory of Relativity**	
	Michelson-Morley Experiment and its outcome, Postulates of Special Theory of Relativity, Lorentz Transformations, Simultaneity and order of events, Lorentz contraction, Time dilation, Relativistic transformation of velocity, frequency and wave number, Relativistic addition of velocities, Variation of mass with velocity, Massless Particles, Mass-energy Equivalence, Transformation of Energy and Momentum.	3
Unit 4	**List of Experiments**	
	1. To determine the height of a building using a Sextant. 2. To study the Motion of Spring and calculate (a) Spring constant, (b) **g** and (c) Modulus of rigidity 3. To determine the Moment of Inertia of a Flywheel. 4. To determine the Modulus of Rigidity of a Wire by Maxwell's needle 5. To determine the elastic Constants of a wire by Searle's method. 6. To determine the value of g using Bar Pendulum. 7. To determine the value of g using Kater's Pendulum.	4
Text Books	1. D. Kleppner, R.J. Kolenkow, An introduction to mechanics, New Delhi: McGraw-Hill, 1973. 2. C.Kittel, W.Knight, et.al. Mechanics, Berkeley Physics, vol.1, New Delhi: Tata McGraw-Hill, 2007. 3. Resnick, Halliday and Walker, Physics, 8/e. Wiley, 2008. 8. D.S. Mathur, Mechanics, New Delhi: S. Chand and Company Limited, 2000. 9. F.W Sears, M.W Zemansky, H.D Young, University Physics. 13/e, Addison Wesley, 1986. 5. C.L. Arora, B.Sc. Practical Physics	
Reference Books	1. G.R. Fowles and G.L. Cassiday, Analytical Mechanics, New Delhi: Cengage Learning, 2005. 2. R. P. Feynman, R. B. Leighton, M. Sands, Feynman Lectures, Vol. I, Pearson Education, 2008. 3. R. Resnick, Introduction to Special Relativity, John Wiley and Sons, 2005. 4. R. L. Reese University Physics, Thomson Brooks/Cole, 2003. 5. S. Panigrahi and B. Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd, 2015.	

In hours			
L	T	P	Credit
3	0	2	4

Course Code	PHS102							
Course Title	Electricity and Magnetism							
Course Outcomes	CO1: Students will be able to get in-depth information of electrostatics, electrostatic potential energy and methods of images. CO2: To equip the students with the detailed knowledge of magnetostatics and electromagnetic induction. CO3: Students will gain knowledge about electrostatics in dielectrics and magnetic properties of matter. CO4: Students will be able to verify some of the concepts learnt in the theory courses. They will be trained in performing experiments of Mechanics.							
Examination Mode	Theory+ Practical							
Assessment Tools					**MSE**	**MSP**	**ESE**	**ESP**
	Quiz	**Assignment**	**ABL/PBL**	**Lab Performance**				
Weightage	**10**	**-**	**5**	**-**	**25**	**-**	**35**	**25**
Syllabus								**CO Mapping**
Unit 1	**Electrostatics**							
	Conservation and quantization of charge, Coulomb's Law, Concept of electric field, Electric flux, Gauss's law and its applications, Electric potential difference and Electric Potential, Conservative nature of Electrostatic Field, Relation between Electric field and Electric potential, Differential form of Gauss's law, Laplace's equation and Poisson's equation, Electric potential and Electric Field of a dipole. Electrostatic potential energy of system of charges, Potential Energy of charged sphere, Conductors in an electrostatic Field, Method of electric images and its applications							1
Unit 2	**Magnetostatics & Electromagnetic induction**							
	Magnetostatics Magnetic field, Magnetic force on a current carrying wire, Torque acting on a current loop placed in a uniform magnetic field, Biot-Savart's law and its applications, Ampere's Circuital law and its applications, Force on parallel current carrying wires, Curl and Divergence of magnetic field, Magnetic scalar and magnetic vector potential and its expression. **Electromagnetic Induction** Faraday's law (Differential and integral form), Lenz's law, Self Inductance and Mutual Inductance, Reciprocitytheorem, Energy stored in a Magnetic field, A circuit containing self-inductance, Displacement current and Maxwell's equations.							2

Unit 3	**Dielectric and Magnetic properties of matter**	
	Dielectric Properties of Matter Dielectric, Electric field in matter, Polarization vector(P), Dielectric constant, Capacitor with a dielectric, Electric Susceptibility, Gauss's law in dielectrics, Displacement Vector(D), Relations between E, P and D, Energy Stored in capacitor, Electromagnetic energy density. **Magnetic Properties of Matter** Magnetization vector (M), Magnetic Intensity (H), Magnetic Susceptibility and permeability, Relation between B, H and M, B-H curve and hysteresis.	3
Unit 4	**List of Experiments**	
	1. To study the characteristics of a series RC Circuit. 2. To determine an unknown Low Resistance using Potentiometer. 3. To determine an unknown Low Resistance using Carey Foster's Bridge. 4. To compare capacitances using De'Sauty's bridge. 5. Measurement of field strength B and its variation in a solenoid (determine dB/dx). 6. To determine self-inductance of a coil by Anderson's bridge. 7. Determine a high resistance by leakage method using Ballistic Galvanometer. 8. To determine self-inductance of a coil by Rayleigh's method.	4
Text Books	1. D. J. Griffiths, Introduction to Electrodynamics. Benjamin Cummings, 3rd Edn, 1998. 2. E.M.Purcell, Electricity and Magnetism. New York: McGraw Hill Education, 1986. 3. A. S. Mahajan and A. A. Rangwala, Electricity and Magnetism. New Delhi: Tata McGraw Hill, 1988. 3. D. C. Tayal, Electricity and Magnetism. New Delhi: Himalaya Publishing House. 5. C.L. Arora, B.Sc. Practical Physics	
Reference Books	1. A. Kip, Fundamentals of Electricity and Magnetism. New York: McGraw Hill, 1968 2. J. H. Fewkes, and J. Yarwood, Electricity and Magnetism. UK: Oxford University Press, 1991. 3. S. Panigrahi and B. Mallick, Engineering Practical Physics, Cengage Learning, 2015	

In hours			
L	T	P	Credit
3	0	2	4

Course Code	PHS103							
Course Title	Analog System and Applications							
Course Out-comes	On the completion of the course the student will be able to CO1: Understand semiconductor materials, doping, carrier transport and energy level diagram. Study of formation barrier formation in PN junction diode and their applications. CO2: Explain junction transistors and characteristics of CB, CE and CC configurations. Solve load line analysis of transistors, DC Load line and Q-point. CO3: Students will be able to understand operational amplifiers in detail. CO4: Apply analytical techniques and graphical analysis to the experimental data.							
Examination Mode	Theory							
Assessment Tools	**Quiz**	**Assignment**	**ABL/PBL**	**Lab Performance**	**MSE**	**MSP**	**ESE**	**ESP**
Weightage	**10**		**5**	**-**	**25**	**-**	**35**	**25**
Syllabus								**CO Mapping**
Unit 1	***SEMICONDUCTOR DIODES***							
	Semiconductor materials, doping, Energy Level Diagram, Carrier transport in semiconductors: Conductivity and Mobility, Concept of Drift velocity, Barrier Formation in PN Junction Diode, Static and Dynamic Resistance, Current Flow Mechanism in Forward and Reverse Biased Diode and its applications, Zener diode and voltage regulation							1
Unit 2	***JUNCTION TRANSISTORS***							
	Bipolar Junction transistors: n-p-n and p-n-p Transistors, Current components in transistors, Characteristics of CB, CE and CC Configurations, Current gains α and β, Relations between α and β, Load Line analysis of Transistors, DC Load line and Q-point, Physical Mechanism of Current Flow, Active, Cutoff and Saturation Regions, Amplifiers: Transistor Biasing and Stabilization Circuits, Fixed Bias and Voltage Divider Bias, FET, MOSFET.							2
Unit 3	***OPERATIONAL AMPLIFIER***							
	Operational Amplifiers Characteristics of an Ideal and Practical OpAmp (IC 741), Open-loop and Closed-loop Gain, Frequency Response, CMRR, Slew Rate, and concept of Virtual ground, Inverting and non-inverting amplifiers applications of Op Amp as Adder, Sub tractor, Differentiator, Integrator and Log amplifier.							3

Unit 4	***Practical Experiments***	
	1. To study V-I characteristics of PN junction diode, and Light emitting diode. 2. To study the V-I characteristics of a Zener diode and its use as voltage regulator. 3. To study the current voltage characteristics of the Tunnel diode. 4. To study the characteristics of a Bipolar Junction Transistor in CE, CB and CC configurations. 5. To study the characteristics of Junction Field Effect Transistor (JFET). 6. To study the characteristic of Metal Oxide Semiconductor Field Effect Transistor (MOSFET). 7. To investigate the use of an op-amp as an Integrator and a differentiator	4
Text Books	1. J. Millman, and C. C. Halkias, Electronic Devices and Circuits. New Delhi: Tata McGraw 2. Hill, 1983. 2. R.A. Gayakwad, OP-Amps and Linear Integrated Circuit, 4th Edn., New Delhi: Prentice Hall, 2000. 3. J. D. Ryder, Electronic Fundamentals and Applications. New Delhi: Prentice Hall, 2004.	
Reference Books	1. M. S. Tyagi, Introduction to Semiconductor Materials and Devices, Singapore: John Wiley & Sons Inc., 1991 2. R.A. Gayakwad, OP-Amps and Linear Integrated Circuit, 4thEdn., New Delhi: Prentice Hall, 2000 3. M. S. Shur, Introduction to Electronic Devices, Singapore: John Wiley & Sons Inc., 2000	

In hours			
L	**T**	**P**	**Credit**
3	0	2	4

Course Code	PHS201							
Course Title	Vibration & waves							
Course Outcomes	On the completion of the course the student will be able to **CO1:** Gain knowledge in simple harmonic motion in mechanical and electrical systems **CO2:** Understand the damping mechanism in simple harmonic motion **CO3:** Gain knowledge in forced and coupled mechanical and electrical oscillators **CO4:** Understanding of wave motion concepts and hands on training on the SHM experiments and wave motion related practicals							
Examination Mode	Theory+ Practical							
Assessment Tools	**Quiz**	**Assignment**	**ABL/PBL**	**Lab Performance**	**MSE**	**MSP**	**ESE**	**ESP**
Weightage	**10**	**-**	**5**	**-**	**25**	**-**	**35**	**25**
Syllabus								**CO Mapping**
Unit 1	***Simple Harmonic motion***							
	Hooke's law, Equation of Simple harmonic motion, Frequency, Amplitude, Displacement, Velocity, Acceleration, and phase difference of SHM, Energy of a simple harmonic oscillator, Compound pendulum, Torsional pendulum, Kater's pendulum, Simple harmonic oscillations in electrical system, Principle of Superposition Harmonic Oscillations, Superposition of Two Harmonic Motions of Same Frequency, Lissarjous figures and its applications, Anharmonic Oscillations.							1
Unit 2	***Damped oscillations***							2
	Damped simple harmonic motions in mechanical and electrical system, Decay of free vibrations due to damping, Differential equation of damped harmonic motion and its solution, Types of damping, Determination of damping coefficient of a damped vibrating system – Logarithmic decrement, Relaxation time, and Quality Factor, Forced Vibrations – Mechanical and Electrical Forced Oscillator, Transient and steady state oscillations.							

Unit 3	***Forced oscillations***	3
	Forced Mechanical Oscillators - Displacement, Velocity and Acceleration, Variation of Displacement, Velocity and Acceleration with driving force frequency, Power supplied to Forced Oscillator by the driving force, Power dissipated against frictional force, Variation of power with driving force frequency, Quality factor, Amplification factor of forced oscillator Coupled Oscillations - Mechanical and Electrical Coupled Oscillators, Stiffness Coupled Oscillators, Potential energy of coupled pendulums, Equation of motion of two coupled pendulums, Inductive coupling of electrical oscillators.	
Unit 4	***Wave motion and practicals***	4
	Types of Waves - Longitudinal and Transverse Waves, Characteristics of Wave Motion, Differential Equation of Wave Motion, Equation of a Progressive Simple Harmonic Waves, Energy in Progressive waves, Velocities of Wave motion – Particle, Wave, Group Velocities, Relation between Particle Velocity and Wave Velocity, Velocity of Transverse Waves, Characteristics impedance of string, Reflection and Transmission of Waves on a string at a Boundary, Reflection and Transmission Coefficients – Amplitude and Energy, Stationary Waves and Waves on a string of fixed length, Nodes and Anti-nodes, Energy of a Vibrating String 1. To determine the frequency of a tuning fork using a sonometer. 2. To verify the laws of transverse vibrations of stretched strings using a sonometer 3. To determine the frequency of AC mains using a sonometer and an electromagnet. 4. To find the velocity of sound in the material of the given rod with a Kundt's tube 5. To measure the logarithmic decrement, coefficient of damping, relaxation time and quality factor of a simple damped pendulum.	
Text Books	1. S P Puri, Vibrations and Waves, Macmillan India Ltd.,2004. 2. H. J. Pain, Physics of Vibrations and Waves, John Wiley and Sons, 2013.	
Reference Books	1. N.K. Bajaj, Physics of Waves and Oscillations, Tata McGraw Hill, 1998 2. Vibration and Waves by S Chand Publishers	

In hours			
L	**T**	**P**	**Credit**
3	0	2	4

Course Code	PHS202							
Course Title	Digital Systems and Applications							
Course Out-comes	**On the completion of the course, the student will be able to** CO1: Understand the difference between analog and digital circuits and gain knowledge about Boolean algebra CO2: Explain Data processing circuits and Arithmetic circuits CO3: Understand the Sequential Circuits like Flip flops, Registers, Counters CO4: Get direct hand on experience of working with fundamental logic gates, Boolean functions, parity checkers, and sequential systems by choosing Flip-Flop as a building block, and counters to provide a basic idea about memory including RAM, and ROM Demonstrate both combinational circuits and sequential circuits by employing NAND as building blocks and Adders, Subtractors, and Shift Registers.							
Examination Mode	Theory							
Assessment Tools	**Quiz**	**Assignment**	**ABL/PBL**	**Lab Per-formance**	**MSE**	**MSP**	**ESE**	**ESP**
Weightage	**10**		**5**	**-**	**25**	**-**	**35**	**25**
Syllabus								**CO Mapping**
Unit 1	**Digital Circuits and Boolean algebra:**							
	Difference between Analog and Digital Circuits. Binary Numbers, Decimal to Binary and Binary to Decimal Conversion, BCD, Octal and Hexadecimal numbers, AND, OR and NOT Gates (realization using Diodes and Transistor); NAND and NOR Gates as Universal Gates; XOR and XNOR Gates and application as Parity Checkers, De Mor-gan's Theorems; Boolean Laws; Simplification of Logic Circuit using Boolean Algebra; Fundamental Products, Conversion of a Truth table into Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map.							1
Unit 2	*Arithmetic circuits and Data processing circuits:*							
	Binary Addition. Binary Subtraction using 2's Complement;Half and Full Adders, Half & Full Subtractors, 4-bit binary Adder/Subtractor; Basic idea of Multiplexers, De-multiplexers, Decoders, Encoders							2

Unit 3	**Sequential Circuits:**	
	Flip Flops: SR, D, and JK Flip-Flops; Clocked (Level and Edge Triggered) Flip-Flops, Preset and ClearOperations, Race-around conditions in JK Flip-Flop, M/S JK Flip-Flop. **Shift registers:** Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out andParallel in-Parallel-out (only up to 4 bits). **Counters (4 bits):** Ring Counter, Asynchronous counters, Decade Counter. Synchronous Counter. **Computer Organization:** Input/output Devices; Data storage (idea of RAM and ROM); Computer memory,	3
Unit 4	**Digital Electronic Experiments:**	
	1. To verify the truth table of AND, OR, NOT, NAND, NOR Gate USING DTL Kit. 2. To verify and design AND, OR, NOT and XOR gates using NAND gates. 3. To design and verify truth table of Half Adder, Full Adder and 4-bit binary Adder. 4. Parity generator and checker. 5. To build Flip-Flop (RS, Clocked RS, D-type and JK) circuits using NAND gates. 6. To build JK Master-slave flip-flop using Flip-Flop ICs 7. To build a 4-bit Counter using D-type/JK Flip-Flop ICs and study timing diagram.	4
Text Books	1. G. S. Bains, Digital Circuits and Logic Design, PBS Education, 2013 2. A.A Kumar, Fundamentals of digital Circuits, Prentice- Hall India, 2004 3. R. L. Tokheim, Experiments Manuals for Digital Electronic, MCGraw Hill, 2003	
Reference Books	1. A. P. Malvino and D. P. Leach, Digital Principles and Applications. New Delhi: Tata McGraw Hill, 1986. 2. J. Milliman and H. Taub, Pulse, Digital and Switching Waveforms. New Delhi: Tata McGraw Hill, 1992. 3. A. Mottershead, Electronic Devices and Circuits. New Delhi: Prentice Hall, 1977.	

In hours			
L	**T**	**P**	**Credit**
3	0	2	4

Course Code	CHM153							
Course Title	ORGANIC CHEMISTRY							
Course Outcomes	On the completion of the course the student will be able to CO1: understand the concepts related to Compounds of Carbon and Stereochemistry CO2: acquire knowledge of the concepts related to Alkyl Halides and Alcohols CO3: get detailed knowledge about Ethers and Aldehydes and Ketones CO4: familiar organic chemistry practicals							
Examination Mode	Theory + Practical							
Assessment Tools	**Quiz**	**Assignment**	**ABL/PBL**	**Lab Performance**	**MSE**	**MSP**	**ESE**	**ESP**
Weightage	**10**	**-**	**5**	**-**	**25**	**35**	**-**	**25**
Syllabus								**CO Mapping**
Unit 1	*Compounds of Carbon and Stereochemistry*							
•	Differences in chemical and physical behavior as consequences of structure. Discussion (with mechanism) of reactions of hydrocarbons' ranging from saturated acyclic and alicyclic, unsaturated dienes and aromatic systems. Huckel rule; as applied to 4n+2 systems. Industrial sources and utility of such compounds in daily life for medicine clothing and shelter.							CO1
•	Structure, reactivity and stereochemistry. Configuration and conformation. Optical activity due to chirality; d, l, meso and diasteroisomerism, sequence rules. Reactions involving stereoisomerism. Geometrical isomerism – determination of configuration of geometric isomers. E & Z system of nomenclature. Conformational isomerism – conformational analysis of ethane and n-butane; conformations cyclohexane, axial and equatorial bonds, conformations of monosubstituted cyclohexane derivatives. Newman projection and Sawhorse formula, Fischer and flying wedge formulae.							CO1
Unit 2	*Alkyl Halides and Alcohols*							
•	Structure of alkyl halides and their physical properties. Preparation from alcohols, hydrocarbons, alkenes and by halide exchange method. Reactions: (i) Nucleophilic substitution (SN2 and SN1) kinetics, mechanism, stereochemistry, steric and electronic factors, reactivity of alkyl halides, rearrangement, dependence on nucleophile, role of solvent (ii) Elimination E2 and E1 mechanism, stereochemistry, kinetics, rearrangement							CO2
•	Structure, physical properties (Hydrogen bonding), Methods of preparation: Grignard synthesis (scope and limitations), Reactions: Reactions with hydrogen halides. Mechanism and rearrangement, Reaction with Phosphorous trihalides,							CO2

	mechanism of Dehydration	
Unit 3	*Ethers and Aldehydes and Ketones*	
•	Structure, Physical properties, preparation (Williamson synthesis). Reactions: Cleavage, by acids, Electrophilic substitution in ethers.	CO3
•	Structure, Physical Properties; Methods of Preparation: Oxidation of Primary and secondary alcohols, Oxidation of methylbenzenes, Reduction of acid chlorides, Friedel- Crafts Acylation, Reactions; Nucleophilic addition, Addition of Grignard reagents, Addition of cyanide. Addition of Bisulphite, Addition of derivatives of ammonia. Acetal Formation, Cannizzaro reaction, Aldol Condensation	CO3
Unit 4	*ORGANIC CHEMISTRY*	
•	Calibration of Thermometer 80-82^{o} (Naphthalene), 113-114o (acetanilide). 132.5-133^{o} (Urea), 100^{o} (distilled Water)	CO4
•	Determination of melting point Naphthalene 80-82^{o}, Benzoic acid 121.5-122^{O} Urea, 132.5-133^{o}, Succinic acid 184-185^{o} Cinnamic acid 132.5-133^{o}, Salicylic acid 157-5-158^{o} Acetanilide 113-5-114^{o}, m-Dinitrobenzene 90^{o} P-Dichlorobenzene 52^{o}. Aspirin 135^{o}.	CO4
•	Determination of boiling points Ethanol 78^{o}, Cyclohexane 81.4^{o}, Toluene 110.6^{o}, Benzene 80^{O}C	CO4
•	Mixed melting point determination Urea-Cinnamic acid mixture of various compositions (1:4, 1:1, 4:1)	CO4
•	Distillation Simple distillation of ethanol-water mixture using water condenser, Distillation of nitrobenzene and aniline using air condenser	CO4
•	Crystallization Concept of induction of crystallization Phthalic acid from hot water (using fluted filter paper and stemless funnel), Acetanilide from boiling water, Naphthalene from ethanol, Benzoic acid from water	CO4
•	Decolorisation and crystallization using charcoal Decolorisation of brown sugar (sucrose) with animal charcoal using gravity filtration. Crystallization and Decolorisation of impure naphthalene (100g of naphthalene mixed with 0.3g of Congo Red using 1g decolorising carbon) from ethanol	CO4
•	Sublimation (Simple and Vacuum) Camphor, Naphthalene, Phthalic acid and Succinic acid	CO4
•	Extraction: the separatory funnel, drying agent: Isolation of caffeine from tea leaves	CO4
•	Steam distillation	CO4

	Purification of aniline/nitrobenzene by steam distillation	
Text Book/s	1. R. N. Morrison and R. N. Boyd,Organic Chemistry,PearsonEducation,Dorling Kindersley (India) Pvt. Ltd 2. I. L. Finar, Organic Chemistry(Volume 1), Pearson Education, Dorling Kindersley (India) Pvt. Ltd. 3. E. L. Eliel,.And S. H. Wilen, Stereochemistry of Organic Compounds, London: Wiley, 1994. 4. J, March, Advanced Organic Chemistry: Reactions, Mechanism and Structure, John Wiley, 6th edition, 2007. 5. A. I. Vogel, A. R. Tatchell, B. S. Furnis, A. J. Hannaford, andP. W. G. Smith, Vogel's Text Book of Practical Organic Chemistry,5th edition, ELBS, 1989. 6. D. L. Pavia, G. M. Lampanana, and G. S. Kriz,. Jr. Introduction to Organic Laboratory Techniques, Thomson Brooks/Cole, 3rd edition,2005. 7. F. G. Mann, and P. C. Saunders. Practical Organic Chemistry, London: Green & Co. Ltd., 1978. 8. G.Svehla, Vogel's Qualitative Inorganic Analysis (revised), Orient Longman, 7th edition, 1996. 9 .J. Bassett, R. C. Denney, G. H. Jeffery, and J. Mendham, Vogel's Textbook of Quantitative Inorganic Analysis (revised),Orient Longman, 4th edition, 1978.	

In hours			
L	T	P	Credit
3	0	2	4

Course Code	CHM155							
Course Title	SPECTROSCOPY							
Course Outcomes	On the completion of the course the student will be able to CO1: understand the concepts related to Pure Rotational Spectra and Vibrational Spectra CO2: acquire knowledge of the concepts related to Infrared and Raman Spectra CO3: get detailed knowledge about UV and Visible Spectroscopy CO4: familiar spectroscopy practicals							
Examination Mode	Theory + Practical							
Assessment Tools	**Quiz**	**Assignment**	**ABL/PBL**	**Lab Performance**	**MSP**	**MSP**	**ESE**	**ESP**
Weightage	**10**	**-**	**5**	**-**	**25**	**-**	**35**	**25**
Syllabus								**CO Mapping**
Unit 1	*Pure Rotational Spectra and Vibrational Spectra*							
•	Classification of molecules according to their moment of inertia. Rotational energy levels of hydrogen chloride. Determination of molecular geometry by rotational spectrum, isotopic substitution effects. Stark effect, Estimation of molecular dipole moments, Selection rules, Rotational Raman Spectra, anisotropic polarizabilty, specific selection rule in Raman Spectra, Stokes and anti -Stokes lines.							CO1
•	Diatomic molecules, Force constants, Fundamental vibration frequencies, anharmonicity of molecular vibrations and its effect on vibrational frequencies, second and higher harmonies. Frequencies of the vibrational transitions of HCl. Vibrational rotation spectra of CO. P, Q and R branches.							CO1
Unit 2	*Infrared and Raman Spectra*							
•	Vibrations of polyatomic molecules. Examples of CO2, H2O.Mechanics of measurement of infrared and Raman spectra absorption of common functional groups. Their dependence on chemical environment (bond order, conjugation, hydrogen bonding), the number of active infrared and Raman active lines. Fermi resonance, combination bands and overtones, complications due to interactions of vibrations of similar frequency. Application of IR in structure elucidation of organic compounds							CO2
•	Structure, physical properties (Hydrogen bonding), Methods of preparation: Grignard synthesis (scope and limitations), Reactions: Reactions with hydrogen halides. Mechanism and rearrangement, Reaction with Phosphorous trihalides, mechanism of Dehydration							CO2
Unit 3	*UV and Visible Spectroscopy*							
•	Measurement technique, Beer – Lambert's Law, molar extinction coefficient,							CO3

	oscillator strength and intensity of the electronic transition, Frank Condon Principle, Ground and first excited electronic states of diatomic molecules, relationship of potential energy curves to electronic spectra.	
•	Chromophores, auxochromes, electronic spectra of polyatomic molecules. Woodward rules for conjugated dienes, unsaturated carbonyl groups, extended conjugation. Red shift, blue shift, hypo and hyperchromic effects.	CO3
Unit 4	*SPECTROSCOPY PRACTICALS*	
•	Determine the strength of HCl solution by titrating against NaOH solution conductometerically	CO4
•	Determination of total hardness of water (tap) using standard EDTA solution and Eriochrome black T indicator	CO4
•	Determination of alkalinity of water.	CO4
•	Determination of surface tension of given liquid by using Stalagmometer	CO4
•	Determination of residual chlorine in a water sample.	CO4
•	To determine the specific and molecular rotations of an optically active substance by using polarimeter	CO4
•	To determine the composition of an unknown solution with a polarimeter.	CO4
•	Determination of the viscosity of given lubricating oil by using Redwood Viscometer.	CO4
•	Determination of distribution coefficient of I2 between CCl4 and Water	CO4
•	To study the kinetics of hydrolysis of methyl acetate in the presence of hydrochloric acid.	CO4
Text Book/s	1 R. M. Silverstein, and F. X. Webster, Spectrometric Identification of Organic Compounds, Wiley, 6th edition, 2007. 2. W. Kemp, Organic Spectroscopy, ELBS, 1996. 3. C. N. Banwell, Fundamentals of Molecular Spectroscopy, Tata McGraw Hill, 4th edition, 1995. 4. Y. R. Sharma, Elementary Organic Spectroscopy; Principle and Chemical Applications, S. Chand & Company Ltd., 2005. 5. B. P. Levitt,Findlays Practical Physical Chemistry, London & New York: Longman Group Ltd.8th edition, 1978. 6. B. D Khosla, V. C. Garg, and A. Gulati, Senior Practical Physical Chemistry, New Delhi: R. Chand & Co., 11thedition, 2002 7. R. C. Das, and B. Behra, Experimental Physical Chemistry, Tata McGraw Hill Publishing Co. Ltd., 1983. 8. Vogel's Textbook of Quantitative Chemical Analysis (revised by Jeffery, Bassett, Mendham and Denney), 5th edition, ELBS, 1989. 9. G. Svehla, Vogel's Qualitative Inorganic Analysis (revised), 6thedition,NewDelhi:Orient Longman, 1987. 10. G. D. Christian Analytical Chemistry, John Wiley & Sons Inc	

In hours			
L	T	P	Credit
3	0	2	4

Course Code	CHM253							
Course Title	INORGANIC CHEMISTRY							
Course Outcomes	On the completion of the course the student will be able to CO1: understand the concepts related Solid state chemistry CO2: acquire knowledge of the concepts related to Ionic Compounds and Covalent Bond CO3: get detailed knowledge about *Coordination chemistry* CO4: familiar inorganic chemistry practicals							
Examination Mode	Theory + Practical							
Assessment Tools	**Quiz**	**Assignment**	**ABL/PBL**	**Lab Performance**	**MSE**	**MSP**	**ESE**	**ESP**
Weightage	**10**	**-**	**5**	**-**	**25**	**-**	**35**	**25**
Syllabus								**CO Mapping**
Unit 1	*SOLID STATE CHEMISTRY*							
•	Wave mechanical model of Hydrogen atom, The de Broglie relationship, The uncertainty principle, Schrodinger wave equation and its derivation, Significance of Ψ and Ψ^2, Quantum numbers, Normal and orthogonal wave functions, Pauli's exclusion principle, Hund's rule of maximum multiplicity, Aufbau principle and its limitations.							CO1
•	Concept of extra stability of half and completely filled electronic configuration, Electronic configuration of elements, Penetration and shielding (The Slater's rules). The origin and distribution of the elements, The structure of the periodic table, Atomic parameters and their variation in periodic table, Electronegativity and various scales.							CO1
Unit 2	*Ionic Compounds and Covalent Bond*							
•	Properties of ionic substances, Occurrence of ionic bonding, The radius ratio rules, Structures of different crystal lattices, Sodium chloride, Cesium chloride, Wurtzite, Zinc blende, Fluorite, Rutile, Cristobalite, Nickel arsenide, Calcium carbide, Lattice energy, Born-Haber cycle, The calculations of the lattice energy on the basis of Born-Lande equationPolarizing power and polarizabilty of ions, Fajan's rule.							CO2
•	The Lewis theory, Valence bond theory - A mathematical approach, Resonance, Valence Shell Electron Pair Repulsion Model (VSEPR theory), Prediction of structures and variation of bond angles on the basis of VSEPR theory, Shortcomings of VSEPR theory. Concept of hybridization, Rules for obtaining hybrid orbitals, Extent of d-orbital participation in molecular bonding (SO2, PCl5, SO3), Molecular orbital theory (LCAO method), Symmetry of molecular orbitals, Applications of MOT to homo- and hetero-nuclear diatomic molecules, Molecular orbital energy level diagrams (Be2, N2, O2, F2, NO, CO, HCl,							CO2

	NO2, BeH2).	
Unit 3	*Coordination chemistry*	
•	Werner's theory, nomenclature of coordination complexes, isomerism in coordination complexes, chelating agents, metal chelates and chelate effects, names and abbreviations of important ligands, polydenate ligands, polypyarzolyborates,	CO3
•	Macrocylic ligands, macrocylic effect, ketoenolates, troplonates, tripod ligands, conformation of chelate rings, factors determining kinetic and thermodynamic stability	CO3
Unit 4	*INORGANIC CHEMISTRY Practicals*	CO4
•	Qualitative Analysis Identification of cations and anions in a mixture which may contain combinations of acid ions. These must contain interfering acid anions and one, the insoluble. (a) Special Tests for Mixture of anions I. Carbonate in the presence of sulphate. II. Nitrate in the presence of nitrite III. Nitrate in the presence of bromide and iodide. IV. Nitrate in the presence of chlorate. V. Chloride in the presence of bromide and iodide. VI. Chloride in the presence of bromide. VII. Chloride in the presence of iodide. VIII. Bromide and iodide in the presence of each other and of chloride. IX. Iodate and iodide in the presence of each other. X. Phosphate, arsenate and arsenite in the presence of each other. XI. Sulphide, sulphite, thiosulphate and sulphate in the presence of each other. XII. Borate in the presence of copper and barium salts. XIII. Oxalate in the presence of fluoride. XIV. Oxalate, tartrate, acetate, citrate in the presence of each other (b) Separation and identification of cations in mixtures i) Separation of cations in groups. ii) Separation and identification of Group I, Group II (Group IIA and IIB), Group III, Group IV, Group V and Group VI cations.	CO4
Text Book/s	1.D. F.C. Shriver, P. W. Atkins,and C. H. Langford, Inorganic Chemistry, ELBS Oxford, 1991. 2. J. E. Huheey, E. A. Keiter, and R. L. Keiter, Inorganic Chemistry, 4th edition, Singapore: Pearson Education, 1999. 3. J. D. Lee, Concise Inorganic Chemistry, ELBS, Oxford, 1994. 4.G. Svehla, and B. Sivasankar,Vogel's Qualitative Inorganic Analysis (revised),Pearson, 7th edition, 1996. 5. R. C. Bassett, G. H. Denney,and J. Jeffery, Mendham, Vogel's Textbook of Quantitative Inorganic Analysis (revised), 4th edition, Orient Longman, 1978.	

In hours			
L	T	P	Credit
3	0	2	4

Course Code	CHM353							
Course Title	PHYSICAL CHEMISTRY							
Course Outcomes	On the completion of the course the student will be able to CO1: understand the concepts related to Chemical Thermodynamics and Equilibrium CO2: acquire knowledge of the concepts related to Chemical Kinetics and catalysis CO3: get detailed knowledge about Electro-Chemistry CO4: familiar physical chemistry practicals							
Examination Mode	Theory + Practical							
Assessment Tools	**Quiz**	**Assignment**	**ABL/ PBL**	**Lab Performance**	**MSE**	**MSP**	**ESE**	**ESP**
Weightage	**10**	**-**	**5**	**-**	**25**	**-**	**35**	**25**
Syllabus								**CO Mapping**
Unit 1	*Chemical Thermodynamics and Equilibrium*							
•	First Law of Thermodynamics: First law of thermodynamics for open, closed and isolated systems. Reversible isothermal and adiabatic expansion/compression of an ideal gas. Irreversible isothermal and adiabatic expansion, Enthalpy change and its measurement, Kirchhoff's equation.							CO1
•	Second and Third Law: Various statements of the second law of thermodynamics. Efficiency of a cyclic process (Carnot's cycle), Entropy, Entropy changes of an ideal gas with changes in P, V, and T, Free energy and work functions, Gibbs-Helmholtz Equation., Criteria of spontaneity in terms of changes in free energy, Third law of thermodynamics, Absolute entropies.							CO1
•	General characteristics of chemical equilibrium, thermodynamic derivation of the law of chemical equilibrium, Van't Hoff reaction isotherm. Relation between Kp, Kc and Kx. Temperature, Le Chetalier's principle							CO1
Unit 2	*Chemical Kinetics and catalysis*							
•	Rates of reactions, rate constant, order and molecularity of reactions. Chemical Kinetics: Differential rate law and integrated rate expressions for zero, first, second and third order reactions. Half-lifetime of a reaction, Methods for determining order of reaction, Effect of temperature on reaction rate and the concept of activation energy, Reaction mechanism, Steady state hypothesis							CO2
•	Homogeneous catalysis, Acid-base catalysis and enzyme catalysis (Michaelis-Menten equation). Heterogeneous catalysis, Unimolecular surface reactions							CO2
Unit 3	*Electro-Chemistry*							CO3
•	Specific conductance, molar conductance and their dependence on electrolyte concentration, Ionic Equilibria and conductance, Essential postulates of							CO3

	the Debye-Huckel theory of strong electrolytes, Mean ionic activity coefficient and ionic strength, Transport number and its relation to ionic conductance and ionic mobility, Conductometry titrations, pH scale, Buffer solutions, salt hydrolysis, Acid-base indicators,	
•	Distinction between electrolytic and electrochemical cells, Standard EMF and electrode potential, Types of electrodes, Reference electrode, Calculation of NG, NH, NS and equilibrium constant from EMF data, Potentiometric determination of pH, Potentiometric titrations	CO3
Unit 4	*PHYSICAL CHEMISTRY PRACTICALS*	CO4
•	Treatment of experimental data: Recording of experimental data. Significant number, accuracy and precision, error analysis.	CO4
•	Liquids and Solutions (i) To determine relative viscosities of aqueous solutions of glycerol at different concentrations. (ii) Calculate partial molar volume of glycerol at infinite dilution from density measurement. (iii) To determine viscosity-average molecular weight, number-average molecular weight and mean diameter of polyvinyl alcohol molecule from intrinsic viscosity data	CO4
•	Thermochemistry (i) To determine heat capacity of a calorimeter and heat of solution of a given solid compound. (ii) To determine heat of solution of Solid calcium chloride and calculate lattice energy of calcium chloride using Born-Haber cycle. (iii) To determine heat of hydration of copper sulphate	CO4
•	Distribution Law (i) To determine distribution (i.e. partition) coefficient of a solute between water and a non-aqueous solvent	CO4
•	Surface Phenomena To study the adsorption of acetic acid/oxalic acid from aqueous solution on charcoal. Verify Freundlich and Langmuir adsorption isotherms.	CO4
•	Colorimetery (i) To verify Lambert-Beer law.	CO4
•	pH-metry (i) To titrate a strong acid against a strong base pH-metrically. (ii) To titrate a weak acid against a strong base and determine the ionization constant of the weak acid.	CO4
Text Book/s	1. P. W. Atkins, Physical Chemistry, Oxford University Press, 8th edition, 2006 (Indian Print). 2. . T. Engel,.andP. Reid,. Physical Chemistry, Pearson Education, 1st edition, 2006. 3 G.W. Castellan, Physical Chemistry, Wisley/ Narosa, 3rd edition, 1985 (Indian Print).	

	4. G. M. Barrow, Physical Chemistry, New York: McGraw Hill, 6th edition, 1996. 5. R. J. Silbey, R. A. Albert, and M. G. Bawendi, Physical Chemistry, 4th edition, New York: John Wiley, 2005. 6.B. P. Levitt, Findlays Practical Physical Chemistry,London& New York:Longman Group Ltd., 8th edition,1978. 7. B. D. Khosla, V. C. Garg, andA. Gulati, Senior Practical Physical Chemistry, New Delhi: R. Chand & Co., 11thedition, 2002. 8. R. C. .Das, and B. Behra, Experimental Physical Chemistry, Tata McGraw Hill Publishing Co. Ltd. 1983. 9.Vogel's Textbook of Quantitative Chemical Analysis (revised by Jeffery, Bassett, Mendham and Denney), ELBS, 5th edition,1989. 10. G.vehla, Vogel's Qualitative Inorganic Analysis (revised), 6th edition, New Delhi: Orient Longman, 1987. 11. G. D. Christian, Analytical Chemistry, Wiley, 6th edition	

Course Title: Matrices and Infinite series

Paper Code: MAT 155

L	T	P	Credits
3	0	0	3

Course Objective:
The aim of this course is to familiarize the students with the theory of matrices which are used in solving equations in mechanics and the other streams. This course also provides a comprehensive understanding of some basic concepts of linear algebra.

UNIT-A **12 HOURS**
Determinants and their properties, special matrices-hermitian, skew hermitian, orthogonal, unitary, rank of matrix, elementary transformations, vector spaces, linear span, linear dependence and independence, bases and dimension.

UNIT-B **15 HOURS**
Linear transformations, properties of linear transformations, Rank and Nullity of a linear transformation, Rank-Nullity theorem (without proof), matrix of a linear transformation with respect to a given basis.

UNIT-C **13 HOURS**
Eigen values and eigenvectors, characteristic polynomials, minimal polynomials, Cayley-Hamilton Theorem, diagonalization, Eigen values of special type of matrices.

UNIT-D **14 HOURS**
Sequence, Infinite series, convergence , divergence and oscillation of a series, Geometric series, Convergence tests (Comparison test, integral test, D'Alembert's ratio test, Logarithmic test, Cauchy's root test), Alternating series, Absolute convergence of a series, convergence of exponential series.

Reference Books:

1. Narayan, S. and P. K. Mittal. *A textbook of Matrices*. New Delhi: S. Chand and Co., 2010.
2. Grewal, B.S. *Higher Engineering Mathematics, 42nd edition*. New Delhi: Khanna Publication, Reprint 2012.
3. Lipschutz, S., and M. Lipson. *Schaum's Outline of Linear Algebra,* 4th edition. New Delhi: Tata McGraw-Hill, 2008.
4. Hoffman K., and R. Kunze, *Linear Algebra*, 2nd edition. New Delhi: PHI Learning Pvt. Ltd., Reprint 2014.

Course Title: Calculus & Geometry

Paper Code: MAT255

L	T	P	Credits
3	0	0	3

Course Objective:
The objective of the course is to equip the students with the knowledge of basic concepts of partial derivatives, multiple integration and their applications in geometry.

UNIT-A **12 HOURS**
Sphere: Equation of a sphere, sphere through four given points, plane section of a sphere, sphere through a given circle, equation of tangent plane of sphere.
Cone: Equation of cone, enveloping cone of sphere, cones with vertex at origin, tangent lines and tangent plane at a point, right circular cone.

UNIT-B **14 HOURS**
Cylinder: Equation of Cylinder, enveloping cylinder, right circular cylinder.
Solid Geometry:, Equation of Paraboloid, ellipsoid and hyperboloid in standard forms. Simple properties of these surfaces. Equation of tangent planes to the above surfaces.

UNIT-C **13 HOURS**
Functions of two and more variables: Vector-valued function and space curves. Arc length and unit tangent vector. Limit and continuity of multivariable function. Partial derivatives. Directional derivatives, gradient vectors and tangent planes.

UNIT-D **14 HOURS**
Multiple Integrals and Integral in vector fields: Double and triple integrals. Fubini's Theorem Without proof, Change of order of integration in double integrals, volume of a region in space, Triple integrals in spherical and cylindrical coordinates, substitution in multiple integrals. Line integrals vector fields. Path independence and surface integrals. Divergence and Stoke's theorem (Applications only).

Reference Books:

1. Thomas, G.B. and R.L. Finney. *Calculus and Analytic Geometry*. New-Delhi: Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), 2012.
2. Loney, S.L. *The Elements of Coordinate Geometry*, London: McMillan and Company, 1895, Print.
3. Grewal, B.S. *Higher Engineering Mathematics, 42nd edition*. New-Delhi: Khanna Publication, Reprint 2012.
4. Narayan, S. and P.K. Mittal, *Analytical Solid Geometry.* Delhi: S. Chand & Company Pvt. Ltd., 2008. Print.

DEPARTMENT WISE COMMON COURSES

Ability-Enhancement Courses	**Deptt.**	**Skill-Enhancement Courses**	**Deptt.**	**Value-Added Courses**	**Deptt.**
Personality Enhancement	CBM&E	Essentials of Entrepreneurship-Thinking and Action	CBM&E	Environmental Studies **(Mandatory)**	BOT & EVS
Personality Development	Psychology	Design Thinking	Mech. Engg.	Human Values and Ethics **(Mandatory)**	English
Behavioural & Life Skills	Psychology	Design Thinking & Innovation	CBM&E	Gender Sensitization	BoT& EVS
Global Citizenship in Higher Education	English	Data Analytics	CSE	Professional Ethics	CBM
Communication Skills **(Mandatory)** **OR** Cambridge English-I **(Mandatory#)** & Cambridge English-II **(Mandatory#)** *# To be offered in two semesters*	English	Cyber Security	CSE	Sustainable Development	Bot & EVS
		Digital Fluency	CSA	Green Technologies	Elect. Engg.
Technical Report Writing	Chemical Engg.	Fundamentals of Computer programming & IT(FCPIT)	CSE	General Studies	English
Leadership Management	CBM&E	Python Programming	CSE	NSS	NSS
Creative & Critical Thinking	Education	Disaster Preparedness and Planning	Civil Engg.	Health & Yoga	Phy Edu

Community Engagement & Social Responsibility **(Mandatory)**	Agriculture	Intellectual Property Rights	Physics	Therapeutic Yoga	Phy Edu.
		Apiculture	Zoology		
		NCC*	NCC		
		LATEX	Mathematics		
		Programming with FORTRAN	Physics		

Multi-disciplinary Courses

Sr. No.	Course Name	Faculty/Department
1	Basics of Physics	Physics
2	Basics of Chemistry	Chemistry
3	Basics of Biology	Zoology & Botany
4	Introductory Biotechnology	Biotechnology
5	Introductory Microbiology	Microbiology
6	Functioning of the Human Body	Zoology
7	Introductory Botany	Botany
8	Business Management for Beginners	CBME
9	Fundamental of Mutual Funds	CBME
10	Economics for Beginners	CBME
11	Professional Communication	English
12	Fine Arts	Arts, Fine Arts & Performing Arts
13	Jyotish: ‘Eye of the Veda’	Vedic Studies
14	Mathematical Statistics	Mathematics
15	Introductory Journalism	JMC
16	Professional Photography	JMC
17	Library Information Sciences	Library Sciences

In hours			
L	**T**	**P**	**Credit**
1	0	2	2

Course Code					
Course Title	Personality Enhancement				
Course Outcomes	By the end of the course the students will be able to: CO1: Acquaint themselves with their own abilities and develop employable personalities. CO2: Develop interpersonal skills, leadership qualities and team working skills for becoming successful professionals. CO3: Think creatively and develop career plans based on their competencies. CO4: Develop problem solving skills, stress management ability and will be able to efficiently resolve conflict.				
Examination Mode	Theory+ Practical				
Assessment Tools	QUIZ	ABL/PBL	MSP	ESE	ESP
Weightage	10	5	20	35	30
Syllabus					**CO Mapping**
Unit 1	**Self managerial skills**				
•	Personality				1
•	Professional Appearance and grooming				1
•	Success and Failure: causes, means to overcome it				1
•	Self awareness (SWOT)				1
•	Goal setting (SMART)				1
Unit 2	**Interpersonal skills**				
•	Meaning and development of Interpersonal skills				2
•	Attitude				2
•	Do’s and don’ts on your first job or internship				2
•	Time management and prioritization				2
•	Team working skills				2
Unit 3	**Motivation and creativity**				
•	Motivation				3
•	Competency mapping				3
•	Self esteem				3
•	Creativity				3
•	Influence of role models				3
Unit 4	**Other aspects of personality**				
•	Manage workplace Conflict				4
•	Stress management				4
•	Problem solving skills				4
•	Work ethics				4
•	Office Etiquette and Professionalism				4

Reference Book/s	1.Swami Vivekananda, *Personality Development*,Published by Advaita Ashrama,2009.	
	2.Manika *Positivity A Way of Life*, Published by Orient Blackswan Pvt Ltd, 2013.	
	3.Robert Heller, *Effective Leadership (Essential Manager)*, Published by PenguinUK,1999.	

In hours			
L	**T**	**P**	**Credit**
0	0	4	2

Course Code			
Course Title	Personality Development		
Course Outcomes	On the completion of the course the student will be able to CO1: Understand their personality well CO2: manage their time well and motivated to do well in all areas CO3: Manage their stress well and able to cope with it effectively. CO4: Able to face interviews and groom their self well.		
Examination Mode	Theory/ Practical/ Theory + Practical		
Assessment Tools	**Continuous Assessment** **Lab Performance**	**MSP**	**ESP**
Weightage	**20**	**30**	**50**

Syllabus		CO Mapping
Unit 1	Introduction to Personality Development	1
•	The concept of personality - Dimensions of personality – Theories of Freud & Erickson-Significance of personality development.	1
•	Understanding feeling and emotions- primary feelings and secondary feelings, Self- regulating emotions	1
•	IQ, EQ, & SQ	1
•	Exercise	1
•	Exercise II	1
Unit 2	Motivation & Time Management	
•	Concept of motivation - Significance – Intrinsic and extrinsic motivation. Importance of self- motivation- Factors leading to de-motivation	2
•	Maslow's Self- actualization theory of Motivation. Importance of Time Management, Values & Beliefs.	2
•	Goals & Benchmarks- the Ladders of success, Prioritizing's your To Do's	2
•	Exercise	2
Unit 3	Stress and Conflict Management	
•	Introduction and types of Stress, role of personality in stress	3
•	Difference between Frustration, Conflict and Anxiety. Common stressors for students.	3
•	Coping mechanisms of Stress.	3
•	Exercise	3
Unit 4	Interview Skills and Social Etiquettes	
•	Types of interviews. Ensuring success in job interviews. Resume writing.	4
•	Exercise- Mock Interviews	4
•	Self -Grooming, Apparel according to the different situation, tips for impressive or smart dressing.	4

•	Make up tutorials.	4
Text Books	1. Soft skills & Employability Skills. Sabina Pillai, Agna Fernandez. 2. Everyday Etiquette: How to navigate 101 common and uncommon social situations by Patrica Rossi.	
Reference Books	1. Building career success skills by Theodore Pietrzak, Mike Fraum. 2. Creative problem solving: An Introduction by Donald J Treffinger, Scott G.Isaksen, K. Brian. 3. Positive Psychology: The science of happiness and human strengths by Alan Carr 4. Personality Development by John Aurthe	

In hours			
L	**T**	**P**	**Credit**
01		02	02

Course Code					
Course Title	Behavioral & life skills				
Course Outcomes	On the completion of the course the student will be able to CO1: To make the student more self-aware CO2: To make the student learn strategies to manage self & emotion CO3: To bring resilience and well-being CO4: To learn to handle psychological crisis				
Examination Mode	Theory + Practical				
Assessment Tools	Written Quiz	ABL/PBL	MSP	ESE	ESP
Weightage	10	5	20	35	30
Syllabus					**CO Mapping**
Unit 1	**Relation with self**				
•	Busting myths related to Mental Health				1
•	Meaning of Fear, anxiety, sadness (mild, moderate, severe)				1
•	Meaning of predisposing and precipitating factors				1
•	Know your triggers and patterns of behavior				1
Unit 2	**Know your emotions& attachment styles**				
•	Meaning of Emotion and types of emotions				2
•	Theories of emotion and Emotional Intelligence (Daniel Goleman)				2
•	Theories of attachment styles				2
•	Know your attachment patterns and their impact on interpersonal relationships				2
Unit 3	**Building resilience and well- being**				
•	Finding solid footing in times of stress, by tapping into inner support. When you feel alone, it is important to find support, either externally or internally. This session will include a technique to find internal support.				3
•	Looking outward. Resilience when dealing with others. The second aspect of resilience hinges on how you deal with others. When you are ready to bounce back, can you pull others along? When others are causing the stress, can you face them constructively? And, when others in distress need your support, can you offer it?				3
Unit 4	**Psychological first-aid**				
•	Recognizing signs & symptoms				4
•	Guided Meditation, Imagery, JPMR, Traatak				4
•	Empathetic and Active listening				4
•	Assertiveness Training				4
•	Disputing Irrational cognitions				4

Text Book/s	1. Psychology by Robert A. Baron 2. Emotional Intelligence by Daniel Goleman	
Reference Book/s	1.APA Dictionary of Psychology by Gary R. Vandenbos 2. Introduction to Psychology by Morgan and King 3. Psychology by Passer and Smith	

In hours			
L	**T**	**P**	**Credit**
2	0	0	2

Course Code						
Course Title	Global Citizenship in Higher Education					
Course Outcomes	On the completion of the course the student will be able to CO1: To instill among the learners a deep-rates pride in being Indian. CO2: To develop knowledge, skill, values to be committed to human rights. CO3:To enable the learners to meet contemporary global Challenges. CO4: To make learners active promoters of peaceful, tolerant, inclusive, secure and sustainable societies. CO5: To enable the learners to attain a holistic and multidisciplinary education. CO6: To help the learners to promote sustainable development and sustainable lifestyle, human rights, gender equality, global citizenship and appreciation of cultural diversity.					
Examination Mode	Theory					
	Continuous Assessment					
Assessment Tools	Quiz	Assignment	ABL/PBL	MSE	ESE	
Weightage	10	10	5	25	50	
Syllabus						**CO Mapping**
Unit 1						
•	The concept of Global Citizenship and Global Citizenship Education.					1
•	Aims of Global Citizenship Education: Justice, Equality, Dignity and Respect.					2
•	Problem Solving Skills- Applying the learner's capability to solve different kinds of problems e.g. social, economic, political and family etc.					2
•	Citizenship in Indian ethos- it is all encompassing horizontal constant of citizenship- Vasudhaiva Kutumbakam.					1
Unit 2						3
•	Global Governance: Local, National and global issues, interconnectedness and interdependence.					3
•	Cultural Diversity and tolerance: about honoring diversity in terms of language, ethnicity, race, gender, religion and region.					3
•	Gender Equality: Addressing the wider issue of gender equality by formatting new and unbiased attitude.					3
Unit 3						
•	Human Right Education: Human Rights					4

	Fundamental Freedoms Prevention of human rights violations Equipping the people with awareness	
•	Peace and Non-Violence: Education about peace and peace-building, conflict-prevention, friendly relations	4
Unit 4		
•	Climate: Climate Changes Combating climate changes Changes in attitudes and behaviors	5
•	Environmental Sustainability: Focus on responsible interactions with the Environment Promote Environmental quality Protecting the Earth, Nature and Natural Resources Protecting Biodiversity, Forest and Wildlife.	6
Text Book/s	1. Education Global Citizenship in India and Pakistan; Arshad Masood Hashmi. 2. Introduction to Global Citizenship Education; Mukherjee, Mousumi et al	
Reference Book/s	3. Achebe Chinua: (1994) Things Fall Apart 4. Coetzer, J.M. (1980) Waiting for the Barbarians 5. Garzon, Mark (2010) American Citizen, Global Citizen 6. Indian Philosophy- Dr. R.S. Radhakrishnan 7. Rethinking of education, towards a global common good, UNESCO 8. Golmohamad, M (2008) global citizenship from theory to practice 9. Education for a New World; Maria Montessori 10. Global Citizenship Education; William Gaudelli	

In hours			
L	**T**	**P**	**Credit**
1	0	2	2

Course Code					
Course Title	Communication Skills				
Course Outcomes	On the completion of the course the student will be able to CO1: Communicate effectively, identify and resolve barriers to communication. CO2: Develop listening and speaking skills to articulate words and sentences clearly and efficiently. CO3: Develop reading skills and write efficiently in a professional context. CO4: Perform efficiently in interviews, presentations, group discussions etc. through thorough practice provided during the course.				
Examination Mode	Theory + Practical				
	Continuous Assessment				
Assessment Tools	Quiz	ABL/PBL	MSP	ESE	ESP
Weightage	10	5	20	35	30
Syllabus					**CO Mapping**
Unit 1	**Communication: Process and Barriers**				
•	**Grammar**: Tenses and Parts of Speech				CO1
•	**Communication**: Introduction and Importance Verbal and Non-verbal communication.				CO1
•	**The Communication Process:** Source, message, channel, receiver, feedback, environment, context and interference; Barriers to Communication.				CO1
•	**Indianism:** Teacher will introduce the concept of Indianism through detailed analysis of 'The Patriot' by Nissim Ezekiel.				CO1
•	**Role-playing:** Teacher will guide teams of students to act-out roles to explore a particular scenario related but not limited to sales meeting, interviews, emotionally difficult conversations, conflict resolution etc.				CO1
Unit 2	**Listening and Speaking Skills**				
•	**Voices:** Active and Passive				CO2
•	**Listening Skills**: Introduction, Self-awareness, Active-listening, becoming an active listener, listening in difficult situations.				CO2
•	**Practicing listening skills:** Students will be shown movie-clippings, documentaries on a variety of topics. This activity shall be followed by a listening quiz and discussion.				CO2
•	**Speaking Skills**: Introduction, Active-speaking, becoming an active-speaker, Elements: Fluency, Vocabulary, Grammar, Pronunciation.				CO2
•	**Practicing speaking skills:** Students will be asked to present orally the topics of their choice in the class. Subsequently, impromptu topics shall be given to the students.				CO2

Unit 3	**Reading and Writing Skills**	
•	**Reading Skills:** Introduction, Types: Skimming, scanning, extensive and intensive reading, Strategies to develop a good reading speed.	CO3
•	**Practicing reading skills**: A comprehensive reading of 'Sexism in English' by Alleen Pace Nilsen in the class followed by reading comprehension exercises. In addition to this, students shall be encouraged to develop a reading habit.	CO3
•	**Writing Skills:** Introduction, Formal and Informal Writing, Writing Effectively: Knowing your audience, organizing the message, Shades of meaning, Clarity and Brevity.	CO3
•	**Practicing writing skills:** Students will practice writing skills by writing • Memos • Emails • Letters • Reports	CO3
Unit 4	**Industry Readiness**	
•	**Interviews:** Purpose of an interview Frequently Asked Questions and how to answer them, Preparation for an interview.	CO4
•	**Group Discussions:** Communication skills used in group discussion, how to give your opinion, Interpersonal Skills assessed in group discussion.	CO4
•	**Curriculum Vitae and Cover Letter:** Importance, how to write, what to include.	CO4
•	**Group discussions and mock interviews** in the class to prepare the students well for placements.	CO4
Text Book/s	1. Kumar, Sanjay and Pushp Lata. Communication Skills. New Delhi: Oxford University Press, 2015. 2. Ezekiel, Nissim. Collected Poems 1952-1988. New Delhi: Oxford University Press,1999. 3. Koneru, Aruna. Professional Communication. Delhi: McGraw, 2008. 4. English Grammar & Composition, Wren and Martin.	
Reference Book/s	1. Oxford Advanced Learner's Dictionary, 10th edition. Oxford University Press, 2020. 2. Sharma, R.C. and Krishna Mohan. Business Correspondence and Report Writing.Delhi: McGraw, 2013. 3. Mahanand, Anand. English for Academic and Professional Skills. Delhi: McGraw,2013. 4. Dulai, Surjit S. "NISSIM EZEKIEL and the Evolution of Modern Indian English 5. Poetry: A Chronology". Journal of South Asian Literature,2000. 6. Murphy, Raymond. English Grammar in Use. Delhi: Cambridge University Press, 2015.	

In hours			
L	**T**	**P**	**Credit**
1	0	2	2

Course Code					
Course Title	**Cambridge English I**				
Course Outcomes	On the completion of the course the student will be able to CO1: Develop effective listening skills to comprehend spoken English in various contexts and accents, employing strategies such as skimming, scanning, and understanding implicit meaning. CO2: Improve spoken communication skills by expressing ideas fluently, engaging in discussions, role-plays, and collaborative tasks, and applying effective communication strategies. CO3: Enhance reading comprehension abilities to understand and interpret diverse written materials using techniques like skimming, scanning, and critical reading to extract essential information. CO4: Develop writing proficiency to produce well-structured, coherent written pieces, demonstrating accurate grammar usage, vocabulary selection, and effective organization.				
Examination Mode	Theory + Practical				
	Continuous Assessment				
Assessment Tools	**Quiz**	**ABL/PBL**	**MSP**	**ESE**	**ESP**
Weightage	**10**	**5**	**20**	**35**	**30**
Syllabus					**CO Mapping**
Unit 1	**Basic communication Part 1 (Chapter1-4)**				
•	**A. Listening: Introduction to Listening I** Listening to people talk about their past, Listening to a description of a transportation system, Listening to people talk about capsule hotels, etc. **B. Speaking: Basic Conversation Skills I** Introducing yourself; Talking about yourself; Exchanging personal information; Talking about transportation and transportation problems; Evaluating city services; Asking for and giving information; describing positive and negative features; Making comparisons; Expressing wishes; talking about food; Giving step-by-step instructions, etc.				1

	C. Reading: Introduction to Reading Skills and Comprehension Strategies I Reading about the life of a Mexican painter, Reading about the happiest cities in the world, Reading about living without money, Reading about the history of pizza, etc **D. Writing: Introduction to Basics of Writing I** Writing a paragraph about your childhood, Writing an online post on a community message board about a local issue, Writing an email comparing two living spaces, etc **E. Grammar: An Introduction to the Fundamentals of English Grammar I** Past tense; *used to* for habitual actions, Expressions of quantity with count and noncount nouns: *too many*, *too much*, *fewer*, *less*, *more*, *not enough*; indirect questions from Wh-questions, Evaluations and comparisons with adjectives: *not . . . enough*, *too*, *(not) as . . . as*; evaluations and comparisons with nouns: *not enough . . . ,too much*/*many . . . , (not) as much*/*many . . . as*; *wish.*	
	F. Self-paced practice with Online Workbook (Units 1-4)	
Unit 2	**Basic communication Part 1 (Chapter5-8)**	
•	**A. Listening: Listening for Basic Information** Listening to travel advice, Listening to the results of a survey about family life, Listening to a radio program, listening to people give suggestions for using technology, Listening to a description of Carnival in Brazil, etc. **B. Speaking: Vocabulary Development for Effective Conversation** Speaking about vacation plans; giving travel advice; planning a vacation, Making requests; agreeing to and refusing requests; complaining; apologizing; giving excuses, giving instructions; giving suggestions, Talking about holidays, festivals, customs, and special events, etc. **C. Reading: Introduction to Reading Skills and Comprehension Strategies II**	2

	Reading about unusual vacations, Reading about unusual hotel requests, Reading about sharing economy, Reading about interesting New Year's customs, etc. **D. Writing: Introduction to Basics of Writing II** Writing a message making a request, Writing a message asking for specific favors, and Writing an entry on a travel website about a cultural custom, etc. **E. Grammar: An Introduction to the Fundamentals of English Grammar II** Future with *be going to* and *will*; modals for necessity and suggestion: *must, need to, (don't) have to, ought to, -'d better, should (not),* Two-part verbs; *will* for responding to requests; requests with modals and *Would you mind . . . ?,* Infinitives and gerunds for uses andpurposes; imperatives and infinitives for giving suggestions,	
•	F. Self-paced practice with Online Workbook (Units 5-8)	2
Unit 3	**Basic communication Part III (Chapter9-12)**	
•	**A. Listening: Listening for Specific Information** Listening to people talk about changes, Listening to people talk about their job preferences, Listening to descriptions of monuments, listening for information about a country, Listening to stories about unexpected experiences, etc. **B. Speaking: Descriptive Speaking I** Talking about change; comparing time periods; describing possible consequences; describing abilities and skills; describing personality traits; talking about landmarks and monuments; describing countries; discussing facts, Describing recent past events and experiences, etc. **C. Reading: Introduction to Reading Skills and Comprehension Strategies III** Reading about a town's attempt to attract new residents, Reading about understanding cultural differences in an international company, Reading about unusual museums, Reading about an unusual rock band, etc	3

	D. Writing: Introduction to Basics of Writing III Writing a paragraph describing a person's past, present, and possible future, Writing an online cover letter for a job application, Writing an introduction to an online city guide, Writing a description of a recent experience **E. Grammar: An Introduction to the Fundamentals of English Grammar III** Time contrasts; conditional sentences with *if* clauses, Gerunds; short responses; clauses with *because*, Passive with *by* (simple past); passive without *by* (simple present); past continuous vs. simple past; present perfect continuous.	
•	**F.** Self-paced practice with Online Workbook (Units 9-12)	3
Unit 4	**Basic communication Part 1V (Chapter13-16)**	
•	**A. Listening: Listening for Sequencing** Listening for opinions; listening to a movie review; listening to people talk about the meaning of signs, Listening to people talk about predicaments; listening to a call-in radio show, etc. **B. Speaking: Descriptive Speaking II** Describing movies and books; talking about actors and actresses; asking for and giving reactions and opinions, Interpreting body language; explaining gestures and meanings; Speculating about past and future events; describing a predicament; giving advice and suggestions, Reporting what people said; making polite requests; making invitations and excuses, etc. **C. Reading: Introduction to Reading Skills and Comprehension Strategies IV** Reading about unpleasant experiences actors put themselves through, Reading about idioms and their meaning, Reading an online advice forum, Reading about taking a sick day, etc. **D. Writing: Introduction to Basics of Writing IV** Writing a movie review, Writing a report about people's responses to a	4

	survey, etc **E. Grammar: An Introduction to the Fundamentals of English Grammar IV** Participles as adjectives; relative pronouns for people and things, Modals and adverbs: *might*, *may*, *could*, *must*, *maybe*, *perhaps*, *probably*, *definitely*; permission, obligation, and prohibition, Unreal conditional sentences with *if* clauses; past modals, Reported speech: requests and statements	
•	**F. Self-paced practice with Online Workbook (Units 13-16)**	4
Text Book/s	***Interchange Level 2 - 5th edition*** published by Cambridge University Press	

In hours			
L	**T**	**P**	**Credit**
1	0	2	2

Course Code					
Course Title	**Cambridge English II**				
Course Outcomes	On the completion of the course the student will be able to CO1: Proficiently handle diverse communication situations, including listening to complaints, news stories, and podcasts; discussing careers and experiences; expressing emotions and cultural expectations; and writing critical online reviews. CO2: Consolidate advanced grammar and vocabulary knowledge for accurate and appropriate language usage. CO3: Utilize comprehensive audio and video resources to develop effective language comprehension and production. CO4: Effective Communication in Diverse Contexts: Demonstrate fluency, coherence, and confidence in expressing complex ideas, drawing conclusions, discussing hypothetical situations, and describing qualities for success.				
Examination Mode	Theory + Practical				
	Continuous Assessment				
Assessment Tools	**Quiz**	**ABL/PBL**	**MSP**	**ESE**	**ESP**
Weightage	**10**	**5**	**20**	**35**	**30**
Syllabus					**CO Mapping**
Unit 1	**Advanced communication (Chapter1-4)**				
•	**Listening: Advanced Listening I** Listening for descriptions of people; listening for opinions; listening to people making, accepting, and declining requests; listening to messages and a podcast. **Speaking – Advanced Speaking I** Describing personalities; expressing likes and dislikes; agreeing and disagreeing; complaining; talking about possible careers; deciding between				1

	two jobs, Making direct and indirect requests; accepting and declining requests, Narrating a story. **Writing / Reading – Advanced Reading/ Writing I** Writing a description of a good friend, Reading about unusual social networking sites, Writing about two career choices, Reading about different types of workplaces, Writing a message with requests, Writing a personal account, Reading about the reliability of online content topics **Grammar – Advanced English Grammar I** Relative pronouns as subjects and objects; *it*clauses + adverbial clauses with *when;*Gerund phrases as subjects and objects; comparisons with adjectives, nouns, verbs, and past participles, Requests with modals, *if* clauses, and gerunds; indirect requests, Past continuous vs. simple past; past perfect _____	
	Self-paced practice with Online Workbook (Units 1-4)	
Unit 2	**Advanced Communication (Chapter5-8)**	
	Listening – ADVANCED LISTENING II Listening for information about living abroad; listening to opinions about customs, listening to complaints; listening to people exchange things in a store; listening to a conversation about a "throwaway culture," Listening to environmental problems; listening for solutions, listening to a conversation with a guidance counselor; listening for additional information. **Speaking – ADVANCED SPEAKING II** Talking about moving abroad; expressing emotions; describing cultural expectations; giving advice; describing problems; making complaints; explaining something that needs to be done; identifying and describing problems; coming up with solutions; asking about preferences; discussing different skills to be learned. **Writing/ Reading – ADVANCED READING/ WRITING II** Writing a pamphlet for tourists, reading about moving to another country, Writing a critical online review, Reading about a problem with a ride-sharing service, Writing a post on a community website, Reading about a creative solution to lionfish on St. Lucia, Writing about a skill, Reading about different studying styles **Grammar - ADVANCED GRAMMAR II** Noun phrases containing relative clauses; expectations: *the custom to*, (*not*) *supposed to, expected to*, (*not*) *acceptable to; d*escribing problems with	2

	pastparticiples as adjectives and with nouns; describing problems with *need* + gerund, *need* + passive infinitive, and *keep* + gerund, Passive in the present continuous and present perfect; prepositions of cause; infinitive clauses and phrases, *Would rather* and *would prefer*; *by* + gerund to describe how to do things.	
•	Self-paced practice with Online Workbook (Units 5-8)	2
Unit 3	**Advanced communication (Chapter9-12)**	
•	**Listening – ADVANCED LISTENING III** Listening to New Year's resolutions, listening for dates and time periods; listening to predictions, Listening to descriptions of important events; listening to regrets and explanations, Listening for features and slogans **Speaking – ADVANCED SPEAKING III** Talking about things you need to have done; asking for and giving advice or suggestions; talking about historical events; talking about things to be accomplished in the future, describing milestones; describing turning points; describing regrets and hypothetical situations; giving reasons for success; interviewing for a job; talking about ads and slogans. **Writing / Reading – ADVANCED READING/ WRITING III** Writing a message of advice, reading about young scientist Jack Andraka, writing a biography, Reading about futurists and their predictions for the year 2050, Writing a message of apology, Reading about a conflict with a friend and advice on how to fix it, Writing a TV or web commercial, Reading about what makes some advertisements memorable, **Grammar – ADVANCED GRAMMAR III** Get or have something done; making suggestions with modals + verbs, gerunds, negative questions, and infinitives; referring to time in the past with adverbs and prepositions: *during, in, ago, from…to, for, since*; predicting the future with *will*, future continuous, and future perfect, Time clauses: *before, after, once, the moment, as soon as, until, by the time*; expressing regret with *should* (*not*) *have* + past participle; describing hypothetical situations with *if* clauses + past perfect and *would*/*could have* + past participle.	3
•	Self-paced practice with Online Workbook (Units 9-12)	3
Unit 4	**Advanced communication (Chapter13-16)**	
•	**Listening – ADVANCED LISTENING IV** Listening to explanations; listening for the best solution, Listening for parts of a movie, Listening for solutions to everyday annoyances; listening to issues and Opinions, Listening to past obstacles and how they were overcome, listening	4

	for people's goals for the future **Speaking – ADVANCED SPEAKING IV** Drawing conclusions, offering explanations; describing hypothetical events; giving advice for complicated situations, Describing how something is done ormade; describing careers in film, TV, publishing, gaming, and music, Giving opinions for and against controversial topics; offering a different opinion; agreeing and disagreeing, Giving opinions about inspirational sayings; talking about the past and the future **Writing / Reading – ADVANCED READING/ WRITING IV** Writing about a complicated situation, Reading about unexplained events, Writing about a process, Reading about what the job of film extra is like, Writing a persuasive essay, Reading about plagiarism in the digital age, Writing a personal statement for an application, Reading about the athlete Michael Edwards **Grammar - ADVANCED GRAMMAR IV** Past modals for degrees of certainty: *must (not) have*, *may (not) have*, *might (not) have*, *could (not) have*; past modals for judgments and suggestions: *should (not) have, could (not) have*, *would (not) have,* The passive to describe process with *is*/*are* + past participle and modal + *be* + past participle; defining and non-defining relative clauses, Giving recommendations and opinions with passive modals: *should be*, *ought to be*, *must be*, *has to be*, *has got to be*; tag questions for opinions, Accomplishments with the simple past and present perfect; goals with the future perfect and *would like to have* + past participle	
•	Self-paced practice with Online Workbook (Units 13-16)	4
Text Book/s	***Interchange Level 3 - 5th edition*** published by Cambridge University Press	

In hours			
L	**T**	**P**	**Credit**
2	0	0	2

Course Code					
Course Title	Technical Report Writing				
Course Outcomes	On the completion of the course the student will be able to CO1: The students will be able to identify the different types of technical writings and will also able to recognize technical from non-technical writing. CO2: The students will be able to relate to the steps for technical writing and report structure. CO3: The students will be able to apply their knowledge of technical writing to construct technical reports and develop presentations. CO4: The students will be able to analyze and appreciate the different most frequently used technical writing manuals.				
Examination Mode	Theory				
Assessment Tools	Quiz	Assignment	ABL/ PBL	MSE	ESE
Weightage	10	10	5	25	50
Syllabus					**CO Mapping**
Unit 1	**Introduction to Technical Writing**.				CO1
•	**What is technical writing?**				
•	Examples of technical writing – white papers, journal articles, training materials, instructional manuals, policy and procedure manuals, process manuals, user manuals, reports of analysis and design, instructions for assembling and using a product.				
Unit 2	**Technical writing Process and Ethics**				CO2
•	Emphasis on the use of planning, clarity, shortness, simplicity, word choice and organization in technical writing.				
•	**Technical writing ethics**				
•	**Formal technical report structure –** universal aspects of report, report format (title, abstract, table of content)				
Unit 3	**Components of technical report**				CO3
•	introduction, background theory, analysis/design, procedure, result and discussion, conclusion, citation, appendix.				
•	**Technical presentation**: basics of informal and formal presentation				
Unit 4	**Introduction to the writing style guides/manuals**				CO4
•	Chicago manual of style				
•	APA style guide				
•	MLA style guide				

•	The elements of style	
•	ACS style guide	
•	Harvard style guide.	
Reference Books	1.Technical Writing 101: A Real-World Guide to Planning and Writing Technical Documentation - by Alan S. Pringle and Sarah S. O'Keefe 2.The Elements of Style - William Strunk Jr. and E.B. White 3. The Chicago Manual of Style 4. Publication Manual of the American Psychological Association (APA) 5. MLA Handbook - The Modern Language Association of America	
Online Resources:	1. The Purdue Online Writing Lab (OWL) 2. Society for Technical Communication (STC)	

In hours			
L	T	P	Credit
2	0	0	2

Course Code					
Course Title	**Leadership Management**				
Course Outcomes	On the completion of the course the student will be able to: CO1: Understanding the differences and balancing between leadership& management roles and leadership style that aligns with organizational goals and values. CO2:Appreciating Motivation for productive team performance through effective communication and coaching techniques CO3:Understanding of creating the vision, mission and strategic plan of the organisation CO4:Preparing the change management plan of the organisation and measuring its effectiveness				
Examination Mode	Theory				
Assessment Tools	Quiz	Assignment	ABL/PBL	MSE	ESE
Weightage	10	10	5	25	50

Syllabus		**CO Mapping**
Unit 1	**Leadership and Management**	CO1
•	Understanding of the terms ‘Management’ and ‘Leadership’, Exploring individual leadership styles and personality traits, Situational leadership	CO1
•	Four ways of leading (leadership approach), Four ways of assessing your staff – maturity, Illustrations and examples on What type of leadership approach should you use, understanding your personality type, Complete the on-line personality test to identify your personality type and task-based activity.	CO1
•	Leadership approaches; Visionary Leader, Coaching Leader, Affiliative Leader, Democratic Leader, Pacesetting Leader, Commanding Leader.	CO1
•	“20-60-20” Rule of Leadership, Transformational leadership,Ethical leadership,Task based activity on how you can demonstrate ethical leadership in your current role.	CO1
Unit 2	**Motivational Theories**	CO2
•	To develop an understanding of how important motivation is in fostering good morale and high-quality performance from all team members	CO2
•	Establish practical strategies to motivate your team, identify common de-motivators and prevent these from attacking morale	CO2
•	Improve your understanding of the unique needs of individuals, theories of Motivation; Frederick Herzberg, Douglas McGregor, Victor Vroomand Charles Handy	CO2
Unit 3	**Vision, Mission and Strategic Planning**	CO3
•	Vision & Mission; what should be in Vision & Mission statements, Task based activity on vision & Mission statements to appreciate the underlying purpose, business and values, Task on identify the key ‘themes’ which would	CO3

	be included in the vision for your own organization. Develop these themes into a written vision and may even be the vision you wish to achieve through your change project	
•	Case studies on few strategic plans, Review of approaches to Strategic Plan structure; Context, where are we now? What will we do?	CO3
•	Strategic actions:what we are actually going to do, Strategic outputs:the vision expressed in measurable units, Task on proposing a number of strategic actions and strategic outputs referring back to the mission and vision developed earlier.	CO3
Unit 4	**Change Management**	CO4
•	Changing the paradigm, Change management in theory, Change management in practice, Reactions to change, Change management theory, Two popular models; Kurt Lewin and John Kotter	CO4
•	Change project planning, Change project presentation, Change project expectations and assessment, Trainer to give the examples of change programmes, Context of change, task on Complete a change proposal form, Developing the Project Plan, Why change fails and managing risk, Risks when change is not managed effectively, Task on Identifying any potential risks to your change project and what additional activity could you undertake to minimise this risk, Change management project guidelines and reporting procedure.	CO4
Text Book/s	1. Robbins, S.P., Judge, T.A., & Vohra, N. (2016). Organisational Behaviour, Pearson education, 16th ed.	
Reference Book/s	1. Pittino, D. (2022).The Concise Leadership Textbook: Essential Knowledge and Skills for Developing Yourself as a Leader, Econcise Publications. 2. Kotter, J.P. (2012).Leading Change,Harvard Business Review Press.	

In hours			
L	**T**	**P**	**Credit**
1	0	2	2

Course Code					
Course Title	**Creative and Critical Thinking**				
Course Outcomes	On the completion of the course the student will be able to CO1:Understand and explain the conceptual framework of creativity & creative thinking CO2: Explain and use various creativity tools and understand the relevance of creative intelligence CO3: Describe the nature of critical thinking CO4: Understand and apply the importance of creative & critical thinking for problem solving				
Examination Mode	Theory + Practical				
Assessment Tools	Written Quiz	ABL+PBL	MSP	ESE	ESP
Weightage	10	5	20	35	30
Syllabus					**CO Mapping**
Unit 1	**Conceptual framework of Creativity and Creative Thinking**				
1.	Creativity- Meaning, Concept, Characteristics and Objectives.				1
2.	Introduction to the principles of Creativity- Basic Principles, Importance in tackling global challenges, Levels of Creativity				1
3.	Creative Thinking- Meaning and Principles of creative thinking, Role of Creative thinking skills in problem solving, Impact of Limitations (such as rules) on creative thinking, Learning Outcomes of Creative Thinking				1
Unit 2	**Tools and identification of Creativity**				
4.	Identification of Creativity – Creativity tests- Torrance, Baquer Mehdi, Techniques of nurturing creativity				2
5.	Creativity Tools- Mind Mapping, brain storming, Random Words, Role Playing, Story Boarding, 5 W's and 1 H				2
6.	Creative Intelligence- Meaning, components and types of creative intelligence				2
Unit 3	**Framework of Critical Thinking**				
7.	Defining Critical Thinking, Critical Thinking Skills, The Essential Skills				3
8.	Critical Thinking Models - Paul Elder Model & Collegiate Learning Assessment (CLA)				3
9.	The 3 C's: context, credibility and consistency				3
10.	Intellectual Standards, Traits and Elements of Reasoning				3
11.	How not to judge prematurely?				3
12.	The importance of maintaining a broad perspective, acquiring facts, listening and reflecting				
Unit 4	**Creative and Critical Thinking for Problem Solving**				
13.	How to make judgments in a disciplined way, with rationality whilst minimizing emotion				4

14.	Creative Vs Critical Thinking	4
15.	Convergent and Divergent Thinking	4
16.	Creative intelligence tests- WKOPAY, Reverse thinking,Anagram	4
17.	Class based/ real life-based problems or situations to develop creative and critical thinking for practical application	4
Text Book/s	1. Paul, R. and Elder, L., 2019, The Nature and Functions of Critical & Creative Thinking, Rowman & Littlefield.	
Reference Book/s	1. S.K Mangal "Understanding the learner and Teaching-Learning Process" Tondon Publications 2. Martinez, P. 2021, Critical Thinking: Decision Making, Problem Solving and Self Development (Effective Strategies That Will Make You Improve Critical Thinking), Tomas Edwards Publication 3. Bowell, T., Cowan, R. and Kemp, G. (2019) Critical Thinking: A Concise Guide. 5th Edition. Routledge: Abingdon, Oxon; New York, NY 4. Paul, R. and Elder, L., 2019, The Nature and Functions of Critical & Creative Thinking, Rowman & Littlefield	

In hours			
L	**T**	**P**	**Credit**
1	0	2	2

Course Code					
Course Title	Community Engagement Course				
Course Outcomes	On the completion of the course the student will be able to CO1: Gain and understanding of rural life, culture and social realities. CO2:Develop a sense of empathy and bonds of mutuality with local community. CO3:Appreciate significant contribution of local communities to Indian society and economy CO4: Learn to value the local knowledge and wisdom of the community CO5: Identify opportunities for contributing to community's socio-economic improvements				
Examination Mode	Theory + Practical				
	Continuous Assessment				
Assessment Tools	Quiz	ABL/PBL	MSP	ESE	ESP
Weightage	10	5	20	35	30
Syllabus					**CO Mapping**
Unit 1	**Appreciation of Rural Society**				
18.	**Appreciation of Rural Society:** Rural life style, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of "soul of India lies in villages'(Gandhi),rural infrastructure. **Teaching Methodology:** Classroom Discussions				1
19.	**Assignment:** Prepare a map (physical, visual or digital) of the village you visited and write an essay a boutinter-family relations in that village. **Mode of Assignment Submission:** Written Assignment				1
Unit 2	**Understanding rural economy& livelihood**				
20.	**Understanding rural economy & livelihood:** Agriculture, farming, land ownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets				2

	Teaching Methodology: Group Discussions in Class	
21.	**Assignment:** Describe your analysis of rural household economy, its challenges and possible pathways to address them. **Mode of Assignment Submission:** Written Assignment	2
Unit 3	**Rural Institutions**	
22.	**Rural Institutions:** Traditional rural organisations, Self-help Groups, Panchayatiraj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civilsociety,local administration**.** **Teaching Methodology:** Classroom Discussions	3
23.	**Assignment:** How effectively are Panchayati raj institutions functioning in thevillage? What would you suggest to improve their effectiveness? Present a casestudy(written oraudio-visual). **Mode of Assignment Submission:** Group presentations of Assignment	3
Unit 4	**Rural Developmental Programmes**	
24.	**Rural Developmental Programmes:**History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swatchh Bharat, PM Awaas Yojana, Skill India, Grampanchayat Decentralised Planning, NRLM, MNREGA, etc. **Teaching Methodology:** Classroom Discussions	4,5
	Assignment: Describe the benefits received and challenges faced in the deliveryof one of these programmes in the rural community; give suggestions about improving implementation of the programme for the rural poor. **ModeofAssignmentSubmission:** WrittenAssignment	4,5
Books	1. Singh, Katar, Rural Development: Principles, Policies and Management, Sage Publications, New Delhi, 2015. 2. A Hand book on Village Panchayat Administration, Rajiv Gandhi Chair for Panchayati Raj Studies, 2002. 3. United Nations, Sustainable Development Goals,2015un.org/sdgs/ 4. M.P.Boraian, Best Practices in Rural Development, Shanlax Publishers, 2016.	
Journals	1. Journals of Rural development, (published by NIRD&PR Hyderabad) 2. Indian Journal of Social Work,(by TISS, Bombay) 3. Indian Journal of Extension Education(by Indian Society of Extension Education) 4. Journal of Extension Education (by Extension Education	

	Society) 5. Fostering Social Responsibility & Community Engagement in Higher Education Institutions in India 6. Kurukshetra(Ministry of Rural Development, GoI) 7. Yojana (Ministry of Information and Broadcasting, GoI)	

Practical/field activities:

The students are required to spend a total of 30 hours in field and select any 5 activities from among the following:

• Interaction with SHG women members, and study of their functions and challenges; planning for their skill building and livelihood activities

• Visit MGNREGS project sites, interact with beneficiaries and interview functionaries at the worksite

• Field visit to Swachh Bharat project sites, conduct analysis and initiate problem solving measures

• Conduct Mission An tyoday a surveys to support under Gram Panchayat Development Plan (GPDP)

• Interactive community exercise with local leaders, panchayat functionaries, grass-root officials and local institutions regarding village development plan preparation and resource mobilization

• Visit Rural Schools /mid- day meal centres, study Academic and infrastructural resources and gaps

• Participate in Gram Sabha meetings, and study community participation

• Associate with Social audit exercises at the Gram Panchayat level, and interact with programme beneficiaries

• Attend Parent Teacher Association meetings, and interview school dropouts Fostering Social Responsibility & Community Engagement in Higher Education Institutions in India

• Visit local Anganwadi Centre and observe the services being provided

• Visit local NGOs, civil society organizations and interact with the staff and beneficiaries,

• Organize awareness programmes, health camps, Disability camps and cleanliness camps

• Conducts oil health test, drinking water analysis, energy use and fuel efficiency surveys

• Raise understanding of people's impacts of climate change, building up community's disaster preparedness

• Organise orientation programmes for farmers regarding organic cultivation, rational use of irrigation and fertilizers and promotion of traditional species of crops and plants

• Formation of committees for common property resource management, village pond maintenance and fishing.

In hours			
L	**T**	**P**	**Credit**
2	0	2	3

Course Code	EVS104							
Course Title	Environment Studies							
Course Outcomes	On the completion of the course the student will be able to: CO1: Understand the interconnected and interdisciplinary nature of environmental studies and develop critical thinking skills in relation to environmental affairs. Acquire knowledge about the depletion of the root cause of natural resources and their effective management. CO2: To aware about the ecosystems, biodiversity and its importance to mankind. Interpret and propose solutions to various environmental pollution, solid waste and disaster management. CO3: Expand awareness of self in a global society and effectively engage diverse perspectives, values, and cultures, ranging from local to global in dealing with environmental and social issues. CO4: Awareness about effect of population increase on humans itself. Causes of spread of different diseases in society. How Indian government is supporting women and children that considered weakest section of society.							
Examination Mode	Theory/ Practical/ Theory + Practical							
	Continuous Assessment				MSE	MSP	ESE	ESP
Assessment Tools	Quiz	Assignment	ABL/PBL	Lab Performance				
Weightage	10%	-	5%	-	25%	-	35%	25%
Syllabus								**CO Mapping**
Unit 1	***Introduction to Environmental Studies, Natural Resources and Ecosystem***							1
•	The multidisciplinary nature of environmental studies							1
•	Natural Resources: Renewable and non-renewable resources.							1
•	Forest resources: Use and over-exploitation							1
•	Water resources: Over-utilization of surface and ground water							1
•	Mineral resources: Use and exploitation, environmental effects of mining							1
•	Food resources: Effects of modern agriculture on environment							1
•	Energy resources: renewable and non-renewable energy sources.							1
•	Land resources: Uses and land degradation, soil erosion							1
•	Ecosystem: Structure and function of an ecosystem. Producers, consumers and decomposers							1
•	Energy flow in the ecosystem, Ecological succession							1
•	Food chains, food webs, ecological pyramids							1
Unit 2	***Biodiversity and Environmental Pollution***							
•	Biodiversity definition. Genetic, species and ecosystem diversity. Bio-geographical classification of India.							2
•	Value of biodiversity. India as mega-diversity nation. Hot-spots of							2

	biodiversity.	
•	Threats to biodiversity. Man wildlife conflicts. In-situ and Ex-situ conservation of biodiversity.	2
•	Environmental Pollution: Definition, causes, effects and control measures of: Air pollution**,** water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, nuclear pollution	2
•	Solid waste management and techniques.	2
•	Disaster management: floods, earthquake, cyclone and landslides.	2
Unit 3	***Social Issues, Human Population and Environment***	
•	Sustainable Development: From unsustainable to sustainable development. Urban problems related to energy.	3
•	Water conservation: Rain water harvesting and watershed management. Resettlement and rehabilitation of people	3
•	Environmental Issues: Climate change, global warming, acid rain, ozone depletion, nuclear accidents and holocaust.	3
•	Wasteland reclamation. Consumerism and waste products.	3
•	Environmental Laws: The Environment Protection Act, 1986; The Air Act, 1981; The Water Act, 1974; The Wildlife Protection Act, 1972; Forest Conservation Act, 1980.	3
•	Human Population and Environment**:** Population growth and population explosion, causes and effects	3
•	HIV/ AIDS	3
•	Women and child welfare programmes in India	3
•	Role of IT in environment and human health.	3
Unit 4	***Practical's and field study***	
•	Visit to sewage treatment plant and rain water harvesting system	4
•	Solid waste management by vermi-composting and biogas plant	4
•	Visit to incineration plant of your area.	4
•	A visit to pond, river and lake ecosystem	4
•	Visit to different industries with respect to pollution	4
•	Testing of water parameters: Hardness, pH, Conductivity, Total dissolved solids, Total suspended solids, BOD and DO	4
•	Study of plants in their natural habitat	4
Text Book/s	1. Garg, S. K. Sewage Disposal and Air Pollution Engineering. Khanna Publishers, Delhi, 2003. 2. Botkin, D.B. and Kodler, E.A. Environmental Studies: The Earth as a living planet. New York: John Wiley and Sons Inc., 2000. 3. Odum, E.P. *Basic Ecology*. Japan: Halt Saundurs, 1983. 4. Oliver, S. O. and Daniel, D. C. Natural Resource Conservation: Management for a Sustainable future. Prentice Hall International, New Jersey, 1990. 5. Rai, G. D. Non-Conventional Energy Sources, Khanna Publishers, Delhi, 1993. 6. Sharma, P. D. Ecology and Environment. Meerut Rastogi Publications, 2004.	

	7. Singh, J.S., Singh, S.P. and Gupta, S. R. Ecology, Environment and Resource Conservation. New Delhi: Anamaya Publishers, 2006. 8. Smith, R.L. (1996). Ecology and Field Biology, Harper Collins, New York, 1996.	
Reference Book/s	1. Alloway, B. J. and Ayres, D.C. Chemical Principles of Environmental Pollution. Blackie Academic and Professional, London, 1997. 2. Botkin, D.B. and Keller, E.A. Environment Science: Earth as a Living Planet, John Wiley & Sons Inc., New York, 2004. 3. Chapman, J. L. and Reiss, M. J. Ecology: Principles and Applications. Cambridge University Press, UK, 1998. 4. De, A.K. Environmental Chemistry. New Delhi: Wiley Eastern Ltd., 1990. 5. Muller-Dombols, D. and Ellenberg, H. Aims and Methods of Vegetation Ecology, Wiley, New York, 1974. 6. Singh, J. S. Restoration of Degraded Land: Concepts and Strategies. Rastogi Publications, Meerut, 1993. 7. Wright, R. T. and Nebel, B. J. Environmental Science, 8th Ed. Prentice Hall India Ltd., 2004.	

In hours			
L	**T**	**P**	**Credit**
2	1	0	3

Course Code								
Course Title	`Human Values and Ethics							
Course Outcomes	On the completion of the course the student will be able to CO1: Development of a holistic perspective based on self – exploration about themselves (human being), family, society and nature/existence. CO2: Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence CO3: Strengthening of self-reflection. CO4: Development of commitment and courage to act.							
Examination Mode	Theory/ Practical/ Theory + Practical							
	Continuous Assessment				MSE	MSP	ESE	ESP
Assessment Tools	Quiz	Assignment	ABL/PBL	Lab Performance				
Weightage	10%	10%	5%	-	25%	-	50%	-
Syllabus								**CO Mapping**
Unit 1	**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education and Understanding Harmony in the Human Being – Harmony in Myself!**							
•	Purpose and motivation for the course, recapitulation from Universal Human Values -1, Self – Exploration – what is it? – its content and process; 'Natural Acceptance' and Experiential Validation – as the process for self – exploration.							1
•	Continuous Happiness and Prosperity – A look at basic Human Aspirations.							1
•	Right understanding, Relationship and Physical Facility – the basic requirements for fulfilment of aspirations of every human being with their correct priority.							1
•	Understanding the needs of Self ('I') and 'Body' – happiness and physical facility.							1
•	Understanding the characteristics and activities of 'I' and harmony in 'I'.							1

•	Understanding the harmony of I with the Body : Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail.	1
Unit 2	**Understanding Harmony in the Family and Society – Harmony in Human – Human Relationship**	
•	Understanding values in human- human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship.	2
•	Understanding the detailed meaning of Trust and Respect: Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship.	2
•	Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co – existence as comprehensive Human Goals.	2
Unit 3	**Understanding Harmony in the Nature and Existence – Whole existence as Coexistence**	
•	Understanding the harmony in the Nature.	3
•	Understanding Existence as Co – existence of mutually interacting units in all- pervasive space.	3
•	Holistic perception of harmony at all levels of existence.	3
•	Include practice sessions to discuss human being as cause of imbalance in nature (film “Home” can be used), pollution, depletion of resources and role of technology etc.	3
Unit 4	**Implications of the above Holistic Understanding of Harmony on Professional Ethics**	
•	Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order	4
•	Competence in professional ethics : a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco- friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.	4
•	Case studies of typical holistic technologies, management models and production systems	4
•	Sum up.	4
Text Books	1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010 2. Satyarth Prakash, Maharishi Dayanand	

Reference Books	1. Jeeban Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999. 2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004. 3. The Story of Stuff (Book). 4. The Story of My Experiments with Truth – by Mohandas Karamchand Gandhi. 5. Small is Beautiful – E. F Schumacher. 6. Slow is Beautiful – Cecile Andrews 7. Economy of Permanence – J C Kumarappa 8. Bharat Mein Angreji Raj – PanditSunderlal 9. Rediscovering India – by Dharampal 10.Hind Swaraj or Indian Home Rule – by Mohandas K. Gandhi 11.India Wins Freedom – Maulana Abdul Kalam Azad 12. Vivekananda – Romain Rolland (English) Gandhi – Romain Rolland (English)	

In hours			30
L	**T**	**P**	**Credit**
2	0	0	2

Course Code								
Course Title	Gender Sensitisation							
Course Outcomes	On the completion of the course the student will be able to CO1: Develop an understanding about gender inequalities and their adverse effects on women as well as men. CO2: Differentiate between biological sex and socially constructed gender; which will help them to break the gender stereotypes and become a better citizen. CO3: Define and understand gender based violence. CO4: Understand the legalities of sexual harassment.							
Examination Mode	Theory/ Practical/ Theory + Practical							
	Continuous Assessment				MSE	MSP	ESE	ESP
Assessment Tools	Quiz	Assignment	ABL/PBL	Lab Performance				
Weightage	10%	10%	5%	-	25%	-	50%	-
Syllabus								**CO Mapping**
Unit 1	*Gender Inequality and its Impact on Men and Women*							
•	Understanding the Notion of Citizenship							1
•	Violation of Women's Rights as Citizens and Individuals							1
•	Nature of Gender Inequalities							1
•	Access to and Control over Resources and Positions of Power							1
Unit 2	*Understanding patriarchy*							
•	Biological Sex and Socially Constructed Gender							2
•	Femininity and Masculinity							2
•	Gender Stereotypes and their Impact; Breaking the Stereotypes							2
•	Gender Equality as Liberation of Men as well as Women							2

Unit 3	*Understanding Violence*	
•	Understanding sexual harassment as gender-based violence	3
•	Nature, victims, causes and impact of gender-based violence	3
•	Violence by men against men	3
•	Impact of violence	3
Unit 4	*Contributing to Prevention of Sexual Harassment*	
•	What is and is not Sexual Harassment	4
•	Supreme Court Judgements, and the provisions in the Act of 2013 about prevention of Sexual Harassment	4
•	Preconditions for Effective Working of Sexual Harassment Complaints Committees	4
•	Role of men in prevention of sexual harassment at workplace e. Gender sensitive language, work culture and workplace	4
Reference Book/s	1. Bhasin, Kamla, 'Gender Basics, What is Patriarchy?' Delhi, Women Unlimited, 1993. 2. Bhasin, Kamla, and Khan S Nighat, 'Gender Basics, Feminism and its Relevance in 5 South Asia', Delhi: Women Unlimited, 1999. 3. Bhasin, Kamla, 'Gender Basics, Exploring Masculinity', Delhi: Women Unlimited, 2004. 4. Bhasin, Kamla, 'Gender Basics, Understanding Gender', Delhi: Women Unlimited, 2000. 5. Bhasin, Kamla, 'Bhala yeh jodar kya hein?' (Hindi), Delhi: Jagori, 2000. Connell, Robert W. Masculinities, Cambridge: Polity Press, 2005. 6. Jaysing, Indira (2004) Ed. Law Relating to Sexual Harassment at the Workplace, Universal Law Publishing Company, Delhi. 7. SAKSHAM: Measures for Ensuring the Safety of Women and Programmes for Gender Sensitization on Campuses, UGC, New Delhi. December 2013. 8. Brod, Harry and Kaufman, Michael. 1994. Theorizing Masculinities, Sage Publications. Thousand Oaks. 9. Supreme Court Guidelines for preventing sexual harassment at the workplace. 1997 (Vishaka guidelines). 10. Supreme Court judgement in Apparel Export Promotion Council vs. A.K. Chopra 1999. 11. The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013.	

In hours			
L	**T**	**P**	**Credit**
2	0	0	2

Course Code								
Course Title	Professional Ethics							
Course Outcomes	On the completion of the course the student will be able to CO1: Understanding the basic Terminology and Professional Ethics. CO2: Adopt the qualities of Professionalism and application of Related Theories. CO3: Acquire knowledge of Ethical Codes and Audit under different situations. CO4: Understand the Emerging Issues in Professional Ethics related to different Industries.							
Examination Mode	Theory/ Practical/ Theory + Practical							
	Continuous Assessment				MSE	MSP	ESE	ESP
Assessment Tools	Quiz	Assignment	ABL/PBL	Lab Performance				
Weightage	10%	10%	5%	-	25%	-	50%	-
Syllabus								**CO Mapping**
Unit 1	**Basic Terminology and Introduction to Professional Ethics**							1
•	Ethics, Moral and Morality, Values, Emotional Intelligence							1
•	Indian and Global Thoughts on Ethics.							1
•	Personal & Professional Ethics, Ethical Egoism, Governing Ethics							1
•	Ethical Dilemmas, Dimensions of Ethics							1
Unit 2	**Professionalism and Theories of Ethics**							
•	Professionalism: Characteristics, Responsibilities, Competencies, Expectations							2
•	Professional Risks, Professional Accountabilities, Professional Success							2
•	Theory of Deontology, Utilitarianism							2
•	Virtue Theory, Rights Theory, Casuist Theory,							2
Unit 3	**Ethical Codes and Audit**							
•	Need for Ethical Codes							3
•	Professional Codes in Practice							3
•	Need for Ethics Audit							3
•	Benchmarking and Procedure for Ethics Audit							3
•	Issues related to Ethical Profiles of Organizations							3
•	Factors/ considerations for Ethical Audit for Manufacturing and Service Organizations							3
Unit 4	**Ethical issues and Practices.**							
•	Emerging Ethical issues in MNC's							4
•	Business Ethics: Corporate Transparency, Finance and Accounting, Marketing, CSR							4
•	Environmental and Bio Ethics; Sustainable Ecosystem, Energy concerns							4

•	Research Ethics: Responsible Authorship, Reviewing & Editing	4
Text Book/s	1. Professional Ethics: R. Subramanian, Oxford University Press, 2013 2. Professional Ethics and Human Values: M Govindarajan; S. Natarajan; V.S. Senthilkumar . PHI Learning Pvt. Ltd. 2013.	
Reference Book/s	1. Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015. 2. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008. 3. Professional Ethics and Human values : R.S. Naagarajan: New age Publication house.	

Recommended Case studies
1. : I phone-Ethical Concern and Dilemma
2. : Ethics for Professional and Directors (Manfold Toy Company)
3. : Maggi Ban in India(Nestle)
4. ***: Green Initiatives by COCA COLA***
5. : Bhopal Gas Tragedy

In hours			
L	**T**	**P**	**Credit**
2	0	0	2

Course Code								
Course Title	Sustainable Development							
Course Outcomes	On the completion of the course the student will be able to CO1: How sustainable development came in existence and its need. To Learn about the economic, social, and environmental aspects of sustainability and about various conventions and policies on sustainability. CO2: understand the need of sustainable development goals at national and international level to progress towards sustainable society. At what extent the sustainability is achieved and what need to plan to achieve. CO3: Explore the major impacts that human activities on the environment and various obstacles for not achieving sustainability. CO4: To able to rationalize the sustainability based on scientific merits							
Examination Mode	Theory/ Practical/ Theory + Practical							
	Continuous Assessment				MSE	MSP	ESE	ESP
Assessment Tools	Quiz	Assignment	ABL/PBL	Lab Performance				
Weightage	10%	10%	5%	-	25%	-	50%	-
Syllabus								**CO Mapping**
Unit 1	**Introduction to sustainable development**							
•	Introduction to Sustainable Development (SD): Glimpse into History of SD - its importance, need, impact and implications.							1
•	Social, ecological and economic symptoms of unsustainable development							1
•	Rio summit / Earth Summit,1992 and outcome							1
•	Brundtland's Commission, 1987 and outcome							1
•	Challenges for Sustainable Development. Multilateral environmental agreements and protocols. Clean Development Mechanism(CDM)							1
•	Conservation and Sustainable Development							1
Unit 2	**Sustainable Development goals**							
•	Introduction to Sustainable Development Goals (SDGs): The origin, development and idea of the SDGs							2
•	Scale and Scope of the SDGs, A Brief History of the SDGs. 17 Goals of sustainable development							2
•	Millennium Development Goals (MDGs)							2
•	From the MDGs to the SDGs: Agenda 2030							2
•	Planning of Government to Achieve SDGs							2
•	Sustainable development goals in India. Sustainable Development Goals Report 2020.							2
Unit 3	**Environmental Sustainability**							

•	Present and Past: An introduction to today's major environmental issues: Global warming, Acid rain, Ozone depletion, habitat loss, biodiversity loss, sea level rise, deforestation, eutrophication, and ecosystem toxicity	3
•	Sustainable Energy Resources: Renewable energy for sustainable development. Natural resources and sustainable development. International efforts for conservation of resources.	3
•	Climate Change: Introduction to climate change and green house effect. Climate change a threat to Sustainable Development. Adaptation to Current and Future Climate Regimes. Mitigating Climate Change. International Legal and Policy Framework to Address Climate Change: United Nations Framework Convention on Climate Change (UNFCCC).	3
•	Obstacles in environmental sustainability: Population Growth, Disparity in use of resources, unsustainable lifestyle, unethical behavior of human beings	3
Unit 4	**Environment Management standards and Socio eco - system**	
•	ISO 14000 series, life cycle analyses- scope and goal, biomimicking, environmental impact assessment-procedures of EIA in India.	4
Text Book/s	1. Bhatt, S. (2004). Environment Protection and Sustainable Development. APH Publishing, New Delhi. 2. Chautervedi, .P. (2003). Energy, Environment and Sustainable Development. Concept Publishing Company, New Delhi. 3. Clayton, B. D. and Bass, S. (2002). Sustainable Development Strategies- A Resource Book. Earth scan Publications Ltd, London. 4. Fulekar, M. H., Pathak, B. and Kale, R. K. (Eds.). (2014). Environment and Sustainable Development. Springer, India. 5. Hardy, J.T. (2003). Climate Change: Causes, Effects, Solutions. Wiley & Sons, USA. 6. Harris, F. (2004). Global Environmental Issues. Wiley & Sons, Inc., USA. 7. Joshi, P. C. and Joshi, N. (2009). A Text Book of Environmental science. A.P.H. Publishers, New Delhi. 8. Oliver, S. O. and Daniel, D. C. (1990). Natural Resource Conservation: Management for a Sustainable Future. Prentice Hall International, New Jersey. 9. Sharma, P.D. (2004). Ecology and Environment. Rastogi Publications, New Delhi.	
Reference Book/s	1. Aswathanarayana, U., Harikrishnan, T. and Thayyib Sahini, K.M. (2010).Green Energy Technology: Economics and Policy. CRC Press, USA. 2. Bowers, J. (1997). Sustainability and Environmental Economics. Addison Weley Longman Ltd, Singapore. 3. Coley. D. (2008). Energy and Climate Change Creating a Sustainable Future. John Wiley and Sons Ltd., UK. 4. Hanley, N., Jainson, F. S. and Ben, W. (1999). Environmental Economics – In Theory and Practice. Macmillan India Ltd, New Delhi. 5. Mulder, K. (2006). Sustainable Development for Engineers - A	

	Handbook and Resource Guide, Green Leaf Publishing, Uttar Pradesh, India. 6. Townsend, C. R. (2007). Ecological Applications: Toward a Sustainable World. Wiley-Blackwell, USA. 7. Turner, K.R., Pearce, D.W. and Bateman, I. (1993). Environmental Economics – An Elementary Introduction. The Johns Hopkins University Press, Baltimore.	

In hours			
L	**T**	**P**	**Credit**
2	0	0	2

Course Code	**BCEXXX**							
Course Title	**GREEN TECHNOLOGIES**							
Course Outcomes	On the completion of the course the student will be able to CO1: To understand the sources of energy and present scenario in India. CO2: To understand the sustainable development through present and future energy system. CO3: To understand the different criteria for green building and green roads. CO4: To understand the basic of green chemistry and green Nano-materials used in construction							
Examination Mode	Theory							
	Continuous Assessment				MSE	MSP	ESE	ESP
Assessment Tools	Quiz	Assignment	ABL/PBL	Lab Performance				
Weightage	10%	10%	5%	-	25%	-	50%	-
Syllabus								**CO Mapping**
Unit 1	INTRODUCTION							
•	Introduction to nexus between Energy, Environment and Sustainable Development; Energy transformation from source to services;							1
•	Energy sources, sun as the source of energy; biological processes; photosynthesis; food chains, classification of energy sources, quality and concentration of energy sources							1
•	Fossil fuel reserves - estimates, duration; theory of renewability, renewable resources; overview of global/ India's energy scenario							2,1
Unit 2	GAS EMISSION & GREEN COMPOSITES							
•	Greenhouse gas emissions, impacts, mitigation and adaptation; future energy Systems- clean/green energy technologies							3
•	International agreements/conventions on energy and sustainability - United Nations Framework Convention on Climate Change (UNFCC); sustainable development							2
•	Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Green Composites for buildings							2
Unit 3	GREEN BUILDING CONCEPT							
•	Urban Environment and Green Buildings. Green Cover and Built Environment. Green roads and its construction procedure.							3,4
•	Introduction to Green Chemistry: Principles of Green Chemistry, Reasons for Green Chemistry (resource minimization, waste minimization, concepts)							3
Unit 4	NANOMATERIALS FOR GREEN BUILDINGS							

•	Green reactions solvent free reactions, Catalyzed (heterogeneous/homogeneous) reactions, MW/ Ultrasound mediated reactions, Bio catalysts etc	4
•	Introduction to nanomaterial's: Nanoparticles preparation techniques, Nanomaterial's for "Green" Systems: Green materials, including biomaterials	4
Text Book/s	1. Energy and the Environment, 2nd Edition, John Wiley, 2006, ISBN:9780471172482; Authors: Ristinen, Robert A. Kraushaar, Jack J. A Kraushaar, Jack P. Ristinen, Robert A., Publisher: Wiley, Location: New York, 2006. 2. Energy and the Challenge of Sustainability, World Energy assessment, UNDP, N York, 2000. 3. K.S.Jagadish, B. U. Venkatarama reddy and K. S. Nanjundarao. Alternative Building Materials and Technologies. New Age International, 2007. 4. Low Energy Cooling For Sustainable Buildings. John Wiley and Sons Ltd, 2009. 5. Paul T.Anastas and John C. Warner, Green Chemistry: Theory and Practice, Oxford University Press, USA (2000) 6. Nano materials, nano technologies and design: an introduction for engineers By M. F. Ashby, Daniel L. Schodek, Paulo J. S. G. Ferr	

In hours			
L	T	P	Credit
2	0	0	2

Course Code								
Course Title	General Studies and Current Topics							
Course Outcomes	On the completion of the course the student will be able to CO1: To aware the students about the Indian Polity and Governance. CO2: To provide opportunity to the students to study interdisciplinary subjects like History, Geography, Economy etc. CO3: To make the students understand and use various discoveries and inventions of science and technology. CO4: To aware the students about different types of sports events and other sources of recreation.							
Examination Mode	Theory/ Practical/ Theory + Practical							
	Continuous Assessment				MSE	MSP	ESE	ESP
Assessment Tools	Quiz	Assignment	ABL/PBL	Lab Performance				
Weightage	10%	10%	5%	-	25%	-	50%	-
Syllabus								**CO Mapping**
Unit 1	Indian Constitution							
•	Preamble, Salient Features, fundamental Rights, Fundamental Duties, Values enshrined in the Constitution: Liberty and Equality, Union Government, Union Legislature, Executive, State Government, Judiciary.							1
•	Election Commission of India- Its formation, Appointment, Qualification, Tenure, Removal, Powers and Duties, Salary, Allowances and Parks.							1
•	Panchayath Day System							1
•	RTI							1
•	Vigilance Commission							1
Unit 2	Indian Economy, Geography and History							
•	Indian Economy- Pattern, DBJ, SEBJ, Liberalization, Privatization and Globalization, Inflation, Decision, Major Economic Treaties, Economic Terminology							2
•	Indian Geography- Location, Area and Dimensions, Indian States and Union Territories, Crops, Industrial Products, Important Sites and Monuments, largest, Longest and Highest in India.							2
•	Indian History- Glimpses, Ancient India, Medieval India, Modern India, Indian National Movement, Prominent Personalities.							2
•	Punjab History- Naming of Punjab, Major Events, Important Personalities, Sikh Gurus, Crops and industrial products of Punjab.							2
Unit 3	General Science							
•	General Appreciation and understanding of Science.							3
•	Science in everyday use.							3

•	Scientific attitude to life	3
•	Important inventions and discoveries.	3
•	Important Scientists of India and their contribution	3
•	ISRO	3
Unit 4	Sports and Recreation	
•	Importance of Sports	4
•	Major Sports	4
•	Major Sports Competitions: Olympics, World Competitions, Common Wealth Games, FIFA, etc.	4
•	Awards and Honors	4
•	Major Festivals and there importance	4
•	Arts and Artists.	4
•	Books and Authors	4
•	Persons in the News	4
Text Book/s	1. General Studies for Civil Services, Mc Graw Hill 2. General Studies 2024, by Tarun Goyal. 3. Fundamentals of General knowledge by Disha Publications 4. Lucent General knowledge 2024 by DVK Rao	
Reference Book/s	1. Advanced General Knowledge- Dr. R. S. Aggarwal, S. Chand and Company 2.Concise General Knowledge Manual- S. Sen, Unique Publishers 3. Encyclopaedia of General Knowledge and General Awareness by R. P. Verma, Pengiun Book Ltd. 4. General Knowledge Manual by Edgar Thorpe and Showick Thrope, the Pearson 5. India 2022, Government of India (Ministry of Information and Broadcasting) Publication Division. 6. Manorama Yearbook -2022, Mammen Mathew, Malayala Manorama Publishers. 7. Spectrum handbook of General Studies, Spectrum Books (p) Ltd. Magazines: 1. Economic and Political Weekly 2. Yajna 3. The Week 4. Frontlines 5. Spectrum 6. Civil Services Chronicle 7. World Atlas Book Newspapers: 1. The Hindu 2. The Times of India 3. The Tribune 4. The Hindustan Times	

In hours			
L	**T**	**P**	**Credit**
1	0	2	2

Course Code	NSS 100							
Course Title	NSS (Skill Based Course)							
Course Outcomes	On the completion of the course the student will be able to CO1: To enable NSS volunteers to undergo a formal course of study so as to supplement their voluntary work CO2: To equip NSS volunteers with some necessary skills to volunteer better CO3: To achieve holistic development of NSS volunteer CO4: To help NSS volunteers to look for other avenues of livelihood in the form of entrepreneurial ventures							
Examination Mode	Theory/ Practical/ Theory + Practical							
	Continuous Assessment				MSE	MSP	ESE	ESP
Assessment Tools	Quiz	Assignment	ABL/PBL	Lab Performance				
Weightage	10%	-	5%	-	-	20%	35%	30%
Syllabus								**CO Mapping**
Unit 1	**Introduction to NSS**							1
•	Introduction to NSS History, philosophy, aims and objectives of NSS; NSS Insignia, Organization of NSS, Funding;							1
•	Regular Activities; Special Camping;							1
•	Adopted village; Maintaining records,							1
•	Collaboration with other Govt. agencies, NGOs							1
Unit 2	**Life Competencies Health & Youth Leadership**							2
•	Definition and importance of life competencies communication and soft skills							2
•	Youth leadership Importance of health, hygiene and sanitation							2
•	Various Govt. programmes							2
•	History and philosophy of yoga; Yoga for healthy living							2

Unit 3	**General Awareness**	3-4
•	Environment conservation, Enrichment and Sustainability; Climate Change;	3-4
•	Waste Management; Natural Resource Management	3-4
•	Introduction; Classification of disasters; Role of NSS in disaster management with more emphasis on disasters specific to NE India; Civil defense	3-4
•	Definition and meaning; Qualities of a good entrepreneur; Risks; Various policies aiding an entrepreneur, Sources of funding and formalities	3-4
Unit 4	**Project /Field work**	1-4
•	Introduction and Basic Concepts of NSS. , Emblem, flag, motto, song, badge, etc.,. Organizational structure, roles, and responsibilities of various NSS functionaries.	1-4
•	Concept of regular activities, special camping, Day Camps, Basis of adoption of village/slums, Methodology of conducting Survey. Maintenance of the Diary, Issues, challenges and opportunities for youth	1-4
•	*Experiential learning and Internship participation*	1-4
•	Shramdan and participation in awareness rallies and activities	1-4
Reference Books	1. NSS Manual 2. National Youth Policy Document 3. National Service Scheme - A Youth Volunteers Programme For Under Graduate Students As Per UGC Guidelines by J D S Panwar, A K Jain & B K Rathi (Astral) 4. Communication Skills by N Rao& R P Das (HPH) 5. Light on Yoga by B K Iyenger (Thorsons) 5. Biodiversity, Environment and Disaster Management by Shamna Hussain (Unique Publishers 6. Fundamentals of Entrepreneurship by H Nandan (PHI)	

In hours			
L	**T**	**P**	**Credit**
1	0	2	2

Course Code					
Course Title	**Therapeutic Yoga**				
Course Outcomes	On the completion of the course the student will be able to CO1:To understand the Concept of Yoga and therapeutic aspect of yoga CO2: Human Anatomy and physiology CO3: Therapeutic aspect of yogasanas, pranayama, mudras and satkriyas CO4:Practice of Yogasanas, pranayama, bandas, sat karma and meditation CO5: Construct and analyze a personal health profile and develop a plan to improve one's health related behavior				
Examination Mode	Theory + Practical				
Assessment Tools	Written Quiz	ABL/PBL	MSP	ESE	ESP
Weightage	10	5	20	35	30
Syllabus					**CO Mapping**
Unit 1	Introduction to Yoga Therapy and Human body				
•	Meaning and concept of Yoga Therapy				CO1
•	Yogic Concept of Health and Disease: Concept of Adhi and Vyadhi; Meaning and definitions				CO1
•	Concepts of Trigunas, Pancha-mahabhutas, Pancha-prana and their role in Health and Healing				CO1
•	Tapatrayas and Kleshas, Physical and Physiological manifestation of Disease: Vyadhi, Alasya, Angamejayatva and Ssvasa–prashvasa				CO1
•	Meaning and concept of anatomy and physiology health				CO2
•	Basics physiology of some major systems				CO2
Unit 2	Yoga Therapy For Common Ailments				
•	Meaning, cause and symptoms of arthritis. Yogasanas, Pranayama, Satkriyas, Meditation, Mitahar, Yoga Nidra for				CO3

	Artritis Back Pain and Yoga:	
•	Meaning, cause and symptoms of Back Pain Yogasanas, Pranayama, Satkriyas, Meditation, Mitahar, Yoga Nidra and Prayer for Back Pain	
•	Meaning, cause and symptoms of Common cold, Sinusitis, Tonsillitis. Yogasanas, Pranayama, Satkriyas, Meditation, Mitahar, Yoga Nidra ,Mitahar and fasting for Common cold, Sinusitis, Tonsillitis. Constipation and Yoga:	
•	Meaning, cause and symptoms of Constipation Yogasanas, Pranayama, Satkriyas, Meditation, Mitahar, Yoga Nidra and Mitahar for Constipation.	
•	Meaning, cause and symptoms of Eye problems, Migraine, Headache. Yogasanas, Pranayama, Satkriyas, Meditation, Mitahar, Yoga Nidra for Eye problems, Migraine and Headache	
•	Meaning, cause and symptoms of High and low B.P. Yogasanas, Pranayama, Satkriyas, Meditation, Mitahar, Yoga Nidra and Karm Yoga Practice for High and low B.P.	
Unit 3	Yoga Therapy(Practical)	CO4
•	Yoga Therapy for Arthritis	
•	Yoga Therapy for Back Pain	
•	Yoga Therapy for Common cold, Sinusitis, Tonsillitis	
•	Yoga Therapy for Constipation	
•	Yoga Therapy for high B.P., low B.P.	
•	Yoga Therapy for Eye problems, Migraine, Headache	
Unit 4	**Lesson Plan and Presentation**:	
•	Each student shall have to prepare and give at least one lecture cum Demonstration on different topics of Paper and also shall have to prepare and to give Four (4) lessons in the class under the supervision of their Yoga Practical Teacher. These Lessons should be observed/examined by the Yoga Practical Teacher.	CO5
Text Book/s	1. Agarwal, Satya, P. (1998). The social role of the Gita: How and why, Motilal Banarsidass. 2. Goel Devraj & Goel Chhaya (2013) Universe of Swami Vivekananda & Complete Wholistic Cocial Development, CASE Publication under UGC SAP, The M.S University of Baroda, Vadodar 3. Nash T.N. (2006). Health and physical education. Hyderabad: Nilkamal Publishers. 4. Hedge,(1997).How to maintain good health. New Delhi : :UBPSD Publishers. 5. Tiwari,O.P.(2002).Asana: Why and how .India: Kanalyadhama. 6. Dr R Nagarathna and Dr H R Nagendra:Yoga and Health, Swami Vivekananda	

	Yoga Prakashana, 2002 7. Dr R Nagarathna and Dr H R Nagendra:Yoga for Promotion of Positive Health, Swami Vivekananda Yoga Prakashana, 2002 8. Jnananda Bharati :Essence of Yoga Vasinoha, Pub: Sanata Books, Chennai 9. Shankar,G.(1998). Holistic approach of yoga. New Delhi:Aditya Publishers. 10. Shekar,K. C. (2003). Yoga for health. Delhi: Khel Sahitya Kendra	
Reference Book/s	11. Hatha Ratnavali, Tirumala Tirupathi Devasthana, Andhra Pradesh. 12. Gheranda Samhita, Shri Sadguru Publication, New Delhi. 13. Brown, F. Y.(2000). How to use yoga. Delhi:Sports Publication. 14. Gharote, M. L. & Ganguly, H. (1988). Teaching methods for yogic practices .Lonawala: Kaixydahmoe. 15. Rajjan, S. M. (1985). Yoga strengthening of relexation for sports man. New Delhi: Allied Publishers.	

In hours			
L	**T**	**P**	**Credit**
1	0	2	2

Course Code					
Course Title	**Health and Yoga**				
Course Outcomes	On the completion of the course the student will be able to CO1: Identify current health issues and explain their influence on physical, mental, and emotional well-being. CO2: Understand the Concept of Sadvritta, Aahar and Mental Health. CO3: Understand the concept of Yoga related to health CO4: Practice of Yogasanas, pranayama, bandas, sat karma and meditation CO5: Construct and analyze a personal health profile and develop a plan to improve one's health related behavior				
Examination Mode	Theory + Practical				
	Continuous Assessment				
Assessment Tools	Quiz	ABL/PBL	MSP	ESE	ESP
Weightage	**10**	**5**	**20**	**35**	**30**
Syllabus					**CO Mapping**
Unit 1	**Health**				
•	Health: Definition, Concept, Dimensions, Spectrum and Determinants of Health.				CO1
•	Role of heredity and Genetics in Achieving Positive Health Nutrition and nutritional disease				CO1
•	Concept of Sadvritta, Aahar and Mental Health.				CO2
Unit 2	**Yoga and Health**				
•	Fundamentals of Yoga: meaning, definition, Historyand concepts (tri-shareer, chakras, panchkoshas) of Yoga.				CO3
•	Yoga Psychology: Chitta, Chitavritti, Chittbhumies and Chittaprasadhanam.				
•	Yoga Schools: Hath yoga,Janana yoga, Asataya yoga, Karma Yoga, Raja Yoga,Bhakti Yoga.				
Unit 3	**Practical** The practice of the following with brief theoretical knowledge about their importance, technique, precautions to be taken and the benefits.				CO4
•	Yogacara's: Suryanamashkar, Pawanmuktasan series- 1,2,3,Simhagarjan, Matsyendrasana, Pada- angushthasana, Dhanurasana, Matsyasana,Uttana-Mandukasana, Garudasana, Ushtrasana, Bhujangasana,Chakrasana,				

	SetubandhSarvangasana, Mayurasana, Sirshasana, Setubandhasana	
•	Pranayamas: Anulom-vilom Pranayama, Ujjai, Sheetali, Seetkari, Bhastrika&Bhramari	
•	Bandhas and Mudras: Practice ofTri-Bandhas, Ashwani, Tadagi, Kaki, Shambhavi	
•	Sat Karmas – JalNeti, Vaman, Trataka, Agnisar	
•	Meditation and Prayer: ChakralMeditation,PanchkoshaDharana.	
Unit 4	**Lesson Plan and Presentation**:	
•	Each student shall have to prepare and give at least one lecture cum Demonstration on different topics of Paper and also shall have to prepare and to give Four (4) lessons in the class under the supervision of their Yoga Practical Teacher. These Lessons should be observed/examined by the Yoga Practical Teacher.	CO5
Text Book/s	1. Agarwal, Satya, P. (1998). The social role of the Gita: How and why, MotilalBanarsidass. 2. GoelDevraj&GoelChhaya (2013) Universe of Swami Vivekananda & Complete WholisticCocial Development, CASE Publication under UGC SAP, The M.S University of Baroda, Vadodar 3. Nash T.N. (2006). Health and physical education. Hyderabad: Nilkamal Publishers. 4. Hedge,(1997).How tomaintain good health. New Delhi:UBPSD Publishers. 5. Tiwari,O.P.(2002).Asana: Why and how. India: Kanalyadhama. 6. Dr R Nagarathna and Dr H R Nagendra: Yoga and Health, Swami Vivekananda Yoga Prakashana, 2002 7. Dr R Nagarathna and Dr H R Nagendra:Yoga for Promotion of Positive Health, Swami Vivekananda Yoga Prakashana, 2002 8. JnanandaBharati: Essence of Yoga Vasinoha, Pub: Sanata Books, Chennai 9. Shankar,G.(1998). Holistic approach of yoga. New Delhi:Aditya Publishers. 10. Shekar,K. C. (2003). Yoga for health. Delhi: KhelSahitya Kendra	

In hours			
L	T	P	Credit
2	0	2	3

Course Code						
Course Title	**Data Analytics**					
Course Outcomes	On the completion of the course the student will be able to CO1: Understand the Basics of Data Analysis and Python Programming. CO2: Explain the strategies of data collection and implement quantitative and graphical techniques in Data Analysis. CO3: Understand Statistics and Visualization methods. CO4: Understand the Security and Privacy issues, and future trends in Data Science.					
Examination Mode	Theory/ Practical/ Theory + Practical					
Assessment Tools	Quiz	MSE	ETE	ETP	ABL/PBL	Total
Weightage	10	25	35	25	5	100
Syllabus						**CO Mapping**
Unit 1	***Fundamentals of Data Analytics and Python***					
•	*Introduction: Data Science and Data Analytics; Different areas using data science.*					CO1
•	*Data Categorization: NOIRClassification-Nominal scale, Ordinal scaleInterval and ratio-scale, Multidimensional DataModel.*					CO1
•	*Python Fundamentals: Introduction, Basic Numeric operations, Data types, Modules, Library*					CO1
Practical	*1. Setting up of Python Environment and interface information.*					CO1
•	*2. Importing various libraries.*					CO1
•	*3. Mathematical computing with Python.(numpy)*					CO1
Unit 2	***Data Management***					
•	*Process of Data Analytics.*					CO2
•	*EDA(Exploratory Data Analysis)and its types.*					CO2
•	*Data Mining: Feature Generation and Feature Selection, user retention, Feature Selection algorithm.*					CO2
Practical	*1. Data Manipulation with Pandas.*					CO2
	2. Prediction with scikit-learn.					CO2
Unit 3	***Statistics and DataVisualization***					
•	*Statistics: Introduction, Data Summarization-Measurement of Central Tendency (mean, mode median etc.) and Dispersion(Range, Variance and standard deviation).*					CO3
•	Data Visualization: Importance of Data Visualization, Tools and techniques for Data Visualization.					CO3
Practical	1. Implementation of central tendency and dispersion operation.					CO3
	2. Interactive Data Visualization in python.					CO3

	3. Statistical Data visualization.	CO3
Unit 4	**Security Issues and Future trends in Data Science**	
•	Ethical issues, Security and privacy issues	CO4
•	*Future generation Data Scientist*	CO4
•	*Challenges in Data Analytics*	CO4
•	*Recent Trends in Data Science and Applications of Data Science*	CO4
Text Book/s	1.V.K. Jain, Data Science and Analytics(with Python, R and SPSS Programming), Khanna Publishing 2.Joel Grus, Data Science from scratch, Shroff Publisher.	
Reference Book/s	1. Parag Kulkarni, Sarang Joshi, Meta S. Brown, Big Data Analytics, PHI Learning. 2. Anil Maheshwari, Data Analytics, McGrawHill. 3.Fabio Nelli, Python Data Analytics: Data Analysis and science using Pandas, matplotlib and the python programming language, Apress. 4. Peters Morgan, Data Analysis from scratch with Python,	

In hours			
L	T	P	Credit
0	0	4	2

Course Code				
Course Title	**Apiculture**			
Course Outcomes	On the completion of the course the student will be able to CO1: Comprehend the various species of honey bees in India, their social organization and its importance CO2: Gain thorough knowledge about the techniques involved in bee keeping and bee products such as honey, bee wax, propolis, pollen, bee venom etc. CO3: Identify enemies of honey bees and manage different bee diseases CO4: Develop entrepreneurial skills necessary for self-employment in beekeeping sector			
Examination Mode	Theory/ Practical/ Theory + Practical			
Assessment Tools	CA	MSP	ETP	Total
Weightage	20	30	50	100
Syllabus				**CO Mapping**
Unit 1	**Biology of Bees**			
•	Study of the life history of honey bees: Apisceranaindica, Apismellifera, Apisdorsata, Apisflorea, Melipona sp. from specimen/ photographs - Egg, larva, pupa, adult (queen, drone, worker).			CO1
•	Study of morphological structures of honey bees through permanent slides/photographs–mouthparts, antenna, wings, sting apparatus and temporary mount of legs (antenna cleaner, mid leg, pollen basket).			CO1
•	Study of natural beehive and identification of queen cells, drone cells and brood.			CO1
Unit 2	**Rearing of Bees**			
•	Distinguishing characters of workers of three bee species.			CO2
•	Importance of site selection for bee keeping.			CO2
•	Study of an artificial hive (Langstroth/Newton), its various parts and beekeeping equipment: draw diagrams of bee boxes proportionate to the body size and measure the body length and wing size.			CO2
•	Preparation of mount of pollen grains from flowers			CO2
Unit 3	**Diseases and Enemies**			CO3
•	Diagnosis of honeybee diseases: Protozoan diseases, Bacterial diseases, Viral diseases (one each)-symptoms, nature of damage and control.			CO3
•	Identification of honeybee enemies: Predators-Insects and non-insects.			CO3
Unit 4	**Bee Economy**			
•	Video demonstration of wax extraction and preparation of comb foundation sheets.			CO4
•	Analysis of honey – purity, physical and biochemical parameters (any two constituents).			CO4

•	Study of bee pasturage – visit to fields/gardens/orchards for studying the beeactivity (role in pollination, nectar collection, videography of honeybee activity) and preparation of herbarium of nectar and pollen yielding flowering plants (floral mapping).	CO4
Text Book/s	1.Singh, S. (1962). Beekeeping in India, Indian Council of Agricultural Research, New Delhi 2. Rahman, A. (2017). Beekeeping in India. Indian Council of Agricultural Research, New Delhi.	
Reference Book/s	1.Mishra, R.C. (1995). Honeybees and their management in India. Indian Council of Agricultural Research,New Delhi. 2. Prost, P. J. (1962). Apiculture. Oxford and IBH, New Delhi 3. Gupta, J.K. (2016). Apiculture, Indian Council of Agricultural Research, New Delhi.	

In hours			
L	**T**	**P**	**Credit**
2	0	2	3

Course Code						
Course Title	**Cyber Security**					
Course Outcomes	On the completion of the course the student will be able to CO1: understand the concept of Cyber security and issues and challenges associated with it. CO2: understand the cyber-crimes, their nature, legal remedies and as to how report the crimes through available platforms and procedures CO3: various privacy and security concerns on online Social media and understand the reporting procedure of inappropriate content, underlying legal aspects and best practices for the use of Social media platforms CO4: Understand the basic concepts related to E-Commerce and digital payments. They will become familiar with various digital payment modes and related cyber security aspects, RBI guidelines and preventive measures against digital payment frauds					
Examination Mode	Theory/ Practical/ Theory + Practical					
Assessment Tools	Quiz	MSP	ETE	ETP	ABL/PBL	Total
Weightage	10	25	25	35	5	100
Syllabus						**CO Mapping**
Unit 1	*Introduction to Cyber security*					
•	Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace					CO1
•	Communication and web technology, Internet, World wide web, Advent of internet, Internet society,					CO1
•	Concept of cyber security, Issues and challenges of cyber security.					CO1
Unit 2	*Cybercrime and Cyber law*					CO2
•	Classification of cyber-crimes, Common cyber-crimes- cyber-crime targeting computers and mobiles, financial frauds					CO2
•	Social engineering attacks ,Legal perspective of cyber-crime, IT Act 2000 and its amendments, Cyber-crime and offences					CO2
•	Organizations dealing with Cybercrime and Cyber security in India					CO2
Unit 3	*Social Media Overview and Security*					CO3

•	Introduction to Social networks. Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral content	CO3
•	Social media privacy, Challenges, Security issues related to social media, Laws regarding posting of inappropriate content.	CO3
Unit 4	*E-Commerce and Digital Payments*	CO4
•	Definition of E- Commerce, Main components of E-Commerce, Elements of E-Commerce security, E-Commerce threats,	CO4
•	Introduction to digital payments, Modes of digital payments- Banking Cards, Unified Payment Interface (UPI), e-Wallets, Aadhar enabled payments, Digital payments related common frauds and preventive measures	CO4
Text Book/s		
Reference Book/s	1. Cyber Crime Impact in the New Millennium, by R. C Mishra, Auther Press. Edition 2010. 2.Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by SumitBelapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011) 3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson , 13th November, 2001) 4. Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd. 5. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers. 6. Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt.Ltd. 7. Fundamentals of Network Security by E. Maiwald, McGraw Hill.	

In hours			
L	**T**	**P**	**Credit**
2	0	0	2

Course Code						
Course Title	**Design Thinking and Innovation**					
Course Outcomes	On the completion of the course the student will be able to CO1: Understand the concept of design thinking through engaging the students in projects/assignments. CO2:Apply the knowledge to achieve Innovation CO3: develop the essence of ideating the project and solution to the given problems. CO4: Learn About strategy canvas and entering into market with Innovations.					
Examination Mode	Theory					
Assessment Tools	Quiz	Assign.	MSE	ETE	ABL/PBL	Total
Weightage	10	10	25	50	5	100
Syllabus						**CO Mapping**
Unit 1	**The concept of Innovation and its significance in contemporary environment**					1
•	Introducing the concept of design thinking: Constituents of design thinking					1
•	Applied design thinking in business and strategy;					1
•	Analyze the organizational environment for the ideal conditions for insightful thinking					
•	Principals and tools for design Thinking					1
•	Group activity Related to issues/challenges and application of design thinking					1
Unit 2	**Planning and defining design Thinking**					
•	Understanding the concepts of Empathy, Ethnography, Divergent Thinking, Convergent Thinking					2
•	Design Process					
•	Assignment/project for students for developing a new product /service using design process					2
•	Observations and Insights' stakeholders canvas(Direct and Indirect users, influencers, facilitators).					2
•	Class Activity: Listing pain points related to project/assignment as allocated					
•	Meaning and significance of Empathy Phase					2
•	Class Activity: Making the stakeholder canvas and user journey map for the project					
•	Conceptual modeling, developing affinity diagrams using clustering of observations and drawing insights from them.					
•	Developing questions for finalizing the statements for innovative projects.					
Unit 3	**Ideating the project**					

•	Meaning and significance of ideating	3
•	Brainstorming and brain writing for the solution to the given problem;	3
•	Class Activity: brainstorming session of the students for writing the solution to given common campus problem.	
•	Idea menu/ decision matrix/co creation and other creative tools for solution to the given problem/project.	3
Unit 4	**Prototyping and Marketing**	
•	Techniques of prototyping, temporary adjustments for better output,	4
•	Creating user journey map after solving the problem. Class Activity: Students' demonstrating their projects and prototypes	4
•	Meaning and importance of strategy Canvas, types of strategies	4
•	Using strategy canvas to showcase the business strategy	4
•	Issues related to taking the product to the market.	4
•	Relation of marketing strategies with financial strategy	4
•	Class Activity: Showcasing the strategy canvas and marketing roadmap.	4
Text Book/s	1. Design Thinking for Strategic Innovation, Idris Mootee, Wiley 2014. 2. 101 Design Methods: A Structured approach for designing innovation in your Organisation. V.Kumar, Kindle edition, 2012.	
Reference Book/s	1. Design a better Business, Patrick Van der Pijl, Justin Lockitz and Liza Kay Soloman, Wiley, 2016. 2. Innovation as usual: Ho w to help your people bring Great Ideas to life. HBR Press, 2013.	

Recommended Case studies (HBSP)
1. IBM: Design Thinking
2. IVEY Case: General Mills Canada: Building a culture of Innovation
3. Design Thinking and Innovation by Apple.
4. Telenor: Revolutionizing retail Banking in Serbia

In hours			
L	T	P	Credit
0	0	4	2

Course Code				
Course Title	**Design Thinking**			
Course Outcomes	On the completion of the course the student will be able to CO1: Disseminate the philosophy of design thinking CO2: Information regarding User centric approach and problem and enhance thinking in order to inspect diverse solutions CO3: Sensitize about feasibility, desirability and viability criteria's for selection of Appropriate solution CO4: Educate about different types of prototyping			
Examination Mode	Theory			
Assessment Tools	CA	MSP	ETP	Total
Weightage	20	30	50	100
Syllabus				**CO Mapping**
Unit 1	*Human Centered Design*			
•	Introduction to Human Centered Design, Human centered Phases, Human centered Process, Human Centered Design case study			**CO1**
Unit 2	*Research Methodology (Problem Definition, Information Gathering)*			
•	Design thinking Models & Methodology- General Problem Statement, Random check list, mind mapping Categorization of random check list, Brainstorming of problem areas, Research Methodology- Information gathering-Primary, Secondary Sources, data presentation, Presentation of survey forms, Survey analysis, Drawing Inference			CO2
Unit 3	*Ideation*			
•	SWOT analysis, Vein Diagram (User Desirability, Feasibility, Viability check), Drawing inferences, Translation of inferences into design criteria, specific problem statement, Ideation, free hand sketching drawing of simple forms of products (Isometric views, layout, circuit diagram, Ideation sketches), Ergonomic and aesthetic consideration in design.			CO3
Unit 4	*Prototyping*			
•	Concept validation, evaluation, detailing, Different methods of Prototyping selection of right method of prototyping			CO4
Text Book/s	1. Emrah Yayici, Design Thinking Methodology Book, Amazon Digital Services LLC-Kdp Print Us. 2016. ISBN: 6058603757, 9786058603752			

	2. Idris Mootee. Design Thinking for Strategic Innovation, Wiley (2017), ISBN: 978-8126572694	
Reference Book/s	1. Harper Perennial, Lateral Thinking: Creativity Step by Step: Reissue edition. 2015 (Perennial Library). 2. John Chris Jones, Design Methods, John Wiley & Sons, David Fulton Publishers, London, 1980, ISBN: 0-471-28496-3 3. Nigel Cross, Design Thinking: Understanding How Designers Think and Work, Berg Publishers (May 15, 2011), ISBN-13: 978-1847886361 4. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, Published September 29th 2009 by Harper Business, ISBN: 0061766089	

In hours			
L	T	P	Credit
1	0	2	2

Course Code						
Course Title	**Digital Fluency**					
Course Outcomes	On the completion of the course the student will be able to CO1: Understand the Fundamentals of computers. CO2: Work in Word Processor effectively. CO3: Discover the arena of the Internet and its possibilities. CO4: Effectively communicate through email.					
Examination Mode	Theory + Practical					
Assessment Tools	Quiz	MSE	ETE	ETP	ABL/PBL	Total
Weightage	10	25	35	25	5	100
Syllabus						**CO Mapping**
Unit 1	**Fundamentals of Computer (08 Hours)**					CO1
•	Introduction – Objectives - Computer, Mobile/ Tablet and their application.					
•	Components of a Computer System - Central Processing Unit- Common Input & Output devices- USB ports and Pen Drive - Connecting Power cord, Keyboard, Mouse, Monitor and Printer to CPU.					
Unit 2	**Word Processor (08 Hours)**					CO2
•	Introduction – Objective -Word Processing Basic - Opening Word Processing Package - Title Bar, Menu Bar, - Toolbars & Sidebar.					
•	Creating a New Document - Opening and Closing Documents Opening Documents - Save and Save As - Closing Document.					
•	Using The Help - Page Setup – Print Preview - Printing of Documents - PDF file and Saving a Document as PDF file – Document manipulation & Formatting - Text Selection - Cut, Copy and Paste.					
•	Font, Color, Style and Size selection - Alignment of Text - Undo & Redo - Spelling & Grammar Shortcut Keys.					
Unit 3	**Internet (08 Hours)**					CO3
•	Introduction – Objectives – Internet - protocols: HTTP, HTTPS, FTP, Concept of Internet & WWW - Website Address and URL - Applications of Internet.					
•	Modes of Connecting Internet (Hotspot, Wi-Fi, LAN Cable, Broadband, USB Tethering) - Popular Web Browsers (Internet Explorer/Edge, Chrome, Mozilla Firefox.)					
•	Exploring the Internet - Surfing the web - Popular Search Engines -Searching on Internet.					
Unit 4	**E-mail (06 Hours)**					CO4

•	Introduction -Objectives - Structure - protocols: SMTP, IMAP, POP3 - Opening Email account -Mailbox: Inbox and Outbox.	
•	Creating and Sending a new E-mail - CC – BCC- Replying -Mail Merge Forwarding - attachments – Scheduling – Password Protect – Delete.	
	Skill Developments Activities: (06 Hours) ● Use word processor to prepare Resume ● Draft a covering letter using Word Processor ● Systematically draft different emails ● Prepare a Letter of Internship requisition and send email. ● Install and uninstall a Web Browser and Record the Steps Any other activities, which are relevant to the course.	
Text Book/s		
Reference Book/s	● Fundamentals of Computers, by Rajaraman V , Adabala N ● Fundamentals of Computers by Manoj Wadhwa (Author) ● Fundamentals of Computers by (V. Rajaraman) ● Learning MS-Word and MS-Excel, by Rohit Khurana ● Microsoft Word 2019 Step by Step Joan Lambert (Author) ● MICROSOFT WORD FOR BEGINNERS 2021: LEARN WORD PROCESSING SKILLS by RICHARDSTEVE	

In hours			
L	T	P	Credit
2	0	0	2

Course Code						
Course Title	**Disaster Preparedness and Planning**					
Course Outcomes	On the completion of the course the student will be able to CO1: To provide basic conceptual understanding of disasters and its relationships with development. CO2: To provide the students with good understanding in various disaster managing steps CO3:To build skills to respond to disasters and gain the knowledge of impacts of disaster on environment and society CO4:To enhance awareness of Disaster Risk Management institutional processes in India					
Examination Mode	Theory					
Assessment Tools	Quiz	MSE	ETE	ETP	ABL/PBL	Total
Weightage	10	25	35	25	5	100
Syllabus						**CO Mapping**
Unit 1	*Introduction*					
•	Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Natural disasters – Earthquake, Landslide, Flood, Drought, Cyclone etc – Manmade Disasters - Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea, Rail & Road), Structural failures(Building and Bridge), War & Terrorism etc.					CO1
•	Classification Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc. Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change - Dos and Don'ts during various types of Disasters.					CO1
•	Manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.					CO2,CO1
Unit 2	*Disaster Impacts*					
•	Disaster impacts (environmental, physical, social, ecological, economical, political, etc;					CO2,CO3
•	health, psycho-social issues; demographic aspects (gender, age, special needs)					CO2,CO3
Unit 3	*Disaster Risk Reduction*					
•	Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery					CO3
•	early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control)					CO3,CO4
•	Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk					CO3

	reduction, DRR programmes in India and the activities of National Disaster Management Authority.	
Unit 4	*Disaster Management Environment and Development*	
•	Sustainable and environmental friendly recovery; reconstruction and development methods.	CO3
Text Book/s	1.SahniPardeep, "Disaster Risk Reduction in South Asia", Prentice Hall, 2004. 2. Singh B.K., "Handbook of Disaster Management: techniques & Guidelines", Rajat Publication, 2008. 3. Ghosh G.K., " Disaster Management", APH Publishing Corporation, 2006.	
Reference Book/s	1. http://ndma.gov.in/ (Home page of National Disaster Management Authority). 2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).	

In hours			
L	**T**	**P**	**Credit**
2	0	0	2

Course Code						
Course Title	**Fundamental of Computer Programming & IT(FCPIT)**					
Course Outcomes	On the completion of the course, the student will be able to CO1: Understand basics of computer, its parts and basics of OS. CO2:Interpret the basic programming concepts & program execution CO3: Implement arrays & functions in programming CO4: Work with pointers& structures					
Examination Mode	Theory + Practical					
Assessment Tools	Quiz	MSE	ETE	ETP	ABL/ PBL	Total
Weightage	10	25	35	25	5	100
Syllabus						**CO Mapping**
Unit 1	**Introduction to Computers**					
•	Computer System, Block diagram of a Computer System and its working. Classification and generation of computers.					CO1
•	Number system, I/O devices and types of memories.					CO1
•	Computer Hardware, Software and Firmware Types of Software, Operating Systems, their types and functions. Booting and its types.					CO1
•	Computer Network: Types of network and networking devices.					CO1
Unit 2	**Introduction to Algorithms & Programming**					
•	Definition & Representation of Algorithm & Flowchart with examples.					CO2
•	Generation of programming languages					CO2
•	Basic Constructs of C: Keywords, Identifiers, Variables, Data Types and their storage, Various Operators and Expressions, External Variables and Scope of Variables,					CO2

•	Structure of C Program and stages of compilation of C program. Control Structures, Decision making statements.	CO2
Unit 3	**Arrays and Functions**	
•	Functions, Advantages of functions, Parts of function (Function prototype, declaration and definition)	CO3
•	Return statement, call by value and call by reference, recursion.	CO3
•	Arrays: Introduction to arrays, declaring & defining arrays. Storage classes: Introduction & its types.	CO3
•	Strings: definition, declaration & various string manipulation functions.	CO3
Unit 4	Pointers and Structures	
•	Introduction to Pointers, declaration of pointers and its types (Null pointer, wild pointer, dangling pointer, void pointer).	CO4
•	Introduction to Structures, declaring & defining structures, Introduction to Union, Structure vs union.	CO4
Text Books	1.Anita Goel: "Computers Fundamentals", Pearson Publications 2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill	CO1 CO2, CO3, CO4
Reference Books	1.V.K. Jain: "Fundamentals of Information Technology and Computer Programming", PHI. Latest Edition. 2.Brian Kernighan and Dennis M. Ritchie: "The C Programming language", Prentice Hall, 2nd Edition 2007. 3.Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing	CO1 CO2, CO3, CO4 CO1, CO2, CO3, CO4

In hours			
L	T	P	Credit
2	0	2	3

Course Code							
Course Title	**Essentials of Entrepreneurship, Thinking and Action**						
Course Outcomes	On the completion of the course the student will be able to CO1: Gain Knowledge about the concept of entrepreneurship, the various traits, skills and resources required to be a successful entrepreneur. CO2: Examine the legal requirements for various types of firms and its registration process CO3: Acquire knowledge of fundamentals of marketing. This will help them to formulate marketing strategy for their proposed venture. CO4: Acquire knowledge of fundamentals of finance which will help them understand the sources of finance and its utilization and exposure to fundamentals of human resource management. CO5: Apply their learning on generating viable business idea by interviewing prospective customers. CO6: Prepare the business plan on business model canvas with key partners, key resources, key activities, value proposition, customer relations, customer segments and channels.						
Examination Mode	Theory + Practical						
Assessment Tools	Written Quiz	Assignment/ Project Work	MSE	ESP	ESE	EPR	ABL/PBL
Weightage	10%	-	25%	30%	35%	-	5%
Syllabus							**CO Mapping**
Unit 1	*Fundamentals of Entrepreneurship.*						
•	Creativity and Business Ideas.						CO1
•	Business Idea to opportunity.						CO1
•	Technology Readiness Level.						CO1
•	Legal Aspects of Business.						CO2
•	Practical - Group formation and Exploring of Business Idea.						
Unit 2	*Concepts of Marketing Finance and Human Resource Management*						
•	Marketing Mix: 7 Ps of Marketing.						CO3
•	Segmentation, Targeting and Positioning.						CO3
•	Basics of Finance: Assets-Liabilities, Debt-Equity, P&L Statement- Balance Sheet and Basic Financial Ratio.						CO4
•	Fundamentals of Human Resource Management.						CO4
•	Practical – Discussion on Business Idea						
Unit 3	*Identifying Business Idea and its potentiality*						
•	Generating Business Idea.						CO5
•	Selecting a viable Business Idea.						CO5
•	Practical- Conducting Interview with prospective customers on the business idea finalized.						
Unit 4	*Preparation of Business Plan*						

•	Computing Empathy Map Testing	CO5
•	Preparation of the Business Plan using business model canvas	CO6
•	Practical – Presentation of B-Plan	CO6
Text Book/s	1. Kumar, A., Entrepreneurship: Creating and Leading an Entrepreneurial Organization, New Delhi: Pearson Education, Latest Edition.	
Reference Book/s	1. Roy, R., Entrepreneurship, New Delhi: Oxford University Press., Latest Edition. 2. Jain, P,C., Handbook for New Entrepreneurs, New Delhi: Oxford University Press., Latest Edition.	

In hours			30
L	T	P	Credit
2	0	0	2

Course Code						
Course Title	**Intellectual Property Rights**					
Course Outcomes	On the completion of the course the student will be able to CO1: To understand fundamentals of IPR and to identify the ways to protect their findings of research in form of Patent. CO2: To distinguish, explain various forms of IPRs and the significance of practice and registration procedure of Copyright and trade mark. CO3: To know about other forms of IPR like Industrial Design Right, Plant Variety Rights, Trade Dress and Trade Secret. CO4: Identify procedure to protect different forms of IPRs national and international level.					
Examination Mode	Theory/ Practical/ Theory + Practical					
Assessment Tools	Quiz	Assign.	MSE	ETE	ABL/PBL	Total
Weightage	10	10	25	50	5	100
Syllabus						**CO Mapping**
Unit 1	**Overview of Intellectual Property and Patent** Introduction and the need for intellectual property right (IPR), Theories on concept of property, Nature (territorial, monopolistic, fixed terms etc.) Public Vs. Private – Tangible Vs. Intangible, Protected v/s open source, open innovation. Patent: - Elements of Patentability: Novelty , Non Obviousness (Inventive Steps), Industrial Application - Non - Patentable Subject Matter - Registration Procedure, Rights and Duties of Patentee, Assignment and license, Restoration of lapsed Patents, Surrender and Revocation of Patents.					CO1
Unit 2	**Copyright and Trademark**					
	Nature of Copyright - Subject matter of copyright: original literary, dramatic, musical, artisticworks; cinematograph films and sound recordings - Registration Procedure, Term of protection,Ownership of copyright, Assignment and license of copyright - Infringement, Remedies & Penalties – Related Rights - Distinction between related rights and copyrights Concept of Trademarks - Different kinds of marks (brand names, logos, signatures, symbols,well known marks, certification marks and service marks) - Non Registrable Trademarks -Registration of Trademarks - Rights of holder and assignment and licensing of marks -Infringement, Remedies & Penalties - Trademarks registry and appellate board.					CO2

Unit 3	**Other forms of IP**	
	Design Design: meaning and concept of novel and original - Procedure for registration, effect ofregistration and term of protection Geographical Indication (GI) Geographical indication:meaning, and difference between GI and trademarks - Procedure for registration, effect ofregistration and term of protection **Plant Variety Protection** Plant variety protection: meaning and benefit sharing and farmers' rights – Procedure forregistration, effect of registration and term of protection Layout Design Protection Layout Design protection: meaning – Procedure for registration, effect of registration and term of Protection	CO3
Unit 4	**International and National Instruments relating to IP**	
•	World Intellectual Property Organization (WIPO) , Functions of WIPO , Membership , GATT Agreement , Major Conventions on IP , Berne Convention , Paris Convention , TRIPS agreement-PCT, The Hague Agreement, Madrid Agreement and Protocol, Budapest Treaty, other international treaties and conventions India`s New National IP Policy, 2016 – Govt. of India step towards promoting IPR – Govt. Schemes in IPR – Career Opportunities in IP - IPR in current scenario with case studies.	CO4
Text Book/s	1.World Intellectual Property Organization. (2004). WIPO Intellectual property Handbook.Retrieved from https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub _489.pdf 2.Sidney Diamond, 'Historical Development of Trademarks, (1983) 73 Trademark Representative 222.	
Reference Book/s	1.Ronan Deazley, Martin Kretschmer, Lionel Bently, Privilege and Property: Essays on the History of Copyright (Open Book Publishers 2010). 2.Benedict Atkinson and Brian Fitzgerald, A Short History of Copyright: The Genie of Information (Springer 2014). 3.Ahuja, V K. (2017). Law relating to Intellectual Property Rights. India, IN: Lexis Nexis.	

In hours			
L	T	P	Credit
1	0	4	3

Course Code								
Course Title	LATEX							
Course Outcomes	On the completion of the course the student will be able to CO1: learn LaTex and its features. CO2: learn automatic generation of contents, bibliographies and indexes. CO3: create Mathematical documents using LaTex. CO4: create beamer presentations.							
Examination Mode	Theory+ Practical							
Assessment Tools	**Quiz**	**Assignment**	**ABL/PBL**	**Lab Performance**	**MSE**	**MSP**	**ESE**	**ESP**
Weightage	**10**	**-**	**5**	**-**	**-**	**25**	**25**	**35**
Syllabus								**CO Mapping**
Unit 1	*Introduction to LaTex*							CO1
•	What is Latex, Typesetting, Fonts and Size							CO1
•	Document Class, Page Style, Page Number							CO1
•	Formatting							CO1
•	Hands on practice on above topics							CO1
Unit 2	*Bibliography*							CO2
•	Table of contents, index							CO2
•	list of figures, list of tables							CO2
•	Natbib, Bibliography							CO2
•	Hands on experience on above topics							CO2
Unit 3	*Mathematics Typesetting*							CO3
•	The basics, custom commands, operators, Symbols, Equation							CO3
•	Array, Split equation,							CO3
•	Theorems in Latex, The amsthm package etc.							CO3
•	Hands on experience on above topics							CO3
Unit 4	*Presentation*							CO4
•	Presentations in LaTex							CO4
•	Hands on experience to make presentation							CO4
Text Books	1. J. Erickson, Martin, and Donald Bindner. A Student's Guide to the Study, Practice, and Tools of Modern Mathematics. CRC Press: Boca Raton FL, 2011.Print.							
Reference Books	1. Lamport, L. A Document Preparation System User's Guide and Reference Manual. New York: Addison-Wesley, 1994.Print.							

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code							
Course Title	**Programming with FORTRAN**						
Course Outcomes	On the completion of course the students will be able to: CO1: To equip the students with the knowledge of basics of computer, algorithm Development and some of the basics of Fortran language. CO2: Students will learn about computer programming with Fortran. CO3: Students will gain information about Arrays, control structures, functions and Subprograms in Fortran.						
Examination Mode	Theory						
Assessment Tools	Written Quiz	SAP	MSE	MTP	ESE	EPR	ABL/PBL
Weightage	10%	10%	25%	-	50%	-	5%
Syllabus							**CO Mapping**
Unit 1	**Computer basics**						
	Computer basics, hardware and software, flowchart, flowchart symbols, computer languages, low level languages, high level languages, FORTRAN language, implicit, constants and variables, declaration of reals and integers, arithmetic expressions, real and integer expressions, some problems due to rounding of real numbers, mixed mode expressions, special functions.						CO1
Unit 2	**Computer programming in FORTRAN**						
	Program preparation preliminaries, Input/output statements, list directed input/output statements, PRINT statement, Control statements, relational operators, logical IF statements, nested IF statements, arithmetic IF statement, DO statement, rules to be followed in utilizing DO loops, REPEAT WHILE structure, subscripted variable, use of multiple subscripts, subscript expressions, DIMENSION statement, FORMAT description for PRINT statement, WRITE statement, multi record For Mats, Logical expressions and decision tables.						CO2
Unit 3	**Functions and subroutines in FORTRAN**						
	Functions, statement functions, function subprograms, syntax rules for function subprograms, subroutines, COMMON declaration, processing files in FORTRAN, creating a sequential file, updating a sequential file, merging two sequential files, direct access files, CHARACTER manipulations in FORTRAN, string expressions, substrings, double precision facility in FORTRAN, use of complex quantities, DATA statement, EQUIVALENCE declaration.						CO3

Reference Books	1. V Rajaramanm, Computer Programming in Fortran 77, PHI Learning Pvt. Ltd., 1997. 2. Ian D Shivers and J Sleight, Interactive Fortran 77, A hands on Approach, Ellis Horwood Ltd; 1990. 3. R.S. Salaria, A Modern Approach to Programming in Fortran, Khanna Publishing Company; 2016.	

In hours			
L	T	P	Credit
2	0	2	3

Course Code						
Course Title	**Python Programming**					
Course Outcomes	On the completion of the course the student will be able to CO1: To acquire programming skills in core Python. CO2: To acquire the skills of using operators and working with control constructs in Python. CO3: To develop the skills of using data types, designing functions & modules in Python. CO4: To acquire object-oriented programming and File handling in Python.					
Examination Mode	Theory + Practical					
Assessment Tools	Quiz	MSE	ETE	ETP	ABL/ PBL	Total
Weightage	10	25	35	25	5	100
Syllabus						**CO Mapping**
Unit 1	**Introduction to Python Language**					CO1
•	Programming language, History of Python, Origin of Python Programming, Features, Limitations, Applications, Getting and Installing Python, Python Environment Variables					
•	Python Help, Python differences from other languages.					
•	Keywords, Identifiers, Variables, Statements, Indentation, Documentation, Data Type, Type Conversion.					
•	Python Input and Output.					
Unit 2	**Operators, Expressions and Control Structures**					CO2
•	Arithmetic, Comparison, Assignment, Logical, Bitwise, and Python special operators.					
•	Expressions, Precedence and Associativity.					
•	Decision Making Statements					
•	Python Loops					
•	Python Control Statements					
Unit 3	**Python Functions and Modules**					CO3
•	Creating Functions, Advantages of Functions, Types of Functions, Built-In, User Defined Functions, Anonymous Functions,					
•	Call by Value, Call by Reference, Recursion, Designing of Modules, Importing Modules.					
Unit 4	**Python Class and Objects**					CO4
•	Designing Classes, Creating Objects, Accessing Objects, init method, constructor, garbage collection, destroying objects, inheritance and operator overloading.					

•	File creation, open() and close() methods, read() and write() methods, file modes, file encoding, file object attributes, renaming and deleting files, Python directory, directory methods and functions.	
Text Book/s	1. B. Slatkin, Effective Python, Addison Wesley Professional, 2015. 2. J. M. Zelle, Python Programming: An Introduction to Computer Science, Franklin, Beedle & Associates, Inc., 2004.	
Reference Book/s	1.M. C. Brown, The Complete Reference Python, Osborne/McGraw-Hill, 2001. 2.S. Maruch, A. Maruch, Python for Dummies, John Wiley & Sons, 2011. 3.A. B. Downey, Think Python, O'Reilly Media Inc., 2012.	

Practical Syllabus

Implementation of Python programs: Control Structures, Lists, Tuples, Strings, Dictionary, Sets, Files, Exception handling, Classes and Objects, Inheritance, Overloading, etc