22UMA102C	Mathematics for Civil Sciences-I (Integrated)	04-Credits
Hrs/Week : 3:0:2		CIE Marks:50
Total Hours: 40 Hrs		SEE Marks:50

Course Objectives: The goal of the course **Mathematics for Civil Sciences-I** is to

1) **Familiarize** the importance of calculus associated with one variable and two variables for Civil engineering.
2) **Analyze** Civil engineering problems applying Ordinary Differential Equations.
3) **Develop** the knowledge of Linear Algebra referring to matrices.

UNIT – I Calculus	10 Hrs

Introduction to polar coordinates and curvature relating to Civil engineering.

Polar coordinates, Polar curves, angle between the radius vector and the tangent, and angle between two curves. Pedal equations. Curvature and Radius of curvature (No proof) - Cartesian, Parametric, Polar and Pedal forms. Problems.

Self-study: Center and circle of curvature, evolutes and involutes.

Applications: Structural design and paths, Strength of materials, Elasticity.

(RBT Levels: L1, L2 and L3)

Web links and Video Lectures (e-Resources):

1. Introduction to Polar coordinates : Unit-I https://youtu.be/aSdaT62ndYE
2. Polar Equation to Rectangular equation https://youtu.be/flTz_pSzVFI
3. Rectangular equation to polar wquation https://youtu.be/fTBkr27r3pw
4. How to Graph polar equations https://youtu.be/jO4lwddfeDA
5. Examples on angle between radius vector and tangent https://youtu.be/_RZx377w4nc
6. Curvature https://youtu.be/EMo0vaphXpU
   https://youtu.be/ugtUGhBSeE0
   https://youtu.be/gspjhwSNMWs

UNIT – II Series Expansion and Multivariable Calculus	10 Hrs

Introduction to series expansion and partial differentiation in the field of Civil engineering applications.

Taylor's and Maclaurin's series expansion for one variable (Statement only) – problems. Indeterminate forms - L'Hospital's rule (0/0,∞/∞,∞-∞), problems. Partial differentiation, total derivative - differentiation of composite functions. Jacobian and problems. Maxima and minima for a function of two variables - Problems.

Self-study: Euler's theorem and problems. Method of Lagrange's undetermined multipliers with single constraint.

Applications: Computation of stress and strain, Errors and approximations, Estimating the critical points and extreme values.

(RBT Levels: L1, L2 and L3)

Web links and Video Lectures (e-Resources):

1. Why Taylors and Maclaurins series UNIT-II

https://youtu.be/eX1hvWxmJVE
https://youtu.be/LDBnS4c7YbA

2. Indeteminate forms

https://youtu.be/oEEXnyupzdo
https://youtu.be/Gh48aOvWcxw

3. Partial differentiation and its visualization

https://youtu.be/AXqhWeUEtQU
https://youtu.be/dfvnCHqzK54

UNIT – III Ordinary Differential Equations (ODEs) of first and Higher	10 Hrs

order	

Introduction to first and higher-order ordinary differential equations pertaining to the applications for Civil engineering.

Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations - Integrating factors on 1/□ (□□/□□ – □□/□□) □□□ 1/□ (□□/□□ – □□/□□). Orthogonal trajectories and Newton's law of cooling. Higher-order linear ODEs with constant coefficients - Inverse differential operator, method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations - Problems.

Self-Study: Applications of ODEs in Civil Engineering problems like bending of the beam, whirling of shaft. Formulation and solution of Cantilever beam. Finding the solution by the method of Undetermined coefficients.

Applications: Rate of Growth or Decay, Conduction of heat. Oscillations of a spring, Transmission lines, Highway engineering.

(RBT Levels: L1, L2 and L3)

Web links and Video Lectures (e-Resources):

1. Linear and Bernouli's equation

https://youtu.be/gd1FYn86P0c
https://youtu.be/BoI_ej-T0V4
https://youtu.be/Ez8_t8X2bAI
https://youtu.be/mcjchG4q2Yk

2. Second order DE

https://youtu.be/uI2xt8nTOlQ
https://youtu.be/AYMPeaYz0Tg?list=PLX2gX-ftPVXVQkHNzmZGsdSaZt7GExpmC
https://youtu.be/u5h0pQC9xmc?list=PLX2gX-ftPVXVQkHNzmZGsdSaZt7GExpmC
https://youtu.be/L8dAVcRC1b8?list=PLX2gX-ftPVXVQkHNzmZGsdSaZt7GExpmC
https://youtu.be/wkSjoYHatww?list=PLX2gX-ftPVXVQkHNzmZGsdSaZt7GExpmC
https://youtu.be/q2cJPho-qx0
https://youtu.be/O-9-IXO923o

3. How to solve second order DE using scilab

https://youtu.be/tOL5ErEOK90
https://youtu.be/tg_QM9b1bdA
https://youtu.be/UkZmROLRzRA

UNIT – IV Linear Algebra	10 Hrs

Introduction of linear algebra related to Civil Engineering applications.

Elementary row transformation of a matrix, Rank of a matrix. Consistency and solution of a system of linear equations - Gauss-elimination method, Gauss-Jordan method and approximate solution by Gauss-Seidel method. Eigen values and Eigenvectors, Rayleigh's power method to find the dominant Eigen value and Eigenvector.

Self-Study: Solution of a system of linear equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem.

Applications: Structural Analysis, Balancing equations.

(RBT Levels: L1, L2 and L3)

Web links and Video Lectures (e-Resources):

1. Linear Algebra : Introduction

https://youtu.be/0oGJTQCy4cQ?list=PLi5giWKc4eO1G8oX3ft8ZuLQr4Y4idgng

2. system of equations

https://youtu.be/TD069mR-AF0
https://youtu.be/EC2mgUZyzoA?list=PLi5giWKc4eO1G8oX3ft8ZuLQr4Y4idgng
https://youtu.be/AUqeb9Z3y3k?list=PLi5giWKc4eO1G8oX3ft8ZuLQr4Y4idgng
https://youtu.be/GeDEr4Px2yc
https://youtu.be/Rks9llk1w2o

3. Reduced row echelon form

https://youtu.be/ccadWg3ZwEg

https://youtu.be/L0CmbneYETs?list=PLi5giWKc4eO1G8oX3ft8ZuLQr4Y4idgng

4. Rank of a Matrix

https://youtu.be/JahgX2Bi6cQ

List of Laboratory experiments (2 hours/week per batch/ batch strength 15) 10 lab sessions + 1 repetition class + 1 Lab Assessment

1	2D Plots for Cartesian curves i. Plot of parabola $y = x^2$, $and\ y = sinx$, $y = tanx$ ii. Plot of Perfect parabola $y = x^2$ iii. Change the color (Green) of perfect color perfect parabola iv. Change the color (Red) of perfect color perfect parabola v. Draw a red color with ' - -' perfect parabola vi. Draw a red color with ' *' perfect parabola vii. Draw a red color with axes label perfect parabola viii. Draw a perfect parabola with animation ix. Draw parametric curves cycloid a. $x = a(t + sint)$, $y = a(1 + cost)$ b. x = a(t – sint); y = a (1-cost) c. x=a(t-sint); y=a(1+cost) d. x=a(t + sint), y=a(1-cost) e. x=t^2 , y=t-(t^3/3)
2	Plotting of polar i) Cardiod r = a+b cosθ ii) Cardiod r=a+bcosθ, if a>b iii) Cardiod r = a+b cosθ, if b>a iv) Draw polar petals r = 2 cos4θ v) R=2cosθ, r=2cos7θ, r=2 cos6θ, r=2cos5θ vi) Cardoid $r = a(1 + cos\theta)$ vii) Cardoid $r = a(1 - cos\theta)$ viii) Draw histogram curves
3	i)Plot 3-d Surface $z = x^2 + y^2$ ii) Plot 3-d color Surface $z = x^2 + y^2$ iii) Plot 3-d Surface $z = x^4 + y^4$ iv) Plot 3-d Surface $z = sintcost$
4	i) To calculate volume of a sphere ii)To Evaluate $\int_0^5 xdx$ and $\int_0^5 sinxdx$
5	i)Solve first order o.d.e.$\frac{dy}{dx} = e^{-x}$, $x = 0$, $y = 0$ ii) Solve first order o.d.e.$\frac{dy}{dx} + e^{-x}y = x^2$, $x = 0$, $y = 0$ Note: Change the initial conditions and observe the graph

6	i)Solve $2y'' - 5y' + y = 0\ , y(3) = 6, y'(3) = 1.$ ii)Solve $y'' + 3y' - 10y = 0\ , y(0) = 1, y'(0) = 3$

Suggested Learning Resources:

- Maurice D weir, Joel Hass and Frank R. Giordano, "Thomas calculus", Pearson, eleventh edition, 2011
- B.S. Grewal : Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
- B. V. Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
- Erwin Kreyszing's Advanced Engineering Mathematics volume1 and volume1I,wiley India Pvt.Ltd.,2014
- **N.P Bali and Manish Goyal**: "A textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
- **C. Ray Wylie, Louis C. Barrett:** "Advanced Engineering Mathematics" McGraw – Hill Book Co., Newyork, 6th Ed., 2017.
- **Gupta C.B, Sing S.R and Mukesh Kumar:** "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education (India) Pvt. Ltd 2015.
- **H. K. Dass and Er. Rajnish Verma:** "Higher Engineering Mathematics" S. Chand Publication, 3rd Ed., 2014.
- **James Stewart: "**Calculus" Cengage Publications, 7th Ed., 2019.
- **David C Lay:** "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
- **Gareth Williams:** "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.

Course Outcomes: At the end of the course the student will be able to:
CO1: Apply the knowledge of calculus to solve problems related to polar curves.
CO2: Learn the notion of partial differentiation to compute rate of change of multivariate functions.
CO3: Analyze the solution of ordinary differential equations.
CO4: Make use of matrix theory for solving for system of linear equations and compute Eigen values and eigenvectors.

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	2	0	0	0	0	0	0	0	0	0	0
CO2	3	2	0	0	0	0	0	0	0	0	0	0
CO3	3	2	0	0	0	0	0	0	0	0	0	0
CO4	3	2	0	0	0	0	0	0	0	0	0	0
CO5	3	2	0	0	0	0	0	0	0	0	0	0
CO6	3	2	0	0	0	0	0	0	0	0	0	0

22UPH106C	Physics For Civil Sciences (Integrated)	04-Credits
Hrs/Week : (3:0:2)		CIE Marks:50
Total Hours: 60 Hrs (40L+20 P)		SEE Marks:50

Course Objectives:

1. To study the properties, generation & engineering applications of types of oscillations & shockwaves.
2. To study the basics of Laser and optical fiber and their engineering applications.
3. To identify the importance of acoustics, radiometry and photometry for engineering applications.
4. To study the Elastic properties of materials and failures of engineering materials.
5. To understand the various natural disaster and safety.

UNIT - I	10 Hrs

Oscillations: Simple Harmonic motion (SHM), the differential equation for SHM(no derivation), Sprigs:Stiffness Factor and its Physical Significance, series and parallel combination of springs(Derivation), Types of spring and their applications. Theory of damped oscillations (Qualitative), Types of damping (Graphical Approach). Engineering applications of damped oscillations, Theory of forced oscillations(Qualitative), resonance, sharpness of resonance. Numerical problems.

Laser: Introduction, absorption, spontaneous emission and stimulated emission, **Einstein's coefficients (expression for energy density).** Conditions for laser action, requisites of a laser system, working mechanism. Characteristics of a laser. Classification of lasers, Semiconductor laser, Laser Range Finder, LIDAR, Road Profiling, Bridge Deflection, Speed Checker. Numerical Problems.

Pre-requisites: Basics of Oscillations, Properties of light

Self-learning: Simple Harmonic motion, differential equation for SHM

UNIT – II	10 Hrs

Optical fibers: Principle and Construction of optical fibers, Acceptance angle and numerical aperture(NA), Expression for NA, Modes of Propagation, Attenuation and Fiber Losses, Fiber Optic Displacement Sensor, Fiber Optic Temperature Sensor,

Numerical problems

Acoustics: Introduction to acoustics, Types of Acoustics, reverberation and reverberation time, absorption power and absorption coefficient, Requisites for acoustics in auditorium, Sabine's formula (derivation), measurement of absorption coefficient, factors affecting the acoustics and remedial measures, Noise and its Measurements, Sound Insulation and its measurements. Impact of Noise in Multi-storied buildings.

Pre-requisites: Basics of Sound,

Self-learning: Introduction to acoustics, Propagation Mechanism &TIR in optical fiber

UNIT - III	10 Hrs

Elasticity: Stress-Strain Curve, Stress hardening and softening. Elastic Moduli, Poisson's ratio, Relation between Y, n and σ (with derivation), mention relation between K, Y and σ, limiting values of Poisson's ratio., Single Cantilever (derivation) and their Engineering Applications, Elastic materials (qualitative). Failures of engineering materials - Ductile fracture, Brittle fracture, Stress concentration, Fatigue and factors affecting fatigue (only qualitative explanation), Numerical problems.

Radiometry and Photometry: Radiation Quantities, Spectral Quantities, Relation between luminance and Radiant quantities, Reflectance and Transmittance, Photometry (cosine law and inverse square law).

Pre-requisites:Elasticity, Stress & Strain,

Self-learning: Stress-Strain Curve

UNIT - IV	10 Hrs

Shock waves: Mach number and Mach Angle, Mach Regimes, definition and characteristics of Shock waves, Construction and working of Reddy shock tube, Applications of Shock Waves,Numerical problems.

Natural hazards and Safety: Introduction, Earthquake, (general characteristics, Physics of earthquake, Richter scale of measurement and earthquake resistant measures), Tsunami (causes for tsunami,

characteristics, adverse effects, risk reduction measures, engineering structures to withstand tsunami), Landslide (causes such as excess rainfall, geological structure, human excavation etc, types of landslide, adverse effects, engineering solution for landslides). Forest Fires and detection using remote sensing. Fire hazards and fire protection, fire-proofing materials, fire safety regulations and firefighting equipment - Prevention and safety measures. Numerical problems.

Pre-requisite: Oscillations

Self-learning: Richter scale

Suggested Learning Resources:

Reference books:

1. Materials Science and Engineering by R Balasubramaniam, second edition, Wiley India Pvt. Ltd. Ansari Road, Daryaganj, NewDelhi-110002.
2. A textbook of Engineering Physics by M .N. Avadhanulu, P G. Kshirsagar and T V S Arun Murthy, Eleventh edition, S Chand and Company Ltd. NewDelhi-110055.
3. Engineering Physics by R. K. Gaur and S. L. Gupta, 2010 edition, Dhanpat Rai Publications Ltd., NewDelhi-110002,
4. Lasers and Non-Linear Optics, B. B. Loud, New Age Internationals, 2011edition
5. LASERS Principles, Types and Applications by K.R. Nambiar-New Age International Publishers
6. Building Acoustics: Tor Eric Vigran, Taylor and Francis, 2008 Edition.
7. Photometry Radiometry and Measurements of Optical Losses, Micheal Bukshtab, Springer, 2nd edition.
8. Shock waves made simple by Chintoo S Kumar, K Takayama and K P J Reddy: Willey India Pvt. Ltd, Delhi 2014.
9. Natural Hazards, Edward Bryant, Cambridge University Press, 2nd Edition
10. Natural hazards, Earthquakes, Volcanoes, and landslides by Ramesh P Singh, and Darius Bartlett, CRC Press, Taylor and Francis group.

Web links and Video Lectures (e-Resources):

Web links:

1. Simple Harmonic motion:https://www.youtube.com/watch?v=k2FvSzWeVxQ
2. Shock waves:https://physics.info/shock/
3. Shock waves and its applications:https://www.youtube.com/watch?v=tz_3M3v3kxk
4. Stress-strain curves:https://web.mit.edu/course/3/3.11/www/modules/ss.pdf
5. Stress curves:https://www.youtube.com/watch?v=f08Y39UiC-o
6. Oscillations and waves :https://openstax.org › books › college-physics-2e
7. Earthquakes:www.asc-india.org
8. Earthquakes and Hazards:http://quake.usgs.gov/tsunami
9. Landslide hazards:http://landslides.usgs.gov
10. Acoustics:https://www.youtube.com/watch?v=fHBPvMDFyO8
11. Activity Based Learning (Suggested Activities in Class)/ Practical Based Learning http://nptel.ac.in https://swayam.govin

12. https://virtuallabs.merlot.org/vl_physics.htmlhttps://phet.colorado.eduhttps://www.myphysicslab.com

Laboratory Component:

Any Ten Experiments have to be completed from the list of experiments

List of Experiments:

1. Determination of effective spring constant of the given springs in series and parallel combination
2. Study of forced mechanical oscillations and resonance.
3. The study of frequency response in series and parallel LCR circuits.
4. Identification of passive components and estimation of their values in a given black Box
5. Characteristics of a Laser using diffraction grating
6. Determination of acceptance angle and numerical aperture of the given optical Fiber
7. Determination of rigidity modulus of a wire by torsional pendulum method
8. Determination of Young's modulus of a metal strip by single cantilever method.
9. Determination of Young's modulus of a material of the given bar by uniform bending
10. Determination of Fermi energy for a conductor.
11. Determination of resistivity by four probe method
12. Determination of Planck's constant using LEDs.
13. Determination of dielectric constant by RC charging and discharging method
14. Measurement of velocity of ultrasonic waves in a liquid using ultrasonic interferometer.
15. Determination of viscosity of castor oil by Stokes method
16. Determination of radius of curvature of the given plano convex lens by setting Newton's Rings
17. Step interactive physics simulations
18. Study of motion using spread Sheets
19. Application of Statistics using Spread Sheet
20. PHET Interactive Simulations

(https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype)

Course out comes:

At the end of the course the student will be able to :

1) Apply concepts of oscillations and analize suitability of Lasers for Engineering applications
2) Analize the suitability of optical fiber and concepts of acoustics for engineering applications
3) Apply the concepts of elasticity, radiometry and photometry for engineering applications
4) Apply concepts of shockwaves , natural hazards and safety precautions for engineering applications.

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	2										
CO2	3	2										
CO3	3	2										
CO4	3	2										

22UCV117C	**Engineering Mechanics**	**03-Credits**
Hrs/Week: 3:0:0		**CIE Marks:**50

Total Hours: 40 Hrs (40 T)		**SEE Marks:**50

Course Objectives:

Develop students' ability

1. To analyse the problems involving concurrent forces.
2. To analyse moment and support reactions of rigid bodies.
3. To analyse the trusses for member forces.
4. To make students to learn the effect of friction on different planes.
5. To find out the centre of gravity and moment of inertia.

UNIT - I	**10 Hrs**

Introduction to Engineering Mechanics: Particle, continuum, rigid body, laws of motion, law of parallelogram of forces, polygon law of forces, classification of force system, resolution and composition of forces, principle of transmissibility of force. Resultant of co-planar concurrent force system. Lami's theorem, equilibrium of a particle, Numerical problems.

Forces in Space: Resultant of non-coplanar concurrent forces. Equilibrium of non-coplanar concurrent forces. Numerical Problems.

UNIT – II	**10 Hrs**

Moment and Couple: Definition of moment, moment of a couple, characteristics of a couple, equivalent force and couple system, Varignon's principle, resultant of coplanar non concurrent force system. Numerical problems.

Support Reaction: Types of beams, loads and supports. Support reaction of statically determinate beams subjected to various loads. Numerical problems.

UNIT - III	**10 Hrs**

Analysis of Trusses: Introduction, classification of trusses, analysis of plane perfect trusses by themethod of joints and method of sections. Numerical examples.

Friction: Introduction, laws of Coulomb friction, equilibrium of blocks on horizontal plane & inclined plane and ladder friction. Numerical examples.

UNIT - IV	**10 Hrs**

Centroid of Plane areas: Introduction, locating the centroid of rectangle, triangle, circle, semicircle and quarter circle using method of integration and centroid of composite sections. Numerical examples.

Moment of Inertia of Plane areas: Introduction, moment of inertia, polar moment of inertia, radius of gyration, parallel and perpendicular axis theorem, moment of inertia of rectangle, triangle, circle, semicircle and quarter circle using method of integration. Moment of inertia of composite sections. Numerical examples.

Reference books:

1. Beer F.P. and Johnston E. R., *Mechanics for Engineers*, Statics, 2011, McGraw Hill Publications.
2. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, *Basic Civil Engineering and Engineering Mechanics*, 2015, Laxmi Publications.
3. Kolhapure B. K., *Elements of Civil Engineering and Engineering Mechanics*, 2014, EBPB
4. Singer F.L., "*Engineering Mechanics statics and dynamics*" 3rd Edition, Horper and International New York, 1975.
5. Irving H. Shames, *Engineering Mechanics*, 2019, Prentice-Hall.
6. Hibbler R. C., *Engineering Mechanics: Principles of Statics and Dynamics*, 2017, Pearson Press.

7. Timoshenko S., Young D. H., Rao J. V., *Engineering Mechanics*, 5th Edition, 2017, Pearson Press.
8. Bhavikatti S. S., *Engineering Mechanics*, 2019, New Age International.
9. Reddy Vijaykumar K. and Suresh Kumar K., *Engineering Mechanics*, 2011, BS publication

Course Outcomes:

CO1: Analyse the resultant and equilibrium of concurrent forces.
CO2: Comprehend the action for forces, moments and other types of loads on rigid bodies and compute the reactive forces.
CO3: Analyse the frictional resistance offered by different planes.
CO4: Locate the centroid and compute the moment of inertia of plane areas.

Course Outcomes	Programme Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	3										
CO2	2	3										
CO3	2	3										
CO4	2	3										

22UME122N	Introduction To Mechanical Engineering	03
Hrs./Week: **2 :2: 0**		CIEMarks:50
Total Hours: 40		SEEMarks:50

UNIT-I	10Hrs.

Introduction: Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Energy: Introduction and applications of Energy sources like Fossil fuels, Nuclear fuels, Hydel, Solar, wind, and bio-fuels, Environmental issues like Global warming and Ozone depletion

Engineering Materials: Types and applications of Ferrous & Nonferrous Metals, silica, ceramics, glass, graphite, diamond and polymer. Shape Memory Alloys.

UNIT–II	**10Hrs.**

Machine Tool Operations:

Working Principle of lathe, Lathe operations: Turning, facing, knurling. Working principles of Drilling Machine, drilling operations: drilling, boring, reaming. Working of Milling Machine, Milling operations: plane milling and slot milling.

(No sketches of machine tools, sketches to be used only for explaining the operations).

Introduction to Advanced Manufacturing Systems: Introduction, components of CNC, advantages and applications of CNC, 3D printing.

Joining Processes: Soldering, Brazing and Welding, Definitions, classification of welding process, Arc welding, Gas welding and types of flames.

UNIT–III	**10 Hrs.**

Introduction to IC Engines: Components and Working Principles, 4-Strokes Petrol and Diesel Engines,Application of IC Engines.

Insight into Future Mobility; Electric and Hybrid Vehicles, Components of Electric and HybridVehicles. Advantages and disadvantages of EVs and Hybrid vehicles.

UNIT–IV	**10Hrs.**

Introduction to Mechatronics and Robotics: open-loop and closed-loop mechatronic systems. Classification based on robotics configuration: polar cylindrical, Cartesian coordinate and spherical. Application, Advantages and disadvantages.

Automation in industry: Definition, types – Fixed, programmable and flexible automation, basic elements with block diagrams, advantages

Introduction to IOT: Definition and Characteristics, Physical design, protocols, Logical design of IoT, Functional blocks, and communication models.

Reference Books:

1. Elements of Workshop Technology (Vol. 1 and 2), Hazra Choudhry and Nirzar Roy, Media Promoters and Publishers Pvt. Ltd., 2010.
2. Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill 3rd Ed., 2003.
3. Internal Combustion Engines, V. Ganesan, Tata McGraw Hill Education; 4th edition, 2017
4. Robotics, AppuKuttan KK K. International Pvt Ltd, volume 1
5. Dr SRN Reddy, RachitThukral and Manasi Mishra, " Introduction to Internet of Things: A Practical Approach", ETI Labs
6. Raj kamal, "Internet of Things: Architecture and Design", McGraw hill.
7. Elements of Mechanical Engineering, K R Gopala Krishna, Subhash Publications, 2008
8. An Introduction to Mechanical Engineering, Jonathan Wickert and Kemper Lewis, Third Edition, 2012

Course Outcomes:

CO1: Explain the role of Mechanical Engineering w.r.t the emerging trends and technologies in various sectors, knowledge of various sources of energy and engineering materials

CO2: Describe different conventional, advanced manufacturing systems and various metal joining processes

CO3: Compute and analyze the performance of IC engines used in automobiles and concept of electric and hybrid vehicles for future mobility

CO4: Enlighten about the fundamentals of Mechatronics, Robotics, Automation in industry and IOT

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	2					1	1				1
CO2	2	2			1	1	1					1
CO3	2	1			1	1						1
CO4	2	1			1	1		1	1			1

22UEE116E	**Introduction to Electrical Engineering**	**03-Credits**
Hrs/Week: 3:0:0		**CIE Marks:**50
Total Hours: 40 Hrs (40 T+00 P)		**SEE Marks:**50

Course Objectives:

1 To study the basics of DC, single phase & three phase circuits and electrical earthing

2 To Illustrate the laws of DC circuit, concepts of single phase & three phase AC circuits, domestic wiring practices and electricity generation principles, construction-working principle-applications of electrical machines & transformers
3 To apply circuit laws and concepts to calculate different parameters of DC circuits, single phase & three phase AC circuits
4 To evaluate the emf induced in generators & transformers under given conditions and assess energy consumption in domestic loads

UNIT – I	**10 Hrs**
Introduction: General structure of electrical power systems using single line diagram approach. **Power Generation:** Hydel, thermal, nuclear power plants (block diagram approach). **DC Circuits:** Ohm's law and its limitations, KCL & KVL, series, parallel, series-parallel circuits. Simple Numerical.	
UNIT – II	**10 Hrs**
AC. Fundamentals: Equation of AC voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor (only definitions), voltage and current relationship with phasor diagrams in R, L, and C circuits, concept of impedance, analysis of R-L, R-C, R-L-C series circuits, active power, reactive power and apparent power, concept of power factor. (Simple Numerical). **Three Phase Circuits:** Generation of three phase AC quantity, advantages and limitations, star and delta connection, relationship between line and phase quantities (excluding proof)	
UNIT - III	**10 Hrs**
DC Generator, DC Motor, Transformers: Working principle, construction, equations, types and classifications, specifications, applications, cost. Simple numerical.	
UNIT - IV	**10 Hrs**
Domestic Wiring: Requirements, Types of wiring, Two way and three way control of loads. **Electrical Energy Calculation:** Power rating of household appliances, two-part electricity tariff, calculation of electricity bill for domestic consumers. **Electrical Safety Measures:** Equipment: Types of equipment, voltage and current issues, safety. Human: Electric shock, effect of shock on body, factors affecting severity of shock, safety precautions.	
Reference books: 1. B.L Theraja, "Fundamentals of Electrical Engineering and Electronics", S. Chand Publications, 27th Edition, 2014 2. D C Kulshreshtha, "Basic Electrical Engineering", Tata McGraw Hill, 10th Edition, 2019. 3. Edward Hughes, "Electrical and Electronic Technology", Pearson Publications, 10th Edition, 2010 4. Rajendra Prasad, "Fundamentals of Electrical Engineering", 2nd Edition, PHI Learning, 2009 5. V.N.Mittle&A.Mittal, "Basic Electrical Engineering", Tata McGraw-Hill Education, 2005 6. S. K. Bhattacharya, "Basic Electrical and Electronics Engineering", 2nd Edition, Pearson Publications, 2017	
Course Outcomes: **CO1:** Recall basics of DC, single phase & three phase circuits and electrical earthing **CO2:** Illustrate the laws of DC circuit, concepts of single phase & three phase AC circuits, domestic wiring practices and electricity generation principles, construction-working principle-applications of electrical machines & transformers **CO3:** Apply circuit laws and concepts to calculate different parameters of DC circuits, single phase & three phase AC circuits **CO4:** Evaluate the emf induced in generators & transformers under given conditions and assess	

energy consumption in domestic loads

Course Outcomes	Programme Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	1	1			1	1	1		1		1
CO2	3	1	1	1		1	1	1		1		1
CO3	3	2	3	1								1
CO4	3	3	3	2								1

22UEC114N	Introduction to Electronics Engineering	03-Credits
Hrs/Week: 3:0:0		CIE Marks:50
Total Hours: 40		SEE Marks:50

Course Objectives:

1) Understand the operation of semiconductor devices and their applications.
2) Know transistor (BJT) as an amplifier.
3) Study Op-Amps and its applications.
4) Know logic circuits and their optimization.
5) Understand the principles of transducers and communication systems.

UNIT - I	10 Hrs

Power Supplies –Block diagram, PN Junction Diode Characteristics, Half-wave rectifier, Full-wave rectifiers and filters, Voltage regulators, Output resistance and voltage regulation, Voltage multipliers.

BJT Characteristics and Biasing- Common Base and Common Emitter Configurations, Voltage Divider Biasing.

Self study component: Switched Mode Power Supply.

UNIT – II	**10 Hrs**

Amplifier and Oscillators – Single Stage CE Amplifier, Barkhausen criterion, sinusoidal and non-sinusoidal oscillators, Ladder network oscillator, Wein bridge oscillator, Multivibrators, Single-stage astable oscillator, Crystal controlled oscillators (Only Concepts, working, and waveforms. No mathematical derivations)

Operational amplifiers - Ideal op-amp; characteristics of ideal and practical op-amp; Practical op- amp circuits: Inverting and non-inverting amplifiers, voltage follower, summer, integrator, differentiator.(Text 1)

Self study component: Op-Amp as zero crossing detector

UNIT - III	**10 Hrs**

Boolean Algebra and Logic Circuits: Binary numbers, Number Base Conversion, octal & Hexa Decimal Numbers, Complements, Basic definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates

Combinational logic: Introduction, Design procedure, Adders- Half adder, Full adder, Parallel Adder

Self study component: Half subtractor and full subtractor

UNIT - IV	**10 Hrs**

Analog Communication Schemes – Modern communication system scheme, Information source, and input transducer, Transmitter, Channel or Medium – Hardwired and Soft wired, Noise, Receiver, Multiplexing, Types of communication systems. Types of modulation (only concepts) – AM , FM.

Digital Modulation Schemes: Advantages of digital communication over analog communication, ASK, FSK, PSK, Radio signal transmission Multiple access techniques.

Sensors and Interfacing – Instrumentation and control systems, Transducers, Sensors.

Self study component: Opto-couplers

Reference books:

1) Mike Tooley, 'Electronic Circuits, Fundamentals & Applications', 4th Edition, Elsevier, 2015.

2) Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203- 0417-84.

3) D P Kothari, I J Nagrath, 'Basic Electronics', 2nd edition, McGraw Hill Education (India),Private Limited, 2018

Course Outcomes:

A student who successfully completes this course should be able to

CO1: Differentiate semiconductor devices and their parameters based on V-I characteristics.

CO2: Analyze the applications of electronic devices and circuits.

CO3: Analyze logic circuits built with basic gates.

CO4: Solve numerical problems related to basic electronic circuits and systems.

CO5: Decide type of transducer, sensor and modulation for a given application.

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

CO1	3	3	2	-	2	2	-	-	-	-	-	-
CO2	3	2	3	-	2	1	-	-	-	-	-	-
CO3	3	2	3	-	3	-	-	-	1	-	-	-
CO4	2	1	1	-	2	1	-	-	1	-	-	1
CO5	2	1	1	-	2	1	-	-	1	-	-	1

22UCS120N	**Introduction to C Programming (Integrated)**	**03-Credits**
Hrs/Week: 2:0:2		**CIE Marks:**50
Total Hours: 40 Hrs (28 T+24 P)		**SEE Marks:**50

Course Objectives:

1 Explain the basic architecture and functionalities of a Computer
2 Apply programming constructs of C language to solve the real-world problems
3 Explore user-defined data structures like arrays and structures in implementing solutions to problems
4 Design and Develop Solutions to problems using structured programming constructs such as functions and procedures

UNIT – I	**08 Hrs**
Basic Organization of a Computer, Steps in problem solving, Algorithms and Flowcharts with examples. **Overview of C:** Features of C, Structure of C program, process of compiling and executing the C program.	

C**onstants, Variables and Data types:** Introduction, Character set, C tokens, Keywords and Identifiers, Constants, Variables, Data types, Declaration of variables, Example programs.
Operators and Expressions: Arithmetic operators, Relational operators, Logical operators, Assignment operators, Increment and Decrement operators, Conditional operator, Bitwise operators, Special operators, Arithmetic expressions, Evaluation of expressions, Precedence of arithmetic operators, Type conversion in expressions, Operator precedence and Associativity.

UNIT – II	**06 Hrs**

Managing Input and Output Operations: Formatted and Unformatted input and output statements.
Decision making and Branching: Decision making with *if*, *if-else*, Nesting of *if-else* statements, *else-if* ladders, *switch* statement, ?: Operator, *goto* statement.
Decision making and Looping: *while* statement, *do-while* statement, *for* statement, jumps in loops.

UNIT – III	**06 Hrs**

Arrays: Introduction, One dimensional arrays, declaration and initialization of one-dimensional arrays, Two dimensional arrays, declaration and initialization of two-dimensional arrays. Operations on arrays.
Strings: Introduction, Declaring and initializing string variables, String-handling functions, Array of String.

UNIT – IV	**08 Hrs**

User defined functions: Introduction, Need for user-defined functions, a multi-function program, Elements of user defined function, Definition of functions, Return values and their types, Function calls, Function declaration. Category of functions: Based on call by value, call by reference, argument and return type and recursion.
Structures and Unions: Defining a structure, Declaring structure variables, Accessing structure members, Initialization, Arrays of structure, Structures and Functions.

Reference books:

1. E. Balaguruswamy, Programming in ANSI C**,** 7th Edition, Tata McGraw Hill Publications, 2017.
2. Reema Thareja, Computer fundamentals and programming in c, Oxford University, Second edition, 2017.
3. Kernighan and Ritchie, C Programming Language, 2nd Edition, 1988, 49th Reprint, 2017
4. Wesley J. Chun, A Structured Programming approach using C, Pearson Education India, 3rd Edition, 2015.
5. Stephen Kochan, Programming in C, 4th Edition, 2014
6. B. S. Anami, S. A. Angadi & S. S. Manvi, Computer Concepts and C programming-A Holistic approach to learning C, 2nd Edition, PHI, 2010

Course Outcomes:

CO1. Explain the basic architecture and functionalities of a computer and also recognize the hardware parts.
CO 2. Apply programming constructs of C language to solve the real world problem.
CO 3. Explore user-defined data structures like arrays in implementing solutions to problems like searching, sorting and tabular data processing.
CO 4. Explore user-defined data structures like structures in implementing solutions like heterogeneous data processing.
CO5. Design and Develop Solutions to problems using modular programming constructs using functions.

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	2			2							
CO2		1			2							2

CO3		1										2
CO4		2										2
CO5		3	3	2								2

22UEC134B	**Introduction to Embedded System**	**03-Credits**
Hrs/Week: 3:0:0		**CIE Marks:**50
Total Hours: 40		**SEE Marks:**50

Course Objectives:

1. To provide knowledge of embedded systems, applications, purpose and processor architectures.
2. To provide background knowledge of communication interfaces, characteristics and quality attributes of embedded systems.
3. To study general purpose processors software and processor peripherals.
4. To impart knowledge of 8051 Microcontroller, features and its applications.

UNIT - I	**10 Hrs**
Introduction to embedded systems, Embedded system vs. general computing system, Classifications, Purpose of embedded system, Major application areas. The typical embedded system, Microcontrollers, Microprocessors, RISC, CISC, Harvard and Von-Neumann, Big Endian, Little Endian processors.	
UNIT – II	**10 Hrs**
Memory, Sensors, Actuators, Communication interface: Inter Integrated Interface, Serial Peripheral interface, UART, Parallel interface, RS232 and Bluetooth. Characteristics and quality attributes of embedded systems.	
UNIT - III	**10 Hrs**

General purpose processors software: Introduction, Basic architecture, Operation, Instruction set, program and data memory space, registers, I/O, interrupts, Operating System, ASIP's, Microcontrollers, DSP, Selecting Microprocessor.

Standard Single Purpose Processors peripherals: Introduction, Timers, Counters and watch dog timers, UART.

UNIT - IV	**10 Hrs**

8051 Microcontroller: Introduction, Features of 8051 Microcontroller, Block diagram, ALU, PC, ROM, RAM, Address line, Data line, Special function registers, RAM organization, Stack, Basics of Serial Communication, Interrupts, Timers and counters, Input output ports, simple pseudo code.

Reference books:

1) Shibu K V, "Introduction to embedded systems", Tata McGraw Hill private limited, 2010.

2) Frank Vahid, Tony Givargis, "Embedded system design: A unified hardware/software introduction", John Wiley and Sons, 2001.

3) Kenneth J Ayala, "The 8051 Microcontroller, Architecture programming and applications", West publishing company, college and school division, 1997.

4) Rajkamal, "Embedded systems: architecture, programming and design", Tata McGraw Hill private limited, second edition.

Course Outcomes:

A student who successfully completes this course should be able to

CO1: Gain comprehensive knowledge about embedded systems, major application area of embedded systems and processor architectures.

CO2: Analyze communication interfaces, characteristics and quality attributes of embedded systems.

CO3: Identify general purpose processors software and processor peripherals necessary for embedded systems.

CO4: Explore 8051 Microcontroller capabilities and able to write pseudo codes.

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	**3**	**1**	**1**	**-**	**1**	**1**	**1**	**1**	**1**	**1**	**-**	**1**
CO2	**3**	**2**	**2**	**-**	**1**	**1**	**1**	**1**	**1**	**2**	**-**	**1**
CO3	**3**	**2**	**2**	**-**	**1**	**2**	**1**	**1**	**2**	**1**	**-**	**2**
CO4	**3**	**2**	**2**	**-**	**1**	**2**	**1**	**1**	**2**	**1**	**-**	**2**

22UEC135B	Introduction to Communication Technology	03-Credits
Hrs/Week: 3:0:0		**CIE Marks:**50
Total Hours: 40		**SEE Marks:**50

Course Objectives:

The objectives of the course are to

1. Know the fundamentals of different communication systems.
2. Understand modern communication techniques and their utility in modern cellular communication systems.
3. Know the design principles of cellular communication systems.
4. Understand the different communication standards.

UNIT – I	10 Hrs
Introduction to communication systems: Elements of communication systems, Need for modulation, Electromagnetic spectrum and applications, Terminologies in communication systems **Introduction to wireless .communication systems:** Evolution of mobile radio communication, Beginning of Radio, Wireless mobile communication, Applications of wireless communication, Disadvantages of wireless communication systems, Examples of wireless communication systems, Difference between fixed telephone network and wireless telephone network, Development of wireless communication, Fixed network transmission hierarchy, Comparison of wireless communication systems	
UNIT – II	**10 Hrs**
Modern communication systems: Introduction, First generation (1G), Second generation (2G), Generation (2.5G), Third generation (3G), Evolution from 2G to 3Gt, Fourth generation (4G), Digital cellular parameters, Differences between analog cellular and digital cellular systems,	

wireless local loop (WLL), wireless local area networks (WLANs), Personal Area Networks (PANs), Bluetooth

Introduction to cellular mobile systems: Introduction, Spectrum allocation, International telecommunication union (ITU), Wireless communication system, Basic components of cellular systems, Cellular system architecture, GSM: Most popular cellular system, type of channels, Cell concept in wireless communication, shape selection of the cell

UNIT – III	**10 Hrs**

Cellular system design fundamentals: Introduction, Frequency reuse, Cellular capacity increasing parameters, channel assignment strategies, Hand-off strategies, Hands-off Initiation, Type of hands-off on the basis of decision making process, channel assignment strategies for hands-off, Interference, Tracking, Trunking, Grade of service

UNIT – IV	**10 Hrs**

Multiple access techniques for wireless communication: Introduction, Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Advanced TDMA, Multipath interference, Comparison between TDMA & FDMA, Space Division Multiple Access (SDMA), Spread spectrum, types of spread spectrum, Code Division Multiple Access (CDMA)

Radio wave propagation: Introduction, Doppler shift, parameters of multipath channels, fading, diversity techniques, free space propagation model, Phenomenon of propagation, Propagation models

Reference books:

1) George Kennedy, Bernard Davis, S R M Prasanna, "Electronic Communication Systems", Tata McGraw Hill Education Private Limited, New Delhi, 5th Edition

2).Rajeshwar Dass, "Wireless Communication Systems", I. K. international Publishing House Pvt. Ltd., New Delhi

Course Outcomes:

After completion of this course the students are able to

CO1: Analyze different communication systems with respect to operation and utility.

CO2: Choose suitable modulation technique for cellular mobile systems.

CO3: Decide specific channel multiple access techniques for a communication application.

CO4: Choose specific communication standards for a given communication application.

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1:	3	2	3	-	2	2	-	-	-	-	-	-
CO2:	3	3	2	-	2	1	-	-	-	-	-	-
CO3:	3	2	3	-	3	-	1	-	-	-	-	-
CO4:.	2	1	1	-	3	1	1	-	-	-	-	-

22UEE136B	Renewable Energy Sources	03-Credits
Hrs/Week: 3:0:0		**CIE Marks:** 50
Total Hours: 40 Hrs (40 T+00 P)		**SEE Marks:** 50

Course Objectives:

1) To study energy scenario of solar, wind, biomass, geothermal and ocean energy conversion systems.
2) To explore various concepts and theory related to solar, wind, biomass, geothermal and ocean energy conversion systems.
3) To apply the principles and simple numerical problems of renewable energy conversion systems.
4) To illustrate the similarities and differences of the features of solar, wind, biomass, geothermal and ocean energy conversion systems.

UNIT – I	10 Hrs

Introduction to Energy Sources:

Classification of energy resources, conventional energy resources – availability and their limitations; non-conventional energy resources– classification, advantages, limitations; comparison of conventional and non-conventional energy resources.

Solar Energy Basics:

Introduction, solar constant, basic sun-earth angles – definitions and their representation; solar radiation geometry, solar radiation data measuring instruments – Pyranometer and Pyrheliometer.

UNIT – II	10 Hrs

Solar Thermal Systems:

Principle of conversion of solar radiation into heat, solar water heaters (Flat plate collectors); solar cookers – box type, concentrating dish type; solar driers, solar still.

Solar Electric Systems:

Solar thermal electric power generation – solar pond and concentrating solar collector (parabolic trough, parabolic dish, central tower collector),advantages and disadvantages; solar photovoltaic – solar cell fundamentals, module, panel and array; solar PV systems – street lighting, domestic lighting and solar water pumping systems

UNIT - III	10 Hrs

Wind Energy:

Wind and its properties, history of wind energy,basic principles of Wind Energy Conversion Systems (WECS), wind data measuring instrument, classification of WECS, parts of a WECS, power in the wind; Vertical axis wind turbine generator -Savonious and Darrius types, advantages and limitations of WECS.

Biomass Energy:

Introduction, photosynthesis process, biomass conversion technologies, biomass gasification – principle and working of gasifiers; biogas - production of biogas, factors affecting biogas generation; types of biogas plants–KVIC and Janata model.

UNIT - IV	10 Hrs

Geothermal Energy:

Introduction, classification, conversion technologies,applications, advantages and limitations of geothermal resources.

Energy from Ocean:

Principle of tidal power, components of Tidal Power Plant (TPP), classification, advantages and limitations of TPP.

Ocean Thermal Energy Conversion (OTEC): Principle of OTEC system, types of OTEC power generation, block diagram, applications, advantages and limitations

Reference books:

1) B. H. Khan, "Conventional Energy Resources", Tata McGraw-Hill Education Private Limited, New Delhi, 3rd Edition, 2007.
2) G. D. Rai, "Non-conventional Energy sources", Khanna Publication, 4thEdition, 2015.
3) G. N. Tiwari and M. K. Ghosal, "Fundamentals of Renewable Energy Resources", Alpha Science International Ltd, 1stEdition,2007.
4) ShobhNath Singh, "Non-Conventional Energy Resources",Pearson Education, 2ndEdition 2018.
5) Bent Sorensen, "Renewable Energy", Academic Press, 5thEdition, 2017 (e-book).
6) David Buchla, Thomas Kissell and Thomas Floyd, "Renewable Energy Systems", Pearson,1st Edition, 2014 (e-book).
7) Roland Wengenmayr, Thomas Buhrke, "Renewable Energy: Sustainable Energy Concepts for the Future", Wiley-VCH, 2ndEdition,2008(e-book).

Course Outcomes:

CO1: List and define various parameters and features of solar, wind, biomass, geothermal and ocean energy conversion systems.

CO2: Explain various concepts and theory related to solar, wind, biomass, geothermal and ocean energy conversion systems.

CO3: Solve simple numerical problems on the concepts and theories related to solar, wind, biomass, geothermal and ocean energy conversion systems.

CO4: Compare and contrast the features of solar, wind, biomass, geothermal and ocean energy conversion systems.

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1			1	1	1		1	1	1
CO2	3	1	1	1		1	1	1		1		1
CO3	3	2	3	1							1	1
CO4	3	3	3	2								1

22UCV138B	Green Building	03-Credits
Hrs/Week: 3:0:0		**CIE Marks:**50
Total Hours: 40 Hrs (40 T)		**SEE Marks:**50

Course Objectives:

1) Understand the Definition, Concept & Objectives of the terms cost effective construction and green building. Apply cost effective techniques in construction.
2) Apply cost effective Technologies and Methods in Construction
3) Understand the Problems due to Global Warming
4) State the Concept of Green Building
5) Understand Green Building

UNIT - I	10 Hrs

Introduction to the concept of cost effective construction

Uses of different types of materials and their availability -Stone and Laterite blocks- Burned Bricks- Concrete Blocks- Stabilized Mud Blocks- Lime Poszolana Cement- Gypsum Board- Light Weight Beams- Fiber Reinforced Cement Components- Fiber Reinforced Polymer Composite- Bamboo- Availability of different materials- Recycling of building materials – Brick- Concrete- Steel- Plastics - Environmental issues related to quarrying of building materials

UNIT – II	10 Hrs

Environment friendly and cost effective Building Technologies

Different substitute for wall construction Flemish Bond - Rat Trap Bond – Arches – Panels - Cavity Wall - Ferro-Cement and Ferro-Concrete constructions – different pre-cast members using these materials - Wall and Roof Panels – Beams – columns - Door and Window frames - Water tanks - Septic Tanks - Alternate roofing systems - Filler Slab - Composite Beam and Panel Roof -Pre-engineered and ready to use building elements - wood products - steel and plastic - Contributions of agencies - Costford - Nirmithi Kendra – Habitat.

Global Warming

Definition - Causes and Effects - Contribution of Buildings towards Global Warming - Carbon Footprint – Global Efforts to reduce carbon Emissions Green Buildings – Definition - Features- Necessity – Environmental benefit - Economical benefits - Health and Social benefits - Major Energy efficient areas for buildings – Embodied Energy in Materials Green Materials - Comparison of Initial cost of Green V/s Conventional Building - Life cycle cost of Buildings.

UNIT - III	10 Hrs

Green Building rating Systems

BREEAM – LEED - GREEN STAR -GRIHA (Green Rating for Integrated Habitat Assessment) for new buildings – Purpose - Key highlights - Point System with Differential weight age. Green

Design – Definition - Principles of sustainable development in Building Design - Characteristics of Sustainable Buildings – Sustainably managed Materials - Integrated Life cycle design of Materials and Structures (Concepts only)

UNIT - IV	**10 Hrs**

Utility of Solar Energy in Buildings

Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings.

Green Composites for Buildings

Concepts of Green Composites. Water Utilisation in Buildings, Low Energy Approaches to Water Management. Management of Solid Wastes. Management of Sullage Water and Sewage. Urban Environment and Green Buildings. Green Cover and Built Environ

Reference books:

1. K. S Jagadish, B. V. Venkataramana Reddy, K. N Nanjundarao "Alternative Building Materials and Technologies", New Age International Publishers.
2. G Harihara Iyer, "Green Building Fundamentals", Notion Press.
3. Dr. Adv. Harshul Savla, "Green Building: Principles & Practices", Notion Press.

Course Outcomes:

CO1: Select different building materials for cost effective construct

CO2: Apply effective environmental friendly building technology to reduce global

CO3: Analyse buildings for green ratin

CO4: Use alternate source of energy and effect

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	2	1				1	1					
CO2	2	1				1	1					
CO3	2	1				1	1					
CO4	2	1				1	1					

22UCV139B	Waste Management	03-Credits
Hrs/Week: 3:0:0		CIE Marks:50
Total Hours: 40 Hrs (40 T)		SEE Marks:50

Course Objectives:

1) To learn broader understandings on various aspects of solid waste management.
2) To learn collection, storage, transport, processing, and disposal of waste
3) To learn identification, management and treatment of hazardous waste

UNIT - I	10 Hrs

INTRODUCTION TO SOLID WASTE MANAGEMENT:

Classification of solid wastes (source and type based), solid waste management (SWM), elements of SWM, ESSWM (environmentally sound solid waste management) and EST (environmentally sound technologies), factors affecting SWM, Indian scenario, progress in MSW (municipal solid waste) management in India.

UNIT – II	10 Hrs

WASTE GENERATION ASPECTS:

Waste stream assessment (WSA), waste generation and composition, waste characteristics (physical and chemical), health and environmental effects (public health and environmental), comparative assessment of waste generation and composition of developing and developed nations, a case study results from an Indian city, handouts on solid waste compositions.

UNIT - III	10 Hrs

COLLECTION, STORAGE, TRANSPORT, PROCESSING TECHNIQUES AND DISPOSAL OF WASTES:

Waste Collection, Storage and Transport: Collection components, storage-containers/collection vehicles, collection operation, transfer station, waste collection system design, record keeping, control, inventory and monitoring, implementing collection and transfer system, a case study. Waste Disposal: key issues in waste disposal, disposal options and selection criteria, sanitary landfill, landfill gas emission, leachate formation, environmental effects of landfill, landfill operation issues.

Waste Processing Techniques: Purpose of processing, mechanical volume and size reduction, component separation, drying and dewatering.

UNIT - IV	10 Hrs

SOURCE REDUCTION, REUSE, PRODUCT RECOVERY & RECYCLING:

Source Reduction, Reuse, Product Recovery and Recycling: basics, purpose, implementation monitoring and evaluation of source reduction, Reuse, significance of recycling, planning of a recycling programme, recycling programme elements, commonly recycled materials and

processes, recovery of waste materials, a case study.

HAZARDOUS WASTE MANAGEMENT AND TREATMENT:

Identification and classification of hazardous waste, hazardous waste treatment, pollution prevention and waste minimization, hazardous wastes management in India.

Reference books:

1. Tchobaanoglous, G., Theisen, H., and Samuel A Vigil, Integrated Solid Waste Management, McGraw-Hill Publishers, 1993.
2. Bilitewski B., Hard He G., Marek K., Weissbach A., and Boeddicker H., Waste Management, Springer, 1994.
3. White, F. R., Franke P. R.,, & Hindle M., Integrated solid waste management: a life cycle inventory. McDougall,P. John Wiley & Sons. 2001
4. Nicholas, P., & Cheremisinoff, P. D., Handbook of solid waste management and waste minimization technologies, Imprint of Elsevier Science. 2005

Course Outcomes:

CO1: Apply the basics of solid waste management towards sustainable development

CO2: Study the composition and characteristics of the waste and its affect on the environment

CO3: Apply technologies to process waste and dispose the same.

CO4: Study the 4Rs, management and treatment of the hazardous waste.

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3					1	3					
CO2	3	1				3	2		2			1
CO3	3	1			2	2	3				1	1
CO4	3					3	2				1	2

22UCS140B	Introduction to Internet of Things (IoT)	03-Credits
Hrs/Week: 3:0:0		**CIE Marks:**50
Total Hours: 40 Hrs		**SEE Marks:**50

Course Objectives:

1. Understand about the fundamentals of Internet of Things and its building blocks along with their characteristics.
2. Understand the recent application domains of IoT in everyday life.
3. Gain insights about the current trends of associated IOT technologies and IOT Analytics.

UNIT - I	10 Hrs
Basics of Networking: Introduction, Network Types, Layered network models **Emergence of IoT:** Introduction, Evolution of IoT, Enabling IoT and the Complex Interdependence of Technologies, IoT Networking Components Reference book 1: Chapter 1- 1.1 to 1.3 Chapter 4 – 4.1 to 4.4	
UNIT – II	**10 Hrs**
IoT Sensing and Actuation: Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensing Considerations, Actuators, Actuator Types, Actuator Characteristics. Textbook 1: Chapter 5 – 5.1 to 5.9 **IoT Processing Topologies and Types:** Data Format, Importance of Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations, Processing Offloading. Reference book 1: Chapter 6 – 6.1 to 6.5	
UNIT - III	**10 Hrs**
ASSOCIATED IOT TECHNOLOGIES Cloud Computing: Introduction, Virtualization, Cloud Models, Service-Level Agreement in Cloud Computing, Cloud Implementation, Sensor-Cloud: Sensors-as-a-Service. Textbook 1: Chapter 10– 10.1 to 10.6 **IOT CASE STUDIES** Agricultural IoT – Introduction and Case Studies Reference book 1:Chapter 12- 12.1-12.2	
UNIT - IV	**10 Hrs**
IOT CASE STUDIES AND FUTURE TRENDS Vehicular IoT – Introduction Healthcare IoT – Introduction, Case Studies **IoT Analytics – Introduction** Reference book 1: Chapter 13– 13.1; Chapter 14- 14.1-14.2; Chapter 17- 17.1	

Reference books:

1. Sudip Misra, Anandarup Mukherjee, Arijit Roy, “Introduction to IoT”, Cambridge University Press 2021.
2. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.
3. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.
4. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013.

Course Outcomes:

CO1: Describe the evolution of IoT, IoT networking components, and addressing strategies in IoT.
CO2: Classify various sensing devices and actuator types.
CO3: Demonstrate the processing in IoT.
CO4: Explain associated IoT Technologies.
CO5: Illustrate the architecture of IoT applications.

Course Outcomes	Programme Outcomes											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	2											
CO2		2	3	2								
CO3		2	3									
CO4	1	2	3									
CO5			3									

22UCS141B	Introduction to Cyber Security	03-Credits
Hrs/Week: 3:0:0		**CIE Marks:**50
Total Hours: 40 Hrs		**SEE Marks:**50

Course Objectives:

1) To familiarize cybercrime terminologies and perspectives
2) To understand Cyber Offenses and Botnets
3) To gain knowledge on tools and methods used in cybercrimes
4) To understand phishing and computer forensics

UNIT - I	10 Hrs
Introduction to Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes, An Indian Perspective, Hacking and Indian Laws., Global Perspectives	
UNIT – II	**10 Hrs**
How Criminals Plan Them: Introduction, How criminals plan the attacks, Social Engineering, Cyber Stalking, Cybercafe & cybercrimes. **Botnets:** The fuel for cybercrime, Attack Vector. **Tools and Methods used in Cybercrime: I**ntroduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key Loggers and Spywares	
UNIT - III	**10 Hrs**
Different Forms of attacks in Cybercrime: Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attackers, Attacks on Wireless networks. **Phishing and Identity Theft:** Introduction, methods of phishing, phishing, phishing techniques, spear phishing, types of phishing scams, phishing toolkits and spy phishing, counter measures, Identity Theft	
UNIT - IV	**10 Hrs**
Understanding Computer Forensics: Introduction, Historical Background of Cyber forensics, Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Digital Forensic Life cycle, Chain of Custody Concepts, network forensics.	

Reference books:

1. Sunit Belapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt Ltd, 2011, First Edition
2. Rajkumar Singh Rathore, Mayank Bhushan, "Fundamentals of Cyber Security", BPB; 2017, First Edition
3. Anand Shinde , "Introduction to Cyber Security", 2020, Notion Press, First Edition
4. Nilakshi Jain and Dhananjay R. Kalbande, "Cyber Security and Cyber Laws", Wiley India Pvt Ltd., 2020

Course Outcomes:

CO1: Explain the cybercrime terminologies and laws.
CO2: Illustrate tools and methods used on Cybercrime
CO3: Describe the different forms of attacks, Phishing and Identity Theft
CO4: Comprehend cyber offences and Botnets
CO5: Justify the need of computer forensics

Course Outcomes	Programme Outcomes											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	1							2				
CO2		2		3	3							
CO3					2							
CO4												
CO5						3						2

22UME142B	Composite Materials	03-Credits
Hrs./Week: 3:0: 0		CIEMarks:50
TotalHours:40		SEEMarks:50

UNIT-I	10Hrs.

Introduction to composite materials

Definition and classification of composites based on matrix and reinforcement, Characteristics composite materials, Fibrous composites, Laminate composites and particulate composites. Facto which determine the properties of composites, Benefits of composites, properties and types reinforcements and matrices, Reinforcement-matrix interface.

UNIT–II	10Hrs.

Polymer matrix composites

Introduction, Polymer matrices, Processing methods like Lay up and curing, open and closed mold process- hand lay up techniques, laminate bag molding, production procedures for bag molding, filament winding, pultrusion, pulforming, thermo-forming, molding methods, properties of PMCs and applications, Some commercial PMCs.

UNIT–III	10 Hrs.

Metal matrix composites

Introduction, Metallic matrices, Classification of MMCs, Need for production of MMCs, Interface reactions, processing methods like Powder metallurgy, diffusion bonding, Melt stirring, Compo/Rheo casting, Squeeze casting, Liquid melt infiltration, Spray deposition and In situ Processes, Properties of metal matrix composites, Applications, Some commercial MMCs.

UNIT–IV	10Hrs.

Mechanics of composite materials :

Continuous fibers, Iso-stress condition, Iso-strain condition, Numericals on modulus of rigidity, and mechanics of discontinuous fibers, stress Vs strain curves for PMCs, MMCs and CMCs. Cutting and machining of composites, Mechanical fastening, Adhesive bonding.

Reference Books:

1 Composite Science and Engineering, K. K. Chawla, Springer Verlag, 1998
2 Introduction to composite materials Hull and Clyne Cambridge University Press, 2nd Edition, 1990
3 Composite Materials: Engineering and Science F. L. Mathew and R. D. Rawlings, Woodhead Publishing Limited, 1999
4 Composite materials handbook, MeingSchwaitz, McGraw Hill Book Company, 1984
5 Mechanics of Composite Materials, Robert M. Jones, McGraw Hill Kogakusha Ltd, 1998
6 Composite materials,S. C. Sharma, Narosa Publishing House, 2000
7 Mechanics of composites, Avtar Kaw,CEC Press,2002

Course Outcomes:

CO1: Enlighten about the types of composites, reinforcements, matrices, factors influencing mechanical properties
CO2: Describe various production methods and applications of polymer matrix composites
CO3: Describe various production methods and applications of metal matrix composites
CO4: Demonstrate cutting, machining and joining of composites

Course Outcomes	Programme Outcomes											
	1	1	1	1			1	1				1
CO1	1	1	1	1			1	1				1
CO2	1	1	1	1								1
CO3	1	1	1	1			1	1				1
CO4	1	1	1	1			1	1				1

21UME143B	Introductions to Robotics	03 - Credits
Hrs./Week : **3 : 0 : 0**		CIE Marks : 50
Total Hours : 40 Hrs		SEE Marks : 50

UNIT - I	10 Hrs.

Robot Basics

Robot-Basic concepts, Need, Law, History, Anatomy, specifications. Robot configurations-cartesian, cylinder, polar and articulate. Robot wrist mechanism, Precision and accuracy of robot.

ROBOT ELEMENTS

End effectors-Classification, Types of Mechanical actuation, Gripper design, Robot drive system

Types, Position and velocity feedback devices-Robot joints and links-Types, Motion interpolation

UNIT – II	10 Hrs.

ROBOT KINEMATICS AND CONTROL

Robot kinematics – Basics of direct and inverse kinematics, Robot trajectories, 2D and 3D Transformation-Scaling, Rotation, Translation Homogeneous transformation.

Control of robot manipulators – Point to point, Continuous Path Control, Robot programming

UNIT – III	10 Hrs.

ROBOT SENSORS

Sensors in robot – Touch sensors-Tactile sensor – Proximity and range sensors. Force sensor-Light sensors, Pressure sensors, Introduction to Machine Vision and Artificial Intelligence.

UNIT – IV	10 Hrs.

ROBOT APPLICATIONS

Industrial applications of robots, Medical, Household, Entertainment, Space, Underwater, Defense, Disaster management. Applications, Micro and Nano-robots, Future Applications.

Learning Resources:

1. Mikell P. Groover, Mitchell Weiss, Roger N Nagel, Nicholas G Odrey, “Industrial Robotics Technology, Programming and Applications”, Tata –McGraw Hill Pub. Co., 2008.
2. Deb.S.R and Sankha Deb, "Robotics Technology and Flexible Automation", Tata McGraw Hill Publishing Company Limited, 2010.
3. Klafter.R.D, Chmielewski.T.A, and Noggin’s., “Robot Engineering: An Integrated Approach”’, Prentice Hall of India Pvt. Ltd., 1994.
4. Fu.K.S, Gonzalez.R.C&Lee.C.S.G, “Robotics control, sensing, vision and intelligence”, Tata-McGraw Hill Pub. Co., 2008
5. Yu. “Industrial Robotics”, MIR Publishers Moscow, 1985.

Course Outcomes: On completion of the course the student will be able to:

1. List and explain the basic elements of industrial robots
2. Analyse robot kinematics and its control methods.
3. Classify the various sensors used in robots for better performance.
4. Summarize various industrial and non-industrial applications of robots.

22UBT148B	Biomass and Bioenergy	03-Credits
Hrs/Week: 3:0:0		CIE Marks:50
Total Hours: 40 Hrs (40 T)		SEE Marks:50

Course Objectives:

1. To understand the basic concepts of biomass and bioenergy.
2. To gain the knowledge about different biomass conversion technologies.
3. To know about innovative bioenergy plants and bio refinery concept.

UNIT - I	10 Hrs

Biomass

Biomass: Definition, constituents and energy properties. Biomass as an energy core and its different mode of utilization. Biomass typologies: lignocellulosic, starchy, sugary, oilseeds, MSW, sewage sludge.

Introduction to Biofuels - definition (liquid -biodiesel, bioethanol; gaseous -syngas, biogas; solid - charcoal and biochar), advantages and disadvantages. Biofuel life cycle. Conventional fuels and their environmental impacts. Renewable energy sources. Modern fuels and their environmental impacts.

UNIT – II	10 Hrs

Types of Bioenergies :

First generation, Second generation, third generation and next/future generation fuels

Biomass Conversions Technologies:

Physical conversion: Dewatering, drying, size reduction, steam explosion, densification, pelleting, chipping, oil extraction.

Thermochemical conversion: Oil trans-esterification

Chemical conversion: Lignocellulosic conversion (2G technology)

Biochemical conversion -Anaerobic digestion (biogas production from organic waste and Waste water), CBG. Fermentation (bioethanol production)

UNIT - III	10 Hrs

Thermal conversion:

Combustion plants for heat generation: wood and pellet burning stoves; wood, pellet and wood chips boiler. Gasification plants, Pyrolysis plants.

Innovative bioenergy plants: biomass to synthetic natural gas; biomass to liquid biofuels through Fisher- Tropsch; absorption enhanced reforming. Hydrothermal processes: carbonization, Liquefaction, gasification.

UNIT - IV	10 Hrs

Bio-Energy and Bio-Refinery

Overview of Integrated biorefinery concept, value-added processing of bioenergy residues.

Economic feasibility of producing bioenergy (with one example), Issues with bioenergy production & use. Impact of bioenergy in global climate change & food production. Strategies for new vehicle technologies. Current research on biomass & bioenergy production. Market barriers of bioenergy.

Reference books:

1. Anaerobic Biotechnology for Bioenergy Production: Principles and Applications. Samir K. Khanal. Wiley-Blackwell Publishing, 2008.
2. Biotechnology, Economic & Social Aspects: E.J. Dasilva, C Ratledge & A Sasson, Cambridge Univ. Press, Cambridge, 2000
3. Environmental Biotechnology by Pradipta Kumar Mahopatra, 2007.
4. Biofuel Engineering Process technology by Caye M. Drapcho, Nghiem Phu Nhuan, Terry H.

Walker, Mc Grow Hill company, 2008.

5. Biofuel Technology Handbook by Dominik Rutz & Rainer Janssen, 2008.

Course Outcomes:

CO1: Emphasize on the basic aspects of Biomass and Bio-Energy.

CO2: Interpret & describe biomass conversion technologies.

CO3: Acquire knowledge of Innovative bioenergy plants.

CO4: Interpret & describe of Bio-Refinery concept.

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	1	2				3					2
CO2	1	3	3	2	3	1	3					1
CO3	1	1	3	2	3	1	3					1
CO4	1		2		2	1	2					2

22UHS124C	Communicative English	01-Credit
Hrs/Week: 1:0:0		CIE Marks:50
Total Hours: 15 Hrs (L 15)		SEE Marks:50

Course Objectives:

1.To know about Fundamentals of Communicative English and Communication Skills in general.
2. To train the students identify the nuances of phonetics, intonation and enhance pronunciation skills for better Communication skills.
3. To impart basic English grammar and essentials of important language skills.
4. To enhance with English vocabulary and language proficiency for better communication skills.
5. To learn about Techniques of Information Transfer through presentation.

UNIT - I	3 Hrs
Introduction to Communication Skills: Fundamentals of Communicative English, Process of Communication, Barriers to Effective Communicative English, Different styles and levels in Communicative English. Interpersonal and Intrapersonal Communication Skills.	
UNIT – II	**4 Hrs**
Introduction to Phonetics: Phonetics& its importance, Phonetic Transcription, Pronunciation Guidelines Related to consonants and vowels, Sounds Mispronounced, Silent and Non silent Letters, Syllables&Structure, Word Accent and Stress Shift, Intonation, Spelling Rules & Words often Miss spelt. Common Errors in Pronunciation. **Basic English Grammar and Vocabulary PART-I:**Introduction toEnglish Grammar, Parts of Speech.	
UNIT - III	**4 Hrs**
Basic English Grammar and Vocabulary PART - II: Articles &Preposition, kinds of Preposition and Prepositions often Confused. Articles: Use of Articles – Indefinite and Definite Articles, Verbs &Tenses, Types of tenses, Question Tags, Question Tags for Assertive Sentences (Statements) – Some Exceptions in Question Tags.One Word Substitutes. Strong and Weak forms of words, Words formation - Prefixes and Suffixes, Contractions and Abbreviations.	
UNIT - IV	**4 Hrs**
Communication Skills for Employment: Information Transfer & Its types: Oral Presentation & Extempore/Public Speaking, Difference between Extempore/Public Speaking, Communication Guidelines for Practice. Mother Tongue Influence (MTI) – South Indian Speakers, Various Techniques for Neutralization of Mother Tongue Influence.	

Reference books:

1. A Textbook of English Language Communication Skills, Infinite Learning Solutions(Revised Edition) 2021.
2. Sanjay Kumar and Pushpalata‘Communication Skills’, Oxford University Press - 2019.
3. N. P. Sudharshana and C. Savitha,‘English for Engineers’ , Cambridge University Press – 2018.
4. D Praveen Sam, KN Shoba,‘A Course in Technical English’, Cambridge University Press – 2020.
5. Gajendra Singh Chauhan and Et al,‘Technical Communication’, Cengage learning India Pvt Limited [Latest Revised Edition] - 2019.
6. English Language Communication Skills – Lab Manual cum Workbook, Cengage learning India Pvt Limited [Latest Revised Edition] – 2019.

Course Outcomes:

At the end of the course student will be able to:

CO1: Apply the Fundamentals of communication in their communication skills

CO2: Identify the nuances of phonetics, intonation and enhance pronunciation skills.
CO3: Practice Basic English grammar skills and utilize essential language skills as per requirement.
CO4: Build and use all types of English vocabulary and language proficiency.
CO5: Solve the hindrances faced by (MTI) - Mother Tongue Influence

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	-	-	-	-	-	-	-	-	-	3	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	3

22UHS125C	Constitution of India	01-Credit
Hrs/Week: 1:0:0		CIE Marks:50
Total Hours: 15 Hrs (L 15)		SEE Marks:50

Course Objectives:

1. To realise the significance of constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution.
2. To identify the importance of fundamental rights as well as fundamental duties.
3. To understand the functioning of Union and State Governments in Indian federal system.
4. To review procedure and effects of emergency, composition and activities of election commission.

UNIT - I	04 Hrs
Introduction to Indian constitution: The Salient Features of the Indian Constitution. Preamble to the Constitution of India. Fundamental Rights, Directive Principles of State policy and Fundamental Duties**.**	
UNIT – II	**04 Hrs**
The Union Government: The Union Executive, The Union Legislature and The Union Judiciary - The Supreme Court of India.	
UNIT - III	**04 Hrs**
The State Government: The State Executive, The State legislature and The State Judiciary	
UNIT - IV	**03 Hrs**
Election provisions, Emergency provisions and Amendment of the constitution**..**	

Reference books:

1. M. V. Pylee, "Introduction to the Constitution of India", 4th Edition, Vikas publication, 2005.
2. Durga Das Basu (D. D. Basu), "Introduction to the constitution of India", (Student Edition), 19th edition, Prentice-Hall EEE, 2008.
3. Venkatesh B. R. and Merunandan K. B, 'An introduction to the constitution of India and Profession Ethics', Idea International Publication, Bangalore.
4. K. R. Phaneesh, 'The Constitution of India and Profession of Ethics', Sudha Publication, Bangalore.

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

CO1: Analyse the significance of Indian Constitution as the fundamental law of the land.

CO2: Exercise his/her fundamental rights in proper sense at the same time identifies his/her responsibilities in national building.

CO3: Asses the Indian political system, the powers and functions of the Union and State Governments.

CO4: Elaborate Electoral Process, Emergency provisions and Amendment procedure.

Course Outcomes	Programme Outcomes											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	-	-	-	-	-	1	1	-	-	-	-	1
CO2	-	-	-	-	-	3	1	-	-	-	-	2
CO3	-	-	-	-	-	1	1	-	-	-	-	1
CO4	-	-	-	-	-	-	-	-	-	-	-	1

22UHS128C	Scientific Foundations of Health	01-Credit
Hrs/Week: 1:0:0		**CIE Marks:**50
Total Hours:15Hrs (L 15)		**SEE Marks:**50

Course Objectives:

1. To know about Health and wellness (and its Beliefs) & It's balance for positive mindset.
2. To Build the healthy lifestyles for good health for their better future.
3. To Create a Healthy and caring relationships to meet the requirements of good/social/positive life.
4. To learn about avoiding risks and harmful habits in their campus and outside the campus for their bright future.
5. To Prevent and fight against harmful diseases for good health through positive mindset.

UNIT - I	4Hrs
Good Health and Its balance for positive mindset: What is Health? Health and Behaviour. **Health and Personality - Profession:**Disparities of health in different vulnerable groups. Stress and Health - Stress management.	
UNIT – II	**4Hrs**
Building of healthy lifestyles for better future: Developing a healthy diet for good health, Fitness components for health, Wellness and physical function, Howto avoid exercise injuries? **Creation of Healthy and caring relationships:** Building communication skills (Listening and speaking), Changing health behaviours through social engineering.	
UNIT - III	**4Hrs**
Avoiding risks and harmful habits: Characteristics of health compromising behaviors, Recognizing and avoiding of addictions,Effects and health hazards from addictions Such as how to recovery from addictions.	
UNIT - IV	**3Hrs**
Preventing and fighting against diseases for good health: Process of infections and reasons for it, Management of chronic illness for Quality of life, Health and Wellness of youth.	

Reference books:

1. **Health Psychology** (Second edition) by Charles Abraham, Mark Conner, Fiona Jones and Daryl O'Connor – Published by Routledge 711 Third Avenue, New York, NY 10017.
2. **Health Psychology - A Textbook,** 4th edition by Jane Ogden McGraw Hill Education (India) Pvt. Ltd. - Open University Press
3. **Scientific Foundations of Health (Health & Wellness) - General Books** published for university and colleges references by popular authors and published by the reputed publisher.
4. **Health Psychology (Ninth Edition)** by Shelley E. Taylor - University of California, Los Angeles, McGraw Hill Education (India) Private Limited - Open University Press
5. **SWAYAM / NPTL/ MOOCS/ We blinks/ Internet sources/ YouTube videos** and other materials / notes

Course Outcomes:

At the end of the course student will be able to

CO1: Understand concepts of Good Health and wellness (and its Beliefs).
CO2: Demonstrate the abilities to build healthy, caring relationships and life style
CO3: Adopt the innovative & positive methods to avoid risks from harmful habits in their campus & outside the campus.
CO4: Exhibit the abilities to fight against harmful diseases.

Course Outcomes	Programme Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	-	-	-	-	-	1	-	-	-	-	-	-
CO2	-	-	-	-	-	2	-	-	-	-	-	-
CO3	-	-	-	-	-	3	-	-	-	-	-	-
CO4	-	-	-	-	-	3	-	-	-	-	-	-

22UMA202C	Mathematics for Civil Sciences-II (Integrated)	04-Credits
Hrs/Week: 3:0:2		CIE Marks:50
Total Hours: 40 Hrs		SEE Marks:50

Course Objectives: The goal of the course **Mathematics for Civil Sciences-II** is to

1. **Familiarize** the importance of Integral calculus and Vector calculus essential for civil Engineering.
2. **Analyze** Civil engineering problems by applying Partial Differential Equations.
3. **Develop** the knowledge of solving civil engineering problems numerically.

UNIT – I	10 Hrs
Introduction to Integral Calculus in Civil Engineering applications : **Multiple Integrals:** Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates. Applications to find Area and Volume by double integral. Problems. **Beta and Gamma functions:** Definitions, properties, relation between Beta and Gamma functions. Problems. **Self-Study:** Volume by triple integration, Center of gravity. **Applications:** Applications to mathematical quantities (Area, Surface area, Volume), Analysis of probabilistic models. **(RBT Levels: L1, L2 and L3)**	
UNIT – II	**10 Hrs**
Introduction to Vector Calculus in Civil Engineering applications: **Vector Differentiation:** Scalar and vector fields. Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields. Problems. **Vector Integration:** Line integrals, Surface integrals. Applications to work done by a force and Flux. Statement of Green's theorem and Stokes theorem. Problems. **Self-Study:** Volume integral and Gauss divergence theorem. **Applications:** Heat and mass transfer, oil refinery problems, environmental engineering. Analysis of streamlines, velocity and acceleration of a moving particle. **(RBT Levels: L1, L2 and L3)**	
UNIT – III	**10 Hrs**
Importance of partial differential equations for Civil Engineering applications: Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous, PDE by direct integration. Homogeneous PDEs involving derivatives with respect to one independent variable only. Solution of Lagrange's linear PDE. Derivation of one-dimensional heat equation and wave equation. **Self-Study:** Solution of one-dimensional heat equation and wave equation by the method of separation of variables. **Applications:** Design of structures (vibration of rod / membrane) **(RBT Levels: L1, L2 and L3)**	
UNIT – IV	**10 Hrs**
Introduction to various numerical techniques for handling Civil Engineering applications: Solution of algebraic and transcendental equations: Regula-Falsi and Newton-Raphson methods (only formulae). Problems. Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference formula and Lagrange's interpolation formula (All formulae without proof). Problems. N**umerical integration**: Trapezoidal, Simpson's (1/3)rd and (3/8)th rules (without proof). Problems. **Numerical Solution of Ordinary Differential Equations (ODE's):** Numerical solution of ordinary	

differential equations of first order and first degree - Taylor's series method, Modified Euler'smethod, Runge-Kutta method of fourth order and Milne's predictor-corrector formula (No derivations of formulae). Problems.

Self-Study: Bisection method, Lagrange's inverse Interpolation **and** Adam-Bashforth method.

Applications: Estimating the approximate roots, extremum values, Area, volume, and surface area. Finding approximate solutions to civil engineering problems. Finding approximate solutions to ODE related to civil engineering fields.

(RBT Levels: L1, L2 and L3)

Reference books:

1. Maurice D weir, Joel Hass and Frank R. Giordano, "Thomas calculus", Pearson, eleventh edition, 2011
2. B.S. Grewal : Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
3. B. V. Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. Erwin Kreyszing's Advanced Engineering Mathematics volume1 and volume1I,wiley India Pvt.Ltd.,2014
5. Srimanta Pal & Subodh C. Bhunia: "Engineering Mathematics" Oxford University Press,3rd Ed., 2016.
6. N.P Bali and Manish Goyal: "A textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
7. C. Ray Wylie, Louis C. Barrett: "Advanced Engineering Mathematics" McGraw – Hill Book Co., Newyork, 6th Ed., 2017.
8. Gupta C.B, Sing S.R and Mukesh Kumar: "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education(India) Pvt. Ltd 2015.
9. H. K. Dass and Er. Rajnish Verma: "Higher Engineering Mathematics" S. Chand Publication, 3rd Ed., 2014.
10. James Stewart: **"**Calculus" Cengage Publications, 7th Ed., 2019.
11. David C Lay: "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
12. Gareth Williams: "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.

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

CO1: Apply the knowledge of multiple integrals to compute area and volume.

CO2: Understand the applications of vector calculus refer to solenoidal, irrotational vectors, line integral and surface integral.

CO3: Demonstrate partial differential equations and their solutions for physical interpretations.

CO4: Apply the knowledge of numerical methods in solving physical and engineering phenomena.

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	2	0	0	0	0	0	0	0	0	0	0
CO2	3	2	0	0	0	0	0	0	0	0	0	0
CO3	3	2	0	0	0	0	0	0	0	0	0	0
CO4	3	2	0	0	0	0	0	0	0	0	0	0

22UCH210C	Chemistry for Civil Sciences (Integrated)	04-Credits
Hrs/Week: 3:0:1		CIE Marks:50
Total Hours: 40 Hrs		SEE Marks:50

Course Objectives:

1) To enable students to acquire knowledge on principles of chemistry for engineering applications.
2) To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.
3) To provide students with a solid foundation in analytical reasoning required to solve societal problems.

UNIT - I	10 Hrs

Chemistry of Water and Environment

Water technology: Introduction, water quality parameters, hardness of water, determination of total hardness by EDTA method, numerical problems. Determination of chlorides; Mohr's method. Softening of water by ion exchange method, desalination of water by electrodialysis, Reverse and Forward osmosis: Introduction, Process and applications.

Water pollution: Sources, water quality assessment, effect of oxygen demanding waste water, Sewage treatment; Primary, secondary and tertiary treatment. Determination of Biological Oxygen Demand (BOD), Chemical oxygen demand (COD) and Numerical problems.

Self Study: Determination of DO in water samples by Winkler's method. Impact of heavy metals on human health.

UNIT – II	10 Hrs

Analytical Techniques and Corrosion Science

Analytical Techniques: Sensors, Introduction, basic principle of sensor, Types of sensors; Conductometric sensors, Electrochemical sensors, Thermometric sensors, and Optical sensors. Potentiometric sensors; Introduction, principle, working and application in the estimation of iron. Colorimetric sensors; Introduction, principle, working and application in the estimation of copper. Conductometric sensors; Introduction, principle, working and application in the estimation of weak acid. pH-sensors and its application in the determination of soil sample.

Corrosion: Introduction, electrochemical theory of corrosion, types of electrochemical corrosion; differential metal corrosion, differential aeration corrosion (waterline and pitting), stress corrosion (caustic embrittlement). Factors affecting rate of corrosion. Corrosion testing by weight loss method. Corrosion penetration rate (CPR)-numerical problems.

Corrosion control: Introduction, Metal coating; galvanization, Surface conversion coating; anodization and cathodic protection; sacrificial anodic method.

Self Study: Use of Corrosion inhibitors to control corrosion. Corrosion control by organic coatings.

UNIT - III	10 Hrs

Structural Materials

Metals and Alloys: Introduction, Properties and application of Iron and its alloys, Aluminium and itsalloys.

Cement: Introduction, composition, properties, classification, manufacturing process of cement, processof setting and hardening of cement, additives for cement and testing of cement.

Refractories: Introduction, classification based on chemical composition, properties and application ofrefractory materials.

Glass: Introduction, Composition, Types, Preparation of Soda-lime glass, properties and applications ofglass.

Nano materials: Introduction, size dependent properties of nanomaterial (surface area and catalytic), Synthesis of nanomaterial by sol-gel method and co-precipitation method. Synthesis, properties and engineering applications of carbon nanotubes and graphene. Nanomaterials for water treatment, Introduction and example.

Self Study: Chemistry of reinforced concrete from various sources of water (seawater, groundwater, treated water).

UNIT - IV	10 Hrs

Polymers and Composites

Polymer: Introduction, monomer, polymer, polymerization, degree of polymerization. Molecular weight of polymers, Weight average and number average molecular weight of polymer. Numerical problems. Synthesis, properties and engineering applications of Acrylo Butadiene Styrene (ABS) plastics and Silicon rubber.

Fibers: Introduction, Synthesis, properties and applications of Rayon and Nylon fibers.

Polymer composites: Introduction, properties and applications of fiber reinforced polymers composites (FRPC).

Geo polymer concrete: Introduction, synthesis, constituents, properties & applications.

Adhesives: Introduction, properties and applications of epoxy resin

Biodegradable polymers: Introduction, Synthesis, properties and applications of polylactic acid (PLA)and poly hydroxy butyrate (PHB).

Self Study: Introduction, structural properties and applications of cellulose and lignin.

PRACTICAL CONTENT

List of Experiments

UNIT-I : Compulsorily conducting experiments

1. Estimation of total hardness of water by EDTA method
2. Potentiometric estimation of FAS using $K2Cr_2O_7$
3. Determination of pKa of vinegar using pH sensor (Glass electrode)
4. Estimation of Copper present in electroplating effluent by optical sensor (colorimetry)
5. Conductometric estimation of acid mixture
6. Estimation of iron in TMT bar by diphenyl amine/external indicator method
7. Determination of Alkalinity of given water sample by dual indicator method.
8. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)

UNIT-II: Virtual experiments (any one)

1. Electro-gravimetric estimation of metals
2. Preparation of urea formaldehyde resin
3. Synthesis of iron oxide nanoparticles
4. Electrolysis of water

UNIT-III: Open Ended Experiments (any one)

1. Measurements of IV characteristics of Photovoltaic Cell
2. Determination of percentage of copper in present the brass solution.
3. Determination of CaO in cement solution
4. Determination of manganese dioxide in pyrolusite ore

Reference books:

1. Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013- 2nd Edition.
2. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi
3. A Text Book of Engg. Chemistry, Shashi Chawla, Dhanpat Rai & Co. (P) Ltd.

4. Essentials of Physical Chemistry, Bahl&Tuli, S.Chand Publishing
5. Applied Chemistry, Sunita Rattan, Kataria 5. Engineering Chemistry, Baskar, Wiley
6. Engineering Chemistry – I, D. Grour Krishana, Vikas Publishing
7. A Text book of Engineering Chemistry, SS Dara & Dr. SS Umare, S Chand & Company Ltd., 12th Edition, 2011.
8. A Text Book of Engineering Chemistry, R.V. Gadag and Nityananda Shetty, I. K. International Publishing house. 2nd Edition, 2016.
9. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4th Edition, 1999.
10. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSCPublishing, 2005.
11. Corrosion Engineering, M. G. Fontana, N. D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.
12. Linden's Handbook of Batteries, Kirby W. Beard, Fifth Edition, McGraw Hill, 2019.
13. OLED Display Fundamentals and Applications, Takatoshi Tsujimura, Wiley–Blackwell , 2012
14. "Handbook on Electroplating with Manufacture of Electrochemicals", ASIA PACIFIC BUSINESSPRESS Inc., 2017. Dr. H. Panda,
15. Expanding the Vision of Sensor Materials. National Research Council 1995, Washington, DC: TheNational Academies Press. doi: 10.17226/4782.
16. Laboratory Manual, Department of Chemistry, BEC Bagalkot
17. Laboratory Manual on Engineering Chemistry, Dr. Sudha Rani, DhanapathRai Publishing Co. Ltd., First Edition, 1998.

Web links and Video Lectures (e-Resources):

1) http://libgen.rs/
2) https://nptel.ac.in/downloads/122101001/
3) https://nptel.ac.in/courses/104/103/104103019/
4) https://ndl.iitkgp.ac.in/
5) https://www.youtube.com/watch?v=faESCxAWR9k
6) https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLyhmwFtznRhuz8L1bb3X- 9IbHrDMjHWWh

Course Outcomes:

CO1: Identify the terms and process involved in scientific and engineering applications.
CO2: Explain the phenomena of chemistry to describe the methods of engineering process.
CO3: Solve for the problems in chemistry that are per pertinent in engineering applications
CO4: Apply the basic concepts of chemistry to explain the chemical properties and process.
CO5: Analyze properties & processes associated with chemical substances in multidisciplinary situations.

Course Outcomes	Programme Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	1	1				1					
CO2	3	1	1				1					
CO3	3	1	1				1					
CO4	3	1	1				1					
CO5	3	1	1				1					

22UME223C	Computer Aided Engineering Drawing	03 - Credits
Hrs./Week: 2 :0: 2		CIEMarks:50
TotalHours:40		SEEMarks:50

UNIT-I	10Hrs.

Introduction: Significance of engineering drawing, BIS Conventions of Engineering Drawing. Free hand sketching of Engineering Drawing. Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, and RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves.

Orthographic Projections of Points and Lines:

Introduction to Orthographic projections: Orthographic projections of points in 1st and 3rd quadrants (for practice only, not for CIE and SEE).

Projections of lines located in first quadrant only, line parallel to both the planes, perpendicular to one plane and parallel to other, inclined to one plane and parallel to other, inclined to both the planes. Determinations of true length and true inclinations with principal planes.

UNIT–II	10Hrs.

Orthographic Projections of planes:

Projections of planes- perpendicular to the both the planes, parallel to one plane and perpendicular to other, inclined to one plane and perpendicular to other and inclined to both the planes.(Placed in First quadrant only using change of position method).

UNIT–III	10 Hrs.

Orthographic Projections of solids

Orthographic Projection of right regular solids (Solids Resting on HP only): Prisms, Pyramids, Cones, and Cylinders (triangle, square, rectangle, pentagon, and hexagon) with axis/base inclined to HP and profile views.

Development of Lateral Surfaces of Solids

Development of Lateral Surfaces of right regular prisms, pyramids, cylinders and cones resting with base on HP only

UNIT–IV	10Hrs.

Orthographic Projections of solids:

Orthographic Projection of right regular solids (Solids Resting on HP only): Prisms, Pyramids, Cones, and Cylinders (triangle, square, rectangle, pentagon, and hexagon) with axis/base inclined to HP and profile views.

Development of Lateral Surfaces of Solids:

Development of Lateral Surfaces of right regular prisms, pyramids, cylinders and cones resting with base on HP only

Scheme and Solution for Examinations

Continuous Internal Evaluation (Theory) (Using grid sheet)

CIE	Max Marks	Reduced Marks
1	40 Marks	20 Marks
2	40 Marks	20 Marks
	Assignment	10 Marks

Reduced to 50% of Marks	25 Marks

Continuous Internal Evaluation (Practical)

Particulars	**Max Marks**	**Reduced Marks**
Lab work	30 Marks	15 Marks
Lab CIE	20 Marks	10 Marks
		25 Marks

Total Marks: C I E (Theory + Practical)

Sketching	**Practical**	**Total**
25 Marks	25 Marks	50 Marks

SEMESTER END EXAMINATION

The Lab-SEE of three hours is conducted as per the model question paper for 100 marks and scaled down to 50 Marks. 50%weightage for sketch and 50% weightage for printouts in both CIE and SEE.

QUESTION PAPER FORMAT AWARD OF MARKS

Q No.	**Question**	**Marks**
1	Straight lines OR Planes	30 Marks
2	Solids	40 Marks
3	Development of Surfaces OR Isometric Projections	30 Marks
	Total Marks	100 marks

Q.No	**Solutions & Sketching on Grid Sheets**	**Computer display & Printout**	**Total**
1	50% (15 Marks)	50% (15 Marks)	100% (30 Marks)
2	50% (20 Marks)	50% (20 Marks)	100% (40 Marks)
3	50% (15 Marks)	50% (15 Marks)	100% (30 Marks)

Reference Books:

1) K.R.Gopalkrishna, ''Engineering Drawing', vol. I and II, 23rd edition, Subhas, 2014.
2) N.D.Bhat "Engineering Drawing"
3) R.K.Hegde and Niranjan Murthy, ''Engineering Graphics''1st edition, Sapna, 2003.
4) P.I.Varghese, ''Engineering Graphics'', McGraw Hill, 2013

Course Outcomes:

At the end of the course the student will be able to:

CO 1: Draw and communicate the objects

CO 2: Draw and communicate the objects with definite shape and dimensions

CO 3: Recognize and Draw the shape and size of objects through different views. Develop the lateral surfaces of the object

CO 4: Create a Drawing views using CAD software Identify the interdisciplinary engineering components or systems through its graphical representation.

Course Outcomes	Programme Outcomes											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	2					1	1				1
CO2	2	2			1	1	1					1
CO3	2	1			1	1						1
CO4	2	1			1	1		1	1			1

22UME222N	Introduction To Mechanical Engineering	03-Credits
Hrs./Week: 2 :2: 0		CIEMarks:50
Total Hours: 40		SEEMarks:50

UNIT-I	10Hrs.

Introduction: Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Energy: Introduction and applications of Energy sources like Fossil fuels, Nuclear fuels, Hydel, Solar, wind, and bio-fuels, Environmental issues like Global warming and Ozone depletion

Engineering Materials: Types and applications of Ferrous & Nonferrous Metals, silica, ceramics, glass, graphite, diamond and polymer. Shape Memory Alloys.

UNIT–II	10Hrs.

Machine Tool Operations:

Working Principle of lathe, Lathe operations: Turning, facing, knurling. Working principles of Drilling Machine, drilling operations: drilling, boring, reaming. Working of Milling Machine, Milling operations: plane milling and slot milling.

(No sketches of machine tools, sketches to be used only for explaining the operations).

Introduction to Advanced Manufacturing Systems: Introduction, components of CNC, advantages and applications of CNC, 3D printing.

Joining Processes: Soldering, Brazing and Welding, Definitions, classification of welding process, Arc welding, Gas welding and types of flames.

UNIT–III	10 Hrs.

Introduction to IC Engines: Components and Working Principles, 4-Strokes Petrol and Diesel Engines,Application of IC Engines.

Insight into Future Mobility; Electric and Hybrid Vehicles, Components of Electric and HybridVehicles. Advantages and disadvantages of EVs and Hybrid vehicles.

UNIT–IV	10Hrs.

Introduction to Mechatronics and Robotics: open-loop and closed-loop mechatronic systems. Classification based on robotics configuration: polar cylindrical, Cartesian coordinate and spherical. Application, Advantages and disadvantages.

Automation in industry: Definition, types – Fixed, programmable and flexible automation, basic elements with block diagrams, advantages

Introduction to IOT: Definition and Characteristics, Physical design, protocols, Logical design of IoT, Functional blocks, and communication models.

Reference Books:

1. Elements of Workshop Technology (Vol. 1 and 2), Hazra Choudhry and Nirzar Roy, Media Promoters and Publishers Pvt. Ltd., 2010.
2. Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill 3rd Ed., 2003.
3. Internal Combustion Engines, V. Ganesan, Tata McGraw Hill Education; 4th edition, 2017
4. Robotics, AppuKuttan KK K. International Pvt Ltd, volume 1
5. Dr SRN Reddy, RachitThukral and Manasi Mishra, " Introduction to Internet of Things: A Practical Approach", ETI Labs
6. Raj kamal, "Internet of Things: Architecture and Design", McGraw hill.
7. Elements of Mechanical Engineering, K R Gopala Krishna, Subhash Publications, 2008

8. An Introduction to Mechanical Engineering, Jonathan Wickert and Kemper Lewis, Third Edition, 2012

Course Outcomes:

CO1: Explain the role of Mechanical Engineering w.r.t the emerging trends and technologies in various sectors, knowledge of various sources of energy and engineering materials

CO2: Describe different conventional, advanced manufacturing systems and various metal joining processes

CO3: Compute and analyze the performance of IC engines used in automobiles and concept of electric and hybrid vehicles for future mobility

CO4: Enlighten about the fundamentals of Mechatronics, Robotics, Automation in industry and IOT

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	2					1	1				1
CO2	2	2			1	1	1					1
CO3	2	1			1	1						1
CO4	2	1			1	1		1	1			1

22UEE216E	Introduction to Electrical Engineering	03-Credits
Hrs/Week: 3:0:0		**CIE Marks:**50
Total Hours: 40 Hrs (40 T+00 P)		**SEE Marks:**50

Course Objectives:

1) To study the basics of DC, single phase & three phase circuits and electrical earthing
2) To Illustrate the laws of DC circuit, concepts of single phase & three phase AC circuits, domestic wiring practices and electricity generation principles, construction-working principle-applications of electrical machines & transformers
3) To apply circuit laws and concepts to calculate different parameters of DC circuits, single phase & three phase AC circuits
4) To evaluate the emf induced in generators & transformers under given conditions and assess energy consumption in domestic loads

UNIT – I	10 Hrs
Introduction: General structure of electrical power systems using single line diagram approach. **Power Generation:** Hydel, thermal, nuclear power plants (block diagram approach). **DC Circuits:** Ohm's law and its limitations, KCL & KVL, series, parallel, series-parallel circuits. Simple Numerical.	
UNIT – II	**10 Hrs**
AC. Fundamentals: Equation of AC voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor (only definitions), voltage and current relationship with phasor diagrams in R, L, and C circuits, concept of impedance, analysis of R-L, R-C, R-L-C series circuits, active power, reactive power and apparent power, concept of power factor. (Simple Numerical). **Three Phase Circuits:** Generation of three phase AC quantity, advantages and limitations, star and delta connection, relationship between line and phase quantities (excluding proof)	
UNIT - III	**10 Hrs**
DC Generator, DC Motor, Transformers: Working principle, construction, equations, types and classifications, specifications, applications, cost. Simple numerical.	
UNIT - IV	**10 Hrs**
Domestic Wiring: Requirements, Types of wiring, Two way and three way control of loads. **Electrical Energy Calculation:** Power rating of household appliances, two-part electricity tariff, calculation of electricity bill for domestic consumers. **Electrical Safety Measures:** Equipment: Types of equipment, voltage and current issues, safety. Human: Electric shock, effect of shock on body, factors affecting severity of shock, safety precautions.	
Reference books: 1) B.L Theraja, "Fundamentals of Electrical Engineering and Electronics", S. Chand Publications, 27th Edition, 2014 2) D C Kulshreshtha, "Basic Electrical Engineering", Tata McGraw Hill, 10th Edition, 2019. 3) Edward Hughes, "Electrical and Electronic Technology", Pearson Publications, 10th Edition, 2010 4) Rajendra Prasad, "Fundamentals of Electrical Engineering", 2nd Edition, PHI Learning, 2009 5) V.N.Mittle&A.Mittal, "Basic Electrical Engineering", Tata McGraw-Hill Education, 2005	

6) S. K. Bhattacharya, "Basic Electrical and Electronics Engineering", 2nd Edition, Pearson Publications, 2017

Course Outcomes:

CO1: Recall basics of DC, single phase & three phase circuits and electrical earthing

CO2: Illustrate the laws of DC circuit, concepts of single phase & three phase AC circuits, domestic wiring practices and electricity generation principles, construction-working principle-applications of electrical machines & transformers

CO3: Apply circuit laws and concepts to calculate different parameters of DC circuits, single phase & three phase AC circuits

CO4: Evaluate the emf induced in generators & transformers under given conditions and assess energy consumption in domestic loads

Course Outcomes	Programme Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	1	1			1	1	1		1		1
CO2	3	1	1	1		1	1	1		1		1
CO3	3	2	3	1								1
CO4	3	3	3	2								1

22UEC214N	Introduction to Electronics Engineering	03-Credits
Hrs/Week: 3:0:0		**CIE Marks:**50
Total Hours: 40		**SEE Marks:**50

Course Objectives:

1) Understand the operation of semiconductor devices and their applications.
2) Know transistor (BJT) as an amplifier.
3) Study Op-Amps and its applications.
4) Know logic circuits and their optimization.
5) Understand the principles of transducers and communication systems.

UNIT - I	10 Hrs
Power Supplies –Block diagram, PN Junction Diode Characteristics, Half-wave rectifier, Full-wave rectifiers and filters, Voltage regulators, Output resistance and voltage regulation, Voltage multipliers. **BJT Characteristics and Biasing**- Common Base and Common Emitter Configurations, Voltage Divider Biasing. **Self study component:** Switched Mode Power Supply.	
UNIT – II	**10 Hrs**
Amplifier and Oscillators – Single Stage CE Amplifier, Barkhausen criterion, sinusoidal and non-sinusoidal oscillators, Ladder network oscillator, Wein bridge oscillator, Multivibrators, Single-stage astable oscillator, Crystal controlled oscillators (Only Concepts, working, and waveforms. No mathematical derivations) **Operational amplifiers** - Ideal op-amp; characteristics of ideal and practical op-amp; Practical op- amp circuits: Inverting and non-inverting amplifiers, voltage follower, summer, integrator, differentiator.(Text 1) **Self study component:** Op-Amp as zero crossing detector	
UNIT - III	**10 Hrs**
Boolean Algebra and Logic Circuits: Binary numbers, Number Base Conversion, octal & Hexa Decimal Numbers, Complements, Basic definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates **Combinational logic**: Introduction, Design procedure, Adders- Half adder, Full adder, Parallel Adder **Self study component:** Half subtractor and full subtractor	
UNIT - IV	**10 Hrs**
Analog Communication Schemes – Modern communication system scheme, Information source, and input transducer, Transmitter, Channel or Medium – Hardwired and Soft wired, Noise, Receiver, Multiplexing, Types of communication systems. Types of modulation (only concepts) – AM , FM. **Digital Modulation Schemes**: Advantages of digital communication over analog communication, ASK, FSK, PSK, Radio signal transmission Multiple access techniques. **Sensors and Interfacing** – Instrumentation and control systems, Transducers, Sensors. **Self study component:** Opto-couplers	

Reference books:

1) Mike Tooley, 'Electronic Circuits, Fundamentals & Applications', 4th Edition, Elsevier, 2015.
2) Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203- 0417-84.
3) D P Kothari, I J Nagrath, 'Basic Electronics', 2nd edition, McGraw Hill Education (India),Private Limited, 2018

Course Outcomes:

A student who successfully completes this course should be able to

CO1: Differentiate semiconductor devices and their parameters based on V-I characteristics.
CO2: Analyze the applications of electronic devices and circuits.
CO3: Analyze logic circuits built with basic gates.
CO4: Solve numerical problems related to basic electronic circuits and systems.
CO5: Decide type of transducer, sensor and modulation for a given application.

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	3	2	-	2	2	-	-	-	-	-	-
CO2	3	2	3	-	2	1	-	-	-	-	-	-
CO3	3	2	3	-	3	-	-	-	1	-	-	-
CO4	2	1	1	-	2	1	-	-	1	-	-	1
CO5	2	1	1	-	2	1	-	-	1	-	-	1

22UCS220N	Introduction to C Programming	03-Credits
Hrs/Week: 2:0:2		**CIE Marks:**50
Total Hours: 40 Hrs (28 T+24 P)		**SEE Marks:**50

Course Objectives:

1 Explain the basic architecture and functionalities of a Computer
2 Apply programming constructs of C language to solve the real-world problems
3 Explore user-defined data structures like arrays and structures in implementing solutions to problems
4 Design and Develop Solutions to problems using structured programming constructs such as functions and procedures

UNIT – I	08 Hrs
Basic Organization of a Computer, Steps in problem solving, Algorithms and Flowcharts with examples. **Overview of C:** Features of C, Structure of C program, process of compiling and executing the C program. C**onstants, Variables and Data types:** Introduction, Character set, C tokens, Keywords and Identifiers, Constants, Variables, Data types, Declaration of variables, Example programs. **Operators and Expressions:** Arithmetic operators, Relational operators, Logical operators, Assignment operators, Increment and Decrement operators, Conditional operator, Bitwise operators, Special operators, Arithmetic expressions, Evaluation of expressions, Precedence of arithmetic operators, Type conversion in expressions, Operator precedence and Associativity.	
UNIT – II	**06 Hrs**
Managing Input and Output Operations: Formatted and Unformatted input and output statements. **Decision making and Branching:** Decision making with *if*, *if-else*, Nesting of *if-else* statements, *else-if* ladders, *switch* statement, ?: Operator, *goto* statement. **Decision making and Looping:** *while* statement, *do-while* statement, *for* statement, jumps in loops.	
UNIT – III	**06 Hrs**
Arrays: Introduction, One dimensional arrays, declaration and initialization of one-dimensional arrays, Two dimensional arrays, declaration and initialization of two-dimensional arrays. Operations on arrays. **Strings:** Introduction, Declaring and initializing string variables, String-handling functions, Array of String.	
UNIT – IV	**08 Hrs**
User defined functions: Introduction, Need for user-defined functions, a multi-function program, Elements of user defined function, Definition of functions, Return values and their types, Function calls, Function declaration. Category of functions: Based on call by value, call by reference, argument and return type and recursion. **Structures and Unions:** Defining a structure, Declaring structure variables, Accessing structure members, Initialization, Arrays of structure, Structures and Functions.	

Reference books:

1. E. Balaguruswamy, Programming in ANSI C**,** 7th Edition, Tata McGraw Hill Publications, 2017.
2. Reema Thareja, Computer fundamentals and programming in c, Oxford University, Second edition, 2017.
3. Kernighan and Ritchie, C Programming Language, 2nd Edition, 1988, 49th Reprint, 2017
4. Wesley J. Chun, A Structured Programming approach using C, Pearson Education India, 3rd Edition, 2015.
5. Stephen Kochan, Programming in C, 4th Edition, 2014
6. B. S. Anami, S. A. Angadi & S. S. Manvi, Computer Concepts and C programming-A Holistic approach to learning C, 2nd Edition, PHI, 2010

Course Outcomes:

CO1. Explain the basic architecture and functionalities of a computer and also recognize the hardware parts.
CO 2. Apply programming constructs of C language to solve the real world problem.
CO 3. Explore user-defined data structures like arrays in implementing solutions to problems like searching, sorting and tabular data processing.
CO 4. Explore user-defined data structures like structures in implementing solutions like heterogeneous data processing.
CO5. Design and Develop Solutions to problems using modular programming constructs using functions.

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	2			2							
CO2		1			2							2
CO3		1										2
CO4		2										2
CO5		3	3	2								2

22UCS230B	Introduction to Web Programming (Integrated)	03-Credits
Hrs/Week: 2:0:2		**CIE Marks:**50
Total Hours: 40 Hrs (28 T+24 P)		**SEE Marks:**50

Course objectives

1: To use the syntax and semantics of HTML and XHTML

2: To develop different parts of a web page

3: To understand how CSS can enhance the design of a webpage.

4: To create and apply CSS styling to a webpage

UNIT - I	06 Hrs.

Traditional HTML and XHTML: First Look at HTML and XHTML, Hello HTML and XHTML World, HTML and XHTML: Version History, HTML and XHTML DTDs: The Specifications Up Close, (X)HTML Document Structure, Browsers and (X)HTML, The Rules of (X)HTML, Major Themes of (X)HTML, The Future of Markup—Two Paths?

UNIT – II	06 Hrs.

HTML5: Hello HTML5, Loose Syntax Returns, XHTML5, HTML5: Embracing the Reality of Web Markup, Presentational Markup Removed and Redefined, HTML5 Document Structure Changes, Adding Semantics, HTML5's Open Media Effort, Client-Side Graphics with <canvas>, HTML5 Form Changes, Emerging Elements and Attributes to Support Web Applications

UNIT – III	06 Hrs.

Cascading Style Sheets (CSS): Introduction, CSS Overview , CSS Rules, Example with Type Selectors and the Universal Selector, CSS Syntax and Style, Class Selectors, ID Selectors, span and div Elements, Cascading, style Attribute, style Container, External CSS Files, CSS Properties, Color Properties, RGB Values for Color, Opacity Values for Color, HSL and HSLA Values for Color, Font Properties, line-height Property, Text Properties, Border Properties, Element Box, padding Property, margin Property , Case Study: Description of a Small City's Core Area.

UNIT – IV	06 Hrs.

Tables and CSS, Links and Images: Table Elements, Formatting a Data Table: Borders, Alignment, and Padding, CSS Structural Pseudo- Class Selectors, thead and tbody Elements, Cell Spanning, Web Accessibility, CSS display Property with Table Values, a Element, Relative URLs, Navigation Within a Web Page, CSS for Links, Bitmap Image Formats: GIF, JPEG, PNG, img Element, Responsive Images, Positioning Images, Shortcut Icon, iframe Element.

Programming Assignments:

1) Create an XHTML page using tags to accomplish the following:
   i) A paragraph containing text "All that glitters is not gold". Bold face and italicize this text
   ii)Create Equation: $_1 \square = 1/3(\square_1^2 + \square^2)$
   iii) Put a background image to a page and demonstrate all attributes of background image
   iv) Create unordered list of 5 fruits and ordered list of 3 flowers
2) Create following table using XHTML tags. Properly align cells, give suitable cell padding and cell spacing, and apply background color, bold and emphasis necessary
3) Use HTML5 for performing following tasks:

i) Draw a square using HTML5 SVG , fill the square with green color and make 6px brownstroke width

a. Write the following mathematical expression by using HTML5 MathML.$d=x^2-y^2$
b. Redirecting current page to another page after 5 seconds using HTML5 meta tag

4) Demonstrate the following HTML5 Semantic tags- <article>, <aside>, <details>, <figcaption>,
<figure>, <footer>, <header>, <main>, <mark>, <section> for a webpage that gives informationabout travel experience.

5) Create a class called **income**, and make it a background color of #0ff. Create a class called **expenses**, and make it a background color of #f0f. Create a class called **profit**, and make it a background color of #f00.

Throughout the document, any text that mentions income, expenses, or profit, attach the appropriate class to that piece of text. Further create following line of text in the same document:

and new price is 40₹

6) Change the tag **li** to have the following properties:

- A display status of inline
- A medium, double-lined, black border
- No list style type

Add the following properties to the style for **li**:

- Margin of 5px
- Padding of 10px to the top, 20px to the right, 10px to the bottom, and 20px tothe left

Also demonstrate list style type with user defined image logos

Course Outcomes:

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

1. Explain the historical context and justification for HTML over XHTML.
2. Develop HTML5 documents and adding various semantic markup tags.
3. Analyze various attributes, values and types of CSS.
4. Implement core constructs and event handling mechanisms of JavaScript.

Reference Books :

TextBook-1: HTML & CSS: The Complete Reference Thomas A. Powell, , Fifth Edition, Tata McGraw Hill,

TextBook-2: WEB PROGRAMMING with HTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, First Edition.

Web links and Video Lectures (e-Resources):

https://onlinecourses.swayam2.ac.in/aic20_sp11/preview

22UCS231B	Introduction to Python Programming (Integrated)	03-Credits
Hrs/Week: 2:0:2		**CIE Marks:**50
Total Hours: 40 Hrs (28 T+24 P)		**SEE Marks:**50

Course Objectives:

1. Learn the syntax and semantics of the Python programming language.
2. Illustrate the process of structuring the data using lists, tuples
3. Appraise the need for working with various documents like Excel, PDF, Word and Others.
4. Demonstrate the use of built-in functions to navigate the file system.

UNIT – I	08 Hrs

Python Basics: Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Your First Program, Dissecting Your Program,

Flow control: Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys.exit(),

Functions: def Statements with Parameters, Return Values and return Statements,The None Value, Keyword Arguments and print(), Local and Global Scope, The global Statement, Exception Handling, A Short Program: Guess the Number

Textbook 1: Chapters 1 – 3

UNIT – II	06 Hrs

Lists: The List Data Type, Working with Lists, Augmented Assignment Operators, Methods,Example Program: Magic 8 Ball with a List, List-like Types: Strings and Tuples, References,

Dictionaries and Structuring Data: The Dictionary Data Type, Pretty Printing, Using Data Structures to Model Real-World Things,

Textbook 1: Chapters 4 – 5

UNIT – III	06 Hrs

Manipulating Strings: Working with Strings, Useful String Methods, Project: Password Locker, Project: Adding Bullets to Wiki Markup

Reading and Writing Files: Files and File Paths, The os.path Module, The File Reading/Writing Process, Saving Variables with the shelve Module,Saving Variables with the print.format() Function, Project: Generating Random Quiz Files, Project: Multiclipboard,

Textbook 1: Chapters 6-8

UNIT – IV	08 Hrs

Organizing Files: The shutil Module, Walking a Directory Tree, Compressing Files with the zipfile Module, Project: Renaming Files with American-Style Dates to European-Style Dates,Project: Backing Up a Folder into a ZIP File,

Debugging: Raising Exceptions, Getting the Traceback as a String, Assertions, Logging, IDLE‟s Debugger.

Text Books/Reference books: Textbook 1: Chapters 9-10

Al Sweigart,**"Automate the Boring Stuff with Python",**1st Edition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at https://automatetheboringstuff.com/)

(Chapters 1 to 18, except 12) for lambda functions use this link: https://www.learnbyexample.org/pytho lambda-function/)

1. Allen B. Downey, **"Think Python: How to Think Like a Computer Scientist",** 2nd Edition, Green Tea Press, 2015. (Available under CC-BY-NC license at

http://greenteapress.com/thinkpython2/thinkpython2.pdf
(Chapters 13, 15, 16, 17, 18) (Download pdf/html files from the above link)

Course Outcomes:

CO1. Explain the syntax and semantics of different statements and functions.
CO 2. Demonstrate the use of strings,files,lists, tuples,dictionaries and exceptions
CO 3. Analyze the given problem and select appropriate data types, modules to develop the solution

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	2			2							
CO2		2										2
CO3		3	3	2								2

22UCS232B	Basics of Java Programming	03-Credits
Hrs/Week: 2:0:2		**CIE Marks:**50
Total Hours: 40 Hrs (28 T+12 P)		**SEE Marks:**50

Course Objectives:

1. Learn fundamental features of object oriented language and JAVA
2. Set up Java JDK environment to create, debug and run simple Java programs.
3. Learn object oriented concepts using programming examples.
4. Study the concepts of importing of packages and exception handling mechanism.

UNIT – I	08 Hrs
An Overview of Java: Object-Oriented Programming, A First Simple Program, A Second Short Program, Two Control Statements, Using Blocks of Code, Lexical Issues, The Java Class Libraries, Data Types, Variables, and Arrays: Java Is a Strongly Typed Language, The Primitive Types, Integers, Floating-Point Types, Characters, Booleans, A Closer Look at Literals, Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, A Few Words About Strings Text book 1: Ch 2, Ch 3	
UNIT – II	**06 Hrs**
Operators: Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator, Operator Precedence, Using Parentheses, Control Statements: Java‟s Selection Statements, Iteration Statements, Jump Statements. Text book 1: Ch 4, Ch 5	
UNIT – III	**06 Hrs**
Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection, The finalize( ) Method, A Stack Class, A Closer Look at Methods and Classes: Overloading Methods, Using Objects as Parameters, A Closer Look at Argument Passing, Returning Objects, Recursion, Introducing Access Control, Understanding static, Introducing final, Arrays Revisited Text book 1: Ch 6, Ch 7 (7.1-7.9)	
UNIT – IV	**08 Hrs**
Inheritance: Inheritance, Using super, Creating a Multilevel Hierarchy, When Constructors Are Called, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, The Object Class. Text book 1: Ch 8	
Reference books:	
Herbert Schildt, Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007. **Web links and Video Lectures (e-Resources):** ● https://onlinecourses.nptel.ac.in/noc22_cs47/preview	
Course Outcomes:	
CO1. To explain the features and object oriented concepts in JAVA programmin CO 2. To analyse working of bitwise operators in JAVA CO 3. To develop simple programs based on polymorphism and inheritance CO 4. To describe the concepts of importing packages and exception handling mechanism	

22UCS233B	Introduction to C++ Programming	03-Credits
Hrs/Week: 2:0:2		**CIE Marks:**50
Total Hours: 40 Hrs (28T+12 P)		**SEE Marks:**50

Course Objectives:

1. Understanding about object oriented programming and Gain knowledge about the capability to store information together in an object.
2. Understand the capability of a class to rely upon another class and functions.
3. Understand about constructors which are special type of functions.
4. Create and process data in files using file I/O functions
5. Use the generic programming features of C++ including Exception handling

UNIT – I	**08 Hrs**
Introduction to Object Oriented Programming: Computer programming background- C++ overview. First C++ Program -Basic C++ syntax, Object Oriented Programming: What is an object, Classes, methods and messages, abstraction and encapsulation, inheritance, abstract classes, polymorphism.	
UNIT – II	**06 Hrs**
Functions in C++: Tokens – Keywords – Identifiers and constants – Operators in C++ – Scope resolution operator – Expressions and their types – Special assignment expressions – Function prototyping – Call by reference – Return by reference – Inline functions -Default arguments – Function overloading.	
UNIT – III	**06 Hrs**
Inheritance & Polymorphism: Derived class Constructors, destructors-Types of Inheritance-Defining Derived classes, Single Inheritance, Multiple, Hierarchical Inheritance, Hybrid Inheritance.	
UNIT – IV	**08 Hrs**
I/O Streams: C++ Class Hierarchy- File Stream-Text File Handling- Binary File Handling during fileoperations.	

Reference books:

1. Bhushan Trivedi, “Programming with ANSI C++”, Oxford Press, Second Edition, 2012.
2.Balagurusamy E, Object Oriented Programming with C++, Tata McGraw Hill Education Pvt.Ltd , Fourth Edition 2010.

Weblinks and Video Lectures (e-Resources):

1. Basics of C++ - https://www.youtube.com/watch?v=BClS40yzssA
2. Functions of C++ - https://www.youtube.com/watch?v=p8ehAjZWjPw

Tutorial Link: 1. https://www.w3schools.com/cpp/cpp_intro.asp 2. https://www.edx.org/course/introduction-to-c-

Course Outcomes:

CO1. Able to understand and design the solution to a problem using object-oriented programming concepts.
CO2 Able to reuse the code with extensible Class types, User-defined operators and function Overloading.
CO3 Achieve code reusability and extensibility by means of Inheritance and Polymorphism CO4 Implement the features of C++ including templates, exceptions and file handling for providing programmed solutions to complex problems.

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	2			2							
CO2		1			2							2
CO3		1										2
CO4		2										2

22UHS224C:	Professional Writing Skills in English	01-Credit
Hrs/Week: 1:0:0		**CIE Marks:**50
Total Hours:15 Hrs		**SEE Marks:**50

Course Objectives:

The course Professional Writing Skills in English will enable the students,

1. To Identify the Common Errors in Writing and Speaking of English.
2. To Achieve better Technical writing and Presentation skills for employment.
3. To read Technical proposals properly and make them to write good technical reports.
4. To Acquire Employment and Workplace communication skills.
5. To learn about Techniques of Information Transfer through presentation in different level.

UNIT - I	3 Hrs
Identifying Common Errors in Writing and Speaking of English: Common errors identification in parts of speech, Use of verbs and Phrasal verbs, Auxiliary verbs and their forms, Subject Verb Agreement. Noun-pronoun agreement, Sequence of Tenses and errors identification in Tenses. Advanced English Vocabulary and its types –Words often Confused, Misplaced modifiers, Contractions, Collocations, Word Order.	
UNIT – II	**4 Hrs**
Nature and Style of sensible writing: Organizing Principles of Paragraphs in Documents, Writing Introduction and Conclusion, Importance of Proper Punctuation, The Art of Condensation (Precise writing) and Techniques in Essay writing, Common Errors due to Indianism in English Communication, Creating Coherence and Cohesion, Sentence arrangements exercises. Importance of Summarizing and Paraphrasing. **Grammar** – Voice and Speech (Active and Passive Voices) and Reported Speech, Spotting Error Exercises, Sentence Improvement Exercises.	
UNIT - III	**4 Hrs**
Technical Reading and Writing Practices: Introduction to Technical writing process, Effective Technical Reading and Writing, Introduction to Technical Reports writing, Types of Reports. Introduction to Technical Proposals Writing, Types of Technical Proposals. Scientific Writing & It's Process. The Listening Comprehension, Types of Listening, Barriers of listening, Improving Listening Skills. Attribute of a good and poor listener. Reading Skills and Reading Comprehension, Active and Passive Reading.	
UNIT - IV	**4 Hrs**
Professional Communication for Employment: Preparation of Job Application, Components of Letter Writing, Formats and Types of official, employment, Business Letters, Resume vs Bio Data, Profile & CV. Types of resume, Writing effective resume for employment, Model Letter of Application (Cover Letter) with Resume, Emails, Blog Writing, Memos. Presentation skills and Formal Presentations by Students. **Professional Communication at Workplace:** Group Discussion – Importance, Characteristics, Strategies of Group Discussions. Employment/ Job Interviews. Non-Verbal Communication Skills.	
Reference books: 1. Professional Writing Skills in English, Infinite Learning Solutions – (Revised Edition) 2022. 2. Functional English (As per AICTE 2018 Model Curriculum) Cengage learning India Pvt. Ltd. [Latest Revised Edition] - 2020.	

3. A Course in Technical English, Cambridge University Press – 2020.

4. Sanjay Kumar and Pushplata, 'Communication Skills', Oxford University Press - 2018. Refer it'sworkbook for activities and exercises – "Communication Skills – I (A Workbook)" published by Oxford University Press – 2018.

5. Meenakshi Raman and Sangeetha Sharma, 'Technical Communication – Principles and Practice', 3rd edition by, Oxford University Press 2017.

Course Outcomes:

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

CO1: Identify the Common Errors in Writing and Speaking
CO2: Present technical proposals properly and write good technical reports.
CO3: Build Professional and Workplace communication skills.
CO4: Apply Techniques of Information Transfer through presentation in different levels.
CO5: Utilize basic professionalEnglish writing, reading and speaking with fluency.

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	-	-	-	-	-	-	-	-	-	3	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	3

22UHS226C	Samskruthika Kannada	01-Credit
Hrs/Week: 1:0:0		**CIE Marks:**50
Total Hours:15 Hrs		**SEE Marks:**50

Course Objectives:

1. ‘¸ÁA¸ÀÌøwPÀPÀ£ÀßqÀ’ ¥ÀoÀåzÀ ªÀÄÆ®PÀ «zÁåyðUÀ¼À°è PÀ£ÀßqÀ £ÁqÀÄ, £ÀÄr, ¨sÁµÉ, ªÀÄvÀÄÛPÀ£ÀßrUÀgÀ ¸ÁA¸ÀÌøwPÀ §zÀÄQ£À §UÉUÉ CjªÀÅ ªÀÄÆr¸ÀÄªÀÅzÀÄ.
2. «zÁåyðUÀ¼À°è÷PÀ£ÀßqÀ ¨sÁµÉ ºÁUÀÆ CzÀPÉÌ ¥ÀÆgÀPÀªÁVgÀÄªÀPÀ£ÀßqÀ ªÁåPÀgÀuÁA±ÀUÀ¼À §UÉUÉ CjªÀÅ ªÀÄÆr¸ÀÄªÀÅzÀÄ. ¥ÁæzÉÃ²PÀ ¨sÁµÉAiÀÄ°èCfð ªÀÄvÀÄÛ ¥ÀvÀæªÀåªÀºÁgÀUÀ¼À£ÀÄß ¸ÀªÀÄxÀðªÁV ¤ªÀð»¸À®Ä ¥ÉæÃgÉÃ¦¸ÀÄªÀÅzÀÄ. .
3. vÁAwæPÀCzsÀåAiÀÄ£ÀzÀ «zÁåyðUÀ¼À°è PÀ£ÀßqÀ ¨sÁµÉAiÀÄ §gÀªÀtÂUÉ ªÀÄvÀÄÛ §gÀªÀtÂUÉAiÀÄ¯ÁèUÀÄªÀ zÉÆÃµÀUÀ¼À£ÀÄß UÀÄgÀÄw¸ÀÄªÀ ¸ÁªÀÄxÀåðªÀ£ÀÄ ¨É¼É¸ÀÄªÀÅzÀÄ.
4. «zÁåyðUÀ¼À°è CqÀVgÀÄªÀ ¸ÀÄ¥ÀÛ ¥Àæw¨sÉAiÀÄ£ÀÄß C£ÁªÀgÀtUÉÆ½¸ÀÄªÀ ¤nÖ£À°èCªÀgÀ°è PÀ¯É, §gÀªÀtÂUÉ ªÀÄvÀÄÛ ¨sÁµÁAvÀgÀPÀ¯ÉAiÀÄ°èD¸ÀQÛAiÀÄ£ÀÄß ªÀÄÆrü¸ÀÄªÀÅzÀÄ.J®èPÀÆÌ ªÉÄÃ¯ÁV ªÀiÁ£À«ÃAiÀÄ ªÀiË®åUÀ¼ÉÆA¢UÉ ¸ÀªÁðAVÃtªÁV ¸ÀAªÀzsÀð£ÉUÉÆ½¹ CªÀgÀ£ÀÄßgÁµÀÖçzÀCªÀÄÆ®å ¸ÀA¥ÀvÀÛ£ÁßV gÀÆ¦¹¸ÀÄªÀÅzÀÄ.

UNIT - I	4Hrs
1. PÀ£ÁðlPÀ ¸ÀA¸ÀÌÈw : ºÀA¥À £ÁUÀgÁdAiÀÄå 2. PÀ£ÁðlPÀzÀKQÃPÀgÀt :MAzÀÄC¥ÀÇªÀðZÀjvÉæ - f. ªÉAPÀl¸ÀÄ§âAiÀÄå 3. DqÀ½vÀ ¨sÁµÉAiÀiÁVPÀ£ÀßqÀ - □□. □□□. □□□□□□□□□□□□□¥ÉÆæ. □□. □□□□□□□□□□	
UNIT – II	**4Hrs**
1. ªÀZÀ£ÀUÀ¼ÀÄ :□□□□□□□□□□□□□,□□□□□□□, □□□□□□□□□□□□,□□□□□□□□□□□,□□□□□□□□□□□□□□□□□□□, 2. QÃvÀð£ÉUÀ¼ÀÄ :vÀ®ètÂ¸À¢gÀÄPÀAqÀåvÁ¼ÀÄ ªÀÄ£ÀªÉ - PÀ£ÀPÀzÁ¸À 3. vÀvÀé¥ÀzÀUÀ¼ÀÄ :¸Á«gÀ PÉÆqÀUÀ¼À ¸ÀÄlÄÖ - ²±ÀÄ£Á¼À µÀjÃ¥sÀ 4. d£À¥ÀzÀVÃvÉ :©Ã¸ÀÄªÀ ¥ÀzÀ	
UNIT - III	**4Hrs**
1. ªÀÄAPÀÄwªÀÄä£ÀPÀUÀÎ :r.«.f. 2. PÀÄgÀÄqÀÄPÁAZÁuÁ :zÀ.gÁ. ¨ÉÃAzÉæ 3. □□□□□□□□□□□□□:PÀÄªÉA¥ÀÅ 4. □□□□□□□□□□□□□□ :□□□□□□□□□□□□□□ 5. □□□□□□□ :□□□□□□□□□□□□□□□	
UNIT - IV	**3Hrs**
1. qÁ. ¸Àgï JA «±ÉéÃ±ÀégÀAiÀÄå– ªÀåQÛªÀÄvÀÄÛLwºÀå :JJ£ï ªÀÄÆwðgÁªï 2. PÀgÀPÀÄ±À® PÀ¯ÉUÀ¼ÀÄ ªÀÄvÀÄÛ ¥ÀgÀA¥ÀgÉAiÀÄ «eÁÕ£À :PÀjÃUËqÀ ©ÃZÀ£ÀºÀ½î 3. ‘PÀ’ªÀÄvÀÄÛ‘§’ §gÀºÀ vÀAvÁæA±ÀUÀ¼ÀÄ□□□□□PÀ£ÀßqÀzÀmÉÊ¦AUï	
Reference books: ¸ÁA¸ÀÌøwPÀPÀ£ÀßqÀ (¸ÀA), qÁ.».a.¨ÉÆÃgÀ°AUÀAiÀÄå&qÁ.J¯ï.wªÉÄäÃ±À, Prasaranga VTU, Belagavi, Karnataka, 2020.	
□□□□□□□□□□□□□□□□□□: **(Course Outcomes)** **At the end of the course student will be able to:** **CO1:** «zÁåyðUÀ¼ÀÄ ¨Ë¢ÞPÀªÁV ¨É¼ÉAiÀÄÄªÀÅzÀgÉÆA¢UÉ £ÀªÀÄä £Ár£À ªÀÄvÀÄÛzÉÃ±ÀzÀ ¸ÁA¸ÀÌøwPÀ ªÁgÀ¸ÀÄzÁgÀgÁV ¨É¼ÉzÀÄ ¸ÁéªÀ®A©AiÀiÁV §zÀÄPÀÄ PÀnÖPÉÆ¼ÀÄîvÁÛgÉ	

CO2: PÀ£ÀßqÀ ¨sÁµÉAiÀÄ£ÀÄß ¸ÀªÀÄxÀðªÁV ªÀiÁvÀ£ÁqÀÄªÀÅzÀgÉÆA¢UÉ, C£ÀågÀ£ÀÄß CxÉÊð¹PÉÆ¼ÀÄîªÀ ªÀÄ£ÉÆÃ§®
¨É¼É¹PÉÆ¼ÀÄîvÁÛ£É. EªÀwÛ£À ¸ÀAQÃtðªÁzÀ ¸ÁªÀiÁfPÀ ªÀåªÀ¸ÉÜAiÀÄ°è ¸Ëº ÁzÀðAiÀÄÄvÀªÁzÀ
£ÀqÀÄªÀ½PÉAiÉÆA¢UÉ¸ÀA¥À£ÀÆä® ªÀåQÛAiÀiÁV gÀÆ¥ÀÄUÉÆ¼ÀÄîvÁÛ£É.
CO3:eÁUÀwPÀgÀtzÀÀ ¸ÀAzÀ¨sÀðzÀ°è «zÁåyðUÀ¼ÀÄ ¸ÀévÀAvÀæöªÁVD¯ÉÆÃa¸ÀÄªÀ, ¸ÀévÀAvÀæªÁV §gÉAiÀÄÄªÀ,
¸ÀévÀAvÀæªÁV aAvÀ£À²Ã®gÁUÀÄªÀ ¸ÁªÀÄxÀåðªÀ£ÀÄß ¥ÀqÉzÀÄ, ¸ÀªÀÄAiÉÆÃavÀªÁV ¸ÀÆPÀÛ ¤zsÁðgÀUÀ¼À£ÀÄß
PÉÊUÉÆ¼ÀÄîªÀ°è F CzsÀåAiÀÄ£À ¢Ã¥À¸ÀÜA§ªÁVzÉ.
CO4:«zÁåyðUÀ¼ÀÄ EA¢£À eÁUÀwPÀ «zÀåªÀiÁ£ÀUÀ¼À£ÀÄß CxÉÊð¹PÉÆAqÀÄ, ¸ÀªÀiÁdzÀ°è ¸ÀAWÀfÃ«AiÀiÁV
¨É¼ÉAiÀÄÄªÀ ªÀÄ£ÉÆÃ§®ªÀ£ÀÄß ªÀÄvÀÄÛDvÀä¸ÉÛöÊAiÀÄðªÀ£ÀÄßvÀÄA§ÄªÀ°è F CzsÀåAiÀÄ£À ¸ÀÆPÀÛªÁzÀ
ªÀiÁUÀðzÀ²ðPÉAiÀiÁVzÉ.
CO5: vÀ£Àß C¹ävÉAiÀÄ ºÀÄqÀÄPÁlzÀ°ègÀÄªÀ ªÀåQÛUÉ, CzÀÄ F £É®zÀ ¸Áé©üªÀiÁ£À, ¨sÁvÀÈvÀé, ¦æÃw,
¸ËºÁzÀðAiÀÄÄvÀªÁzÀ ªÀÄ£À¸ÀÄìUÀ¼À°è EzJA§ÄzÀ£ÀÄß «zÁåyðUÀ¼À CjvÀPÉÌvÀgÀÄvÀÛzÉ. «zÁåyðUÀ¼À°è
¥Àj¸ÀgÀ ¥ÀæeÉÕAiÀÄ£ÀÄß eÁUÀÈvÀUÉÆ½¹, zÉÊªÀ¸ÀÈ¶ÖAiÀiÁzÀ F CªÀÄÆ®å ¸ÀA¥ÀvÀÛ£ÀÄß »vÀ-«ÄvÀªÁV
§¼À¹PÉÆAqÀÄ ªÀÄÄA¢£À vÀ¯ÉªÀiÁjUÉCzÀ£ÀÄß §¼ÀÄªÀ½AiÀiÁV ©lÄÖºÉÆÃUÀÄªÀ°èeÁUÀÈvÀ£ÁUÀÄvÁÛ£É.

Note:
Eligibility criteria for registration of Kannada subject: students who have studied Kannada language as one of the subjects either in tenth standard or PUC-II have to register Samskruthika Kannada.

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	2	-	-
CO3	-	-	-	-	-	1	-	-	-	-	-	-
CO4	-	-	-	-	-	2	-	-	-	-	-	-
CO5	-	-	-	-	-	1	3	-	-	-	-	-

22UHS227C	§¼ÀPÉ PÀ£ÀßqÀ: Balake Kannada	01-Credit
Hrs/Week: 1:0:0		**CIE Marks:**50
Total Hours: 15 Hrs (15 T)		**SEE Marks:**50

Course Objectives:

1 .'§¼ÀPÉ PÀ£ÀßqÀ '¥ÀoÀåzÀ CzsÀåAiÀÄ£À¢AzÀ «zÁåyðUÀ¼ÀÄ PÀ£ÀßqÀ ¨sÁµÉAiÀÄ£ÀÄß CxÉÊð¹PÉÆAqÀÄ, PÀ£ÀßqÀzÀ°è ¸ÀAªÀºÀ£À ªÀiÁqÀ®Ä ¸ÁzsÀåªÁUÀÄvÀÛzÉ.

2. PÀ£ÀßqÀ ªÀtðªÀiÁ¯ÉAiÀÄ §UÉUÉ CjªÀÅ ªÀÄÆr¸ÀÄªÀÅzÀÄ ªÀÄvÀÄÛ «zÁåyðUÀ¼À°è DAvÀjPÀ ¸ÀAªÀºÀ£À QæAiÉÄAiÀÄ£ÀÄß ªÀÈ¢ÞUÉÆ½¸ÀÄªÀÅzÀÄ.

3. PÀ£ÀßqÀ ¸ÀASÉåUÀ¼À §UÉUÉ CjªÀÅ ªÀÄÆr¹, CªÀÅUÀ¼À£ÀÄß ¸ÀªÀÄAiÉÆÃavÀªÁV §¼À¸ÀÄªÀ «zsÁ£ÀªÀ£ÀÄß PÀ°¹PÉÆqÀÄªÀÅzÀÄ.

4. £ÀªÀÄä £Ár£À ¸ÁA¸ÀÌøwPÀ ªÉÊ«zsÀåvÉAiÀÄ£ÀÄß CjvÀÄ, CxÉÊð¹PÉÆAqÀÄ £ÁqÀªÀgÉÆA¢UÉ ¸ËºÁzÀðAiÀÄÄvÀªÁV §zÀÄPÀ®Ä PÀ°¸ÀÄªÀÅzÀÄ.

UNIT – I	04 Hrs

- Necessity of learning a local language:
- Tips to learn the language with easy methods.
- Easy learning of a Kannada Language: A few tips
- Hints for correct and polite conservation
- Key to Transcription

Lessons to teach and Learn kannada Language

1 ವೈಯಕ್ತಿಕ, ಸ್ವಾಮ್ಯಸೂಚಕ/ಸಂಬಂಧಿತ ಸರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು – Personal pronouns, possessive Forms, Interrogative words

2 ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು – Possessive forms of nouns, dubitive question and Relative nouns

3 ಗುಣ,ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು – Qualitative, Quantitative and Colour Adjectives, Numerals

UNIT – II	04 Hrs

1. ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು – Ordinal numerals and piural markers

2. ನ್ಯೂನ / ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು ಮತ್ತು ವರ್ಣ ಗುಣವಾಚಕಗಳು – Defective/Negative Verbs and Colour Adjectives ಅಪ್ಪಣೆ / ಒಪ್ಪಿಗೆ,ನಿರ್ದೇಶನ,ಪ್ರೋತ್ಸಾಹ ಮತ್ತು ಒತ್ತಾಯ ಅರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು
3. ವಾಕ್ಯಗಳು Permission, Commands, encouraging and Urging words (Imparative words and sentences)

ಹೋಲಿಕೆ (ತರತಮ), ಸಂಬಂಧಸೂಚಕ ಮತ್ತು ವಸ್ತುಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಪದಗಳ

1. ಬಳಕೆ – Comparitive, Rilation ship, identification and Negation words

UNIT-III	**04 Hrs**

1. ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿದ ಪ್ರಕಾರಗಳು – Different types of forms of Tense, Time and Verbs
2. ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು – Kannada words in Conversation
3. ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮತ್ತು ರಾಜ್ಯದ ಬಗ್ಗೆ ಕುರಿತಾದ ಇತರೆ ಮಾಹಿತಿಗಳು
4. ಭಾಷೆ ಕಲಿಯಲು ಏನನ್ನು ಮಾಡಬೇಕು ಮತ್ತು ಮಾಡಬಾರದು – Do's and don'ts in learnig language

	03 Hrs

1. Kannada language script part – 1
2. Kannada language script part – 1

Course Outcomes:

ಕೋರ್ಸ್‌ಲಿತಾಂಶಗಳು:

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

CO1: «zÁåyðUÀ¼ÀÄ PÀ£ÀßqÀ ¨sÁµÉAiÀÄ£ÀÄß ¸ÀÄ®¨sÀªÁV CxÉÊð¹PÉÆAqÀ ¸ÁªÀiÁfPÀªÁV, DyðPÀªÁV DAiÀiÁ ¥ÀæzÉÃ±ÀzÀ d£ÀgÉÆA¢U ÉC£ÉÆåÃ£Àåª ÁV ªÀåªÀºÀj¸ÀÄvÁÛgÉ.

CO2: F ¥ÀoÁåzsÀåAiÀÄ£À¢AzÀ «zÁåyðAiÀÄÄ DAiÀiÁ ¥ÀæzÉÃ±ÀUÀ¼À £ÀA©P ¸ÀA¥ÀæzÁAiÀÄ ªÀÄvÀÄÛ DZÀgÀuÉUÀ¼À£ÀÄß ¸ÀÄ®¨sÀªÁV CxÀðªÀiÁrPÉÆ¼Àî®Ä ¸ÁzsÀåªÁUÀÄvÀÛzÉ.

CO3: PÀ£ÀßqÀ ¸ÀASÉåUÀ¼À ¥ÀjPÀ®à£É¬ÄAzÀ «zÁåyðAiÀÄÄ ªÁtÂ ªÀåªÀºÁgÀUÀ¼À£ÀÄß ¸ÀÄ®¨sÀªÁV £ÉgÉªÉÃj¸À®Ä ¸ÁzsÀåªÁUÀÄvÀÛzÉ.

CO4: ºÀAvÀºÀAvÀªÁV «zÁåyðAiÀÄÄ PÀ£ÀßqÀ ¨sÁµÉAiÀÄ°è §gÀªÀtÂUÉAiÀ PÀ¯ÉAiÀÄ£ÀÄß ªÀÄvÀÄÛ NzÀÄªÀ PÀ¯ÉAiÀÄ£ÀÄß ¨É¼É¹PÉÆ¼ÀÄîvÁÛ£É.

CO5: F ¨sÁµÉAiÀÄ ¸ÀA¥ÀPÀð¢AzÁV «zÁåyðAiÀÄÄ PÀ£ÀßqÀ ¸Á»vÀå ¥ÀæPÁgÀUÀ¼Áz PÀvÉ, PÀªÀ£À, PÁzÀA§j,£ÁlPÀ ªÀÄÄAvÁzÀ PéëÃvÀæUÀ¼À°è vÀ£Àß C©ügÀÄaAiÀÄ£ÀÄß ºÉaÑ¹PÉÆ¼ÀÄîvÁÛ£É

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	-	-	-	-	-	-	-	-	-	2	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	-	-	-	-	2	-	-
CO5	-	-	-	-	-	-	-	-	-	2	-	-

21UHS229C	Innovation and Design Thinking	01-Credit
Hrs/Week: 1:0:0		**CIE Marks:**50
Total Hours: 15 Hrs		**SEE Marks:**50

Course Objectives:

1.To explain the concept of design thinking for product and service development
2.To explain the fundamental concept of innovation and design thinking.
3.To discuss the methods of implementing design thinking in the real world.

UNIT - I	3Hrs
Understanding Design thinking: Introduction about the design thinking, steps in Design Thinking Empathize, Design, Ideate, Prototype and Test, Explore presentation signers across globe–MVP or Prototyping.	
UNIT – II	**4Hrs**
Tools for Design Thinking: Importance of tools for design thinking**,** Visualization**,** Journey mapping, Value chain analysis, Mind mapping, Rapid concept development, Assumption testing, Prototyping, Customer co-creation, Learning launches, Storytelling.	
UNIT - III	**4Hrs**
Design Thinking in IT: Agile in Virtual collaboration environment – Scenario based Prototyping. **DTF or strategic innovations:** Growth – Story telling representation, predictability- Strategic Foresight, Change – Sense Making,	
UNIT - IV	**4Hrs**
Design Thinking in IT: Agile in Virtual collaboration environment – Scenario based Prototyping. **DTF or strategic innovations:** Growth – Story telling representation, predictability- Strategic Foresight, Change – Sense Making,	

Reference books:

1. John R.Karsnitz, Stephen O'Brienand John P. Hutchinson, "Engineering Design", Cengage learning (International edition)2nd edition,2013.
2. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press,2009.
3. HassoPlattner,ChristophMeinelandLarryLeifer(eds),"DesignThinking:Understand–Improve–Apply",Springer,2011

4. Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Businessor Design School", JohnWiley&Sons2013.
5. YousefHaikandTamerM.Shahin,"EngineeringDesignProcess",CengageLearning,2nd edition,2011.

Course Outcomes:

At the end of the course student will be able to:

CO1: Demonstrate the knowledge and concepts of design thinking.

CO2: Analyze various tools of design thinking and use an appropriate tool for design thinking.

CO3: Describe the role of design thinking in IT industry.

CO4: Demonstrate design thinking solutions to business challenges.

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	-	3	3	2	-	-	-	-	-	-	-	-
CO2	-	2	3	2	3	-	-	-	-	-	-	-
CO3	-	-	1	1	3	-	-	-	-	-	-	-
CO4	-	3	2	1	-	-	-	-	-	-	-	-