Basaveshwar Engineering College, Bagalkote
B.E I - Semester Scheme of Teaching and Examinations
(Academic year 2022-23)

I - Semester (Mechanical Engineering Stream) **Branches: ME and IP** **(Chemistry Group)**

Sl. No.	Course			TD	Teaching (Hours/Week)				Examination				Credits
	Category	Code	Title		Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1.	ASC (IC)	22UMA104C	Mathematics for Mechanical Sciences - I	Mathematics	3	0	2	0	3	50	50	100	4
2.	ASC (IC)	22UCH112C	Chemistry for Mechanical Sciences	Chemistry	3	0	2	0	3	50	50	100	4
3.	ESC	22UME121C	Elements of Mechanical Engineering	ME	3	0	0	0	3	50	50	100	3
4.	ESC - I	22UXXXXXN	Engineering Science Course - I	Respective Engg. Dept	2	0	2	0	3	50	50	100	3
5.	ETC - I	22USXXXXB	Emerging Technology Course - I	Any Engg. Dept	3	0	0	0	3	50	50	100	3
6.	HSSC	22UHS124C	Communicative English	Humanities	1	0	0	0	1	50	50	100	1
7.	HSSC	22UHS126C 22UHS127C	Samskruthika Kannada* Balake Kannada**	Humanities	1	0	0	0	1	50	50	100	1
8.	AEC	22UHS129C	Innovation and Design Thinking	Any Dept	1	0	0	0	1	50	50	100	1
				Total	**17**		**6**	**0**		**400**	**400**	**800**	**20**

SDA	: Skill Development Activities	**TD**	: Teaching Department	**ASC**	:	Applied Science Course
ESC	: Engineering Science Courses	**ETC**	: Emerging Technology Course	**AEC**	:	Ability Enhancement Course
HSSC	: Humanities & Social Science Course	**SDC**	: Skill Development Course	**IC**	:	Integrated Course (Theory & Lab integrated)
CIE	: Continuous Internal Evaluation	**SEE**	: Semester End Examination			

*The student who has studied Kannada language as one of the subjects either in 10^{th}, 12^{th} std. or PUC - II has to register
** The student who has not studied Kannada language as one of the subjects either in 10^{th}, 12^{th} std. or PUC - II has to register

Student's Induction Program (SIP):

The objective is to provide newly admitted students i) a broad understanding of society, relationships and values. ii) Knowledge & skill of his/her study, iii) to nurture character as an essential quality by which he/she shall understand and fulfill the responsibility as an engineer.

Activities : Creative Arts, Universal Human Values, Literary, Proficiency Modules, Physical Activity, Lectures by Eminent People, Visits to Local areas, Familiarization with Department/Branch and Innovation, etc.

AICTE Activity Points (AAP): (For details refer to Chapter 6, AICTE Activity Point Program, Model Internship Guidelines)

To be earned by all students admitted to BE program over and above the academic grades. A regular student admitted to 4 years Degree program and also through lateral entry shall earn 100 and 75 Activity Points respectively for the award of degree. Students transferred from other Universities to the V semester are required to earn 50 Activity Points from the year of entry. The Activity Points earned shall be reflected in the student's VIII semester Grade Card. The activities can be spread over the course duration, any time during the semester weekends and holidays, as per the convenience of a student from the year of entry to the program. However, the minimum duration (number of hours) should be fulfilled. Activity Points (non-credit) do not affect SGPA/CGPA and shall not be considered for vertical progression. In case students fail to earn the prescribed AAP, the VIII Semester Grade Card shall be issued only after earning the required points. A Student shall be eligible for the award of the degree only after the release of the VIII semester Grade Card.

(ESC - I) Engineering Science Courses - I					**(ETC - I) Emerging Technology Courses - I**				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
22UCV118N	Introduction to Civil Engineering	3	0	0	22UEC134B	Introduction to Embedded Systems	3	0	0
22UEE116N	Introduction to Electrical Engineering	3	0	0	22UEC135B	Introduction to Communication Technology	3	0	0
22UEC114N	Introduction to Electronics Engineering	3	0	0	22UEE136B	Renewable Energy Sources	3	0	0
22UCS120N	Introduction to 'C' Programming	2	0	2	22UCV138B	Green Buildings	3	0	0
					22UCV139B	Waste Management	3	0	0
					22UCS140B	Introduction to Internet of Things (IOT)	3	0	0
					22UCS141B	Introduction to Cyber Security	3	0	0
					22UME142B	Composite Materials	3	0	0
					22UME143B	Introduction to Robotics	3	0	0
					22UBT148B	Biomass and Bio-energy	3	0	0

(PLC - I) Programming Language Courses - I				
Code	**Title**	**L**	**T**	**P**
22UCS130B	Introduction to Web Programming	2	0	2
22UCS131B	Introduction to Python Programming	2	0	2
22UCS132B	Basics to JAVA programming	2	0	2
22UCS133B	Introduction to C++ Programming	2	0	2

NOTE: The student has to,

i) Select one course from ESC - I group

ii) Select one course from either ETC - I or PLC - I group

iii) Opt for the courses from ESC-I group without repeating the course either in 1st or 2nd semester

If the student studies a subject from ETC - I in 1st semester, then he/she has to select the course from PLC - I in the 2nd semester and vice-versa

Basaveshwar Engineering College, Bagalkote
B.E II - Semester Scheme of Teaching and Examinations
(Academic year 2022-23)

II - Semester (Mechanical Engineering Stream) **Branches: ME and IP** **(Physics Group)**

Sl. No.	Course			TD	Teaching (Hours/Week)				Examination				Credits
	Category	Code	Title		Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1.	ASC (IC)	22UMA204C	Mathematics for Mechanical Sciences - II	Mathematics	3	0	2	0	3	50	50	100	4
2.	ASC (IC)	22UPH208C	Physics for Mechanical Sciences	Physics	3	0	2	0	3	50	50	100	4
3.	ESC	22UME223C	CAED	Civil / Mechanical	2	0	2	0	3	50	50	100	3
4.	ESC - I	22UXXXXXE	Engineering Science Course-I	Respective Engg. Dept	3	0	0	0	3	50	50	100	3
5.	PLC - I	22USXXXXE	Programming Language Course-I	Any Engg. Dept	2	0	2	0	3	50	50	100	3
6.	HSSC	22UHS224C	Professional Writing Skills in English	Humanities	1	0	0	0	1	50	50	100	1
7.	HSSC	22UHS225C	Constitution of India	Humanities	1	0	0	0	1	50	50	100	1
8.	AEC	22UHS228C	Scientific Foundations of Health	Any Dept	1	0	0	0	1	50	50	100	1
				Total	**16**		**8**	**0**		**400**	**400**	**800**	**20**

SDA : Skill Development Activities
TD : Teaching Department
ASC : Applied Science Course
ESC : Engineering Science Courses
ETC : Emerging Technology Course
AEC : Ability Enhancement Course
HSSC : Humanities & Social Science Course
SDC : Skill Development Course
IC : Integrated Course (Theory & Lab integrated)
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Student's Induction Program (SIP):

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(ESC - I) Engineering Science Courses - I					**(ETC - I) Emerging Technology Courses - I**				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
22UCV218N	Introduction to Civil Engineering	3	0	0	22UEC234B	Introduction to Embedded Systems	3	0	0
22UEE216N	Introduction to Electrical Engineering	3	0	0	22UEC235B	Introduction to Communication Technology	3	0	0
22UEC214N	Introduction to Electronics Engineering	3	0	0	22UEE236B	Renewable Energy Sources	3	0	0
22UCS220N	Introduction to 'C' Programming	2	0	2	22UCV238B	Green Buildings	3	0	0
					22UCV239B	Waste Management	3	0	0
					22UCS240B	Introduction to Internet of Things (IOT)	3	0	0
					22UCS241B	Introduction to Cyber Security	3	0	0
					22UME242B	Composite Materials	3	0	0
					22UME243B	Introduction to Robotics	3	0	0
					22UBT248B	Biomass and Bio-energy	3	0	0

(PLC - I) Programming Language Courses - I					
Code	**Title**	**L**	**T**	**P**	
22UCS230B	Introduction to Web Programming	2	0	2	
22UCS231B	Introduction to Python Programming	2	0	2	
22UCS232B	Basics to JAVA programming	2	0	2	
22UCS233B	Introduction to C++ Programming	2	0	2	

NOTE: The student has to,

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iii) Opt for the courses from ESC-I group without repeating the course either in 1st or 2nd semester

If the student studies a subject from ETC - I in 1st semester, then he/she has to select the course from PLC - I in the 2nd semester and vice-versa

22UMA104C	Mathematics for Mechanical Sciences–I (Integrated)	04-Credits
Hrs/Week: 3:0:2		**CIE Marks:**50
Total Hours: 40Hrs		**SEE Marks:**50

Course Objectives:

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

UNIT – I	10 Hrs

Introduction to polar coordinates and curvature relating to mechanical engineering.

Polar coordinates, Polar curves, angle between the radius vector and the tangent, 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: Applied Mechanics, 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 equation

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	10 Hrs

Introduction to series expansion and partial differentiation in the field of Mechanical 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 a single constraint.

Applications: Computation of stress and strain, Errors and approximations in manufacturing process, Estimating the critical points and extreme values, vector calculus.

(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	10 Hrs

Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations- Integrating factors on $1/N\ (\partial M/\partial y - \partial N/\partial x)$ *and* $1/M\ (\partial N/\partial x - \partial M/\partial y)$. 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: L-R circuits.

Applications: Rate of Growth or Decay, Conduction of heat. Formulation and solution of oscillations of a spring. Finding the solution by the method of undetermined coefficients. Applications to oscillations of a spring, Mechanical systems and Transmission lines.

(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	10 Hrs

Introduction of linear algebra related to Mechanical 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 equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem.

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

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 $y'' + 3y' - 10y = 0\ , y(0) = 1, y'(0) = 3$
7	i) Define polynomial and to solve polynomials. ii) Derivatives of polynomials (first, second and higher order)
8	i) Plot Taylor's series of continuous function of single variable. ii)Addition of two matrices iii) Subtraction of two matrices iv) Multiplication of two matrices v)Multiplication by a scalar
9	i) Inverse of a matrix ii) Identity matrix iii) To obtain the sum of diagonal elements of the matrix.
10.	i) Find the rank of a matrix ii) Find the row reduced echelon form of a matrix. iii) Find the rank of a matrix after row reducing the matrix

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. **N.P Bali and Manish Goyal**: "A textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
6. **C. Ray Wylie, Louis C. Barrett:** "Advanced Engineering Mathematics" McGraw – Hill Book Co., Newyork, 6th Ed., 2017.
7. **Gupta C.B, Sing S.R and Mukesh Kumar:** "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education (India) Pvt. Ltd 2015.
8. **H. K. Dass and Er. Rajnish Verma:** "Higher Engineering Mathematics" S. Chand Publication, 3rd Ed., 2014.
9. **James Stewart: "**Calculus" Cengage Publications, 7th Ed., 2019.
10. **David C Lay:** "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
11. **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 eigen vectors.

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

22UCH112C/212C	Chemistry for Mechanical Engineering	04-Credits
Hrs/Week: 3:0:2		**CIE Marks:**50
Total Hours: 40Hrs (28T+ 12P)		**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

Analytical Techniques & Energy Sources

Analytical techniques: Introduction, principle, instrumentation of potentiometric sensors; its application in the estimation of iron, Optical sensors (colorimetry); its application in the estimation of the copper, pH-sensor (Glass electrode); its application in the determination of pH of beverages.

Fuels: Introduction, classification and characteristics of a good fuel, calorific value, Gross calorific value (GCV) and Net calorific value (NCV), determination of calorific value using bomb calorimeter, numerical problems on GCV and NCV.

Green fuels: Introduction, synthesis and applications of Bio gas, Bio ethanol and biodiesel.

High energy fuels: Production of hydrogen by electrolysis of water and its advantages and limitations.

Self Study: Types of electrodes - Reference electrode, Calomel electrode; Construction, working and applications.

UNIT – II	10 Hrs

Corrosion Science and Metal Finishing

Corrosion: Introduction, electrochemical theory of corrosion, types of electrochemical corrosion - differential metal, differential aeration (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.

Metal finishing: Introduction, technological importances. Electroplating: Process, Factors affecting quality of electrodeposit. Determination of throwing power by Haring-Blum cell. Numerical problems on throwing Power. Electroplating of chromium (hard and decorative). Electroless plating: Introduction, Comparision between electroplating and electroless plating, electroless plating of nickel.

Self Study: Use of corrosion inhibitors to control corrosion. Factors governing electroplating – Polarization, Decomposition potential and Over voltage.

UNIT - III	10 Hrs

Macromolecules for Engineering Applications

Polymers: Introduction, Monomer, polymer, polymerization degree of polymerization, Glass transition temperature- factors affecting Tg. Molecular weight; number average and weight average, numerical problems. Synthesis, properties and industrial applications of Acrylo-Butadiene Styrene (ABS) plastics and silicon rubber.

Fibers: Introduction, synthesis, properties and industrial applications of Kevlar and Polyester.

Plastics: Introduction, synthesis, properties and industrial applications of poly methyl methacrylate (PMMA) and Polyurethene (PU).

Composites: Introduction, properties and industrial applications of carbon-based reinforced composites (grapheme/carbon nano-tubes as fillers) and metal matrix polymer composites.

Lubricants: Introduction, classification, properties and applications of lubricants.

Self Study: Biodegradable polymer: Introduction, synthesis, properties and applications of polylactic acid(PLA) and poly caprolactum (PCL).

UNIT - IV	10 Hrs

Phase Rule and Materials for Engineering Applications

Phase rule: Introduction, Definition of terms: phase, components, degree of freedom, phase rule equation. Phase diagram: Two component lead-silver system.

Alloys: Introduction, classification, composition, properties and applications of Stainless Steel, Solders, Brass and Alnico.

Ceramics: Introduction, classification based on chemical composition, properties and applications of perovskites ($CaTiO_3$).

Nanomaterials: Introduction, size-dependent properties of nanomaterial (surface area, catalytical and thermal), synthesis of nanoparticles by sol-gel and co-precipitation method. Synthesis, Properties and engineering applications of carbon nanotubes and graphene.

Self Study: Phase diagram of one component system; Water system and classification of nano particles.

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 (2nd edition), Wiley India Pvt. Ltd. New Delhi(2013).
2. Satyaprakash & Manisha Agrawal Engineering Chemistry,1st edition, Khanna Book Publishing, Delhi. (2012),
3. Shashi Chawla, A Text Book of Engineering Chemistry (3rd edition), Dhantpat Rai & Co. Pvt., Pub. Delhi. (2003),
4. Bahl.B.S., Arun Bahl &Tuli.G.D, Essentials of Physical Chemistry (1st edition), S.Chand Publishing. (2010)
5. Sunita Rattan, Applied Chemistry (3rd edition), S.K. Kataria & Sons. (2011)
6. Gourkrishna Dasmohapatra ,Engineering Chemistry (4th edition), Vikas Publishing(2017).
7. Dhara.S.S. & Umare.S.S,Engineering Chemistry (12th edition), S. Chand & Company Ltd., Delhi. (2010).
8. Gadag R.V. and Nityananda Shetty, A Text Book of Engineering Chemistry (2nd edition), I. K. International Publishing house. (2016)
9. Billmeyer.F.W., Text Book of Polymer Science (4th edition), John Wiley & Sons. (1919).
10. Ozin.G.A. & Arsenault.A.C., Nanotechnology A Chemical Approach to Nanomaterials (2nd edition), RSCPublishing.(2005).
11. Fontana.M.G., Greene.N.D., Corrosion Engineering (3rd edition), McGraw Hill Publications, New York.(1996)
12. Kirby W. Beard, Linden's Handbook of Batteries (5th edition), McGraw

Hill.(2019).

13. Takatoshi Tsujimura, OLED Display Fundamentals and Applications (2nd edition), Wiley–Blackwell(2012).
14. Dr. Panda H., "Handbook on Electroplating with Manufacture of Electrochemicals" (1st edition), Asia Pacific BusinessPress Inc.(2017).
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. Dr. Sudha Rani, Laboratory Manual on Engineering Chemistry (1st edition), DhanapathRai Publishing Co. Ltd(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:

After successful completion of the course student will be able to:

CO1: Identify suitable sensor for the estimation of elements and fuel for future generation.

CO2: Assess and describe the forms, mechanisms, control of corrosion and surface modifications.

CO3: Choose appropriate smart materials for design of display systems.

CO4: Identify and determine composition of various materials using sensors and synthesis of polymers for specific engineering applications

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

22UME121C	Elements of Mechanical Engineering	03-Credits
Hrs./Week: 3:0:0		CIEMarks:50
TotalHours:40Hrs		SEEMarks:50

UNIT-I	10Hrs.

Energy sources and power plants:

Review of energy sources, construction and working of hydel power plant, thermal power plant. Nuclear power plant, solar power plant, tidal power plant, wind power plant, Environmental issues like global warming, ozone depletion

Steam formation and steam turbines:

Introduction, Formation of steam, TS, PH, PV diagram, Types of steam, Steam properties, Specific volume enthalpy and internal energy and Entropy (Numerical problems), steam turbine classification and working principle of impulse and reaction turbines.

Water turbines :

Introduction, Classification, Working principle and operation of Kaplan,Francis and Pelton turbine.

UNIT–II	10Hrs.

Automobile Engineering:

Introduction, Classification of IC engines, Parts of IC engine, IC Engine nomenclature. Working of 4 stroke petrol and diesel engines. Comparison between SI and CI engines. Calculations IP, BP, Mechanical efficiency, thermal efficiency, volumetric efficiency, specific fuel consumption, brake specific energy consumption, Problems of 4 stroke engine. Clutch, gear box, differential. Introduction ***to electric and hybrid vehicles***.

Refrigeration & Air-conditioning (HVAC):

Introduction, Definition of Refrigeration, Principle of Refrigeration, Unit of Refrigeration (TR), Co-efficient of performance, Relative co-efficient of performance. Working of vapor compression refrigeration system (VCRS), Working of vapor absorption refrigeration system (VARS) and comparison.

UNIT–III	10 Hrs.

Fundamentals of Machine Tools and Operations:

Fundamentals of Machining and machine tools, Construction and Working Principle of Lathe, Milling, drilling machines and applications. (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.

Metal Joining Processes: Soldering, Brazing and Welding:

Definitions. Classification and methods of soldering, brazing, and welding. Brief description of arc welding, Oxy-acetylene welding.

UNIT–IV	10Hrs.

Mechanical Power Transmission:

Gear Drives: Types - spur, helical, bevel, worm and rack and pinion, velocity ratio, simple and compound gear trains (simple numerical problems)

Belt Drives: Introduction, Types of belt drives (Flat and V-Belt Drive), length of the belt and tensions ratio (simple numerical problems)

Introduction to Mechatronics and Robotics: Open-loop and Closed-loop mechatronic systems.

Joints & links, Robot anatomy, Applications of Robots in material handling, processing and assembly and inspection.

Reference Books

1. An Introduction to Mechanical Engineering, Jonathan Wickert and Kemper Lewis, Third Edition, 2012.
2. Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill 3rd Ed., 2003.
3. Robotics, AppuKuttan KK K. International Pvt Ltd, volume 1.

Course Outcomes:

After completion of the course students will be able to:

CO1: Calculate the enthalpy and internal energy of different types of steams and identify the different types of energy resources, steam turbine and waterturbines

CO2: Compute and analyze the performance of IC engines used in automobiles and concept of electric, hybrid vehicles for future mobility and refrigeration and air conditioning

CO3: Illustrate the different conventional, advance manufacturing systems and various metal joining processes.

CO4: Solve problems on velocity ratio of gear trains and belt drives and interpret different gear drives and belt drive and also identify the aspects of future mobility and applications of of robotics

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Course Outcomes (Cos)	Program Outcomes (Pos)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
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

22UCV118N	Introduction to Civil Engineering	03-Credits
Hrs/Week: 3:0:0		**CIE Marks:**50
Total Hours: 40Hrs		**SEE Marks:**50

Course Objectives: Develop students' ability

1. To make students learn the scope of various specializations of civil engineering.
2. To develop students' ability to analyze the problems involving forces, moments with their applications.
3. To develop the student's ability to find out the center of gravity and its applications.
4. To develop the student's ability to find out the moment of inertia and its applications.

UNIT - I	10 Hrs
Civil Engineering Disciplines and Building Science: **Introduction to Civil Engineering:** Surveying, Structural Engineering, Geotechnical Engineering, Hydraulics & Water Resources, Transportation Engineering, Environmental Engineering, Construction planning & Project management. **Basic Materials of Construction**: Bricks, Cement & mortars, Plain, Reinforced & Pre-stressed Concrete, Structural steel, Construction Chemicals. **Structural elements of a building:** foundation, plinth, lintel, chejja, Masonry wall, column, beam, slab and staircase **Societal and Global Impact of Infrastructure** **Infrastructure**: Introduction to sustainable development goals, Smart city concept, clean city concept, Safe city concept. **Built-environment:** Energy efficient buildings; Smart buildings.	
UNIT – II	**10 Hrs**
Analysis of force systems: Concept of idealization, system of forces, principles of super position and transmissibility, Resolution and composition of forces, Law of Parallelogram of forces, Resultant of concurrent and non-concurrent coplanar force systems, moment of forces, couple, Varignon's theorem, free body diagram, equations of equilibrium, equilibrium of concurrent and non-concurrent coplanar force systems. Numerical examples	
UNIT - III	**10 Hrs**
Centroid: Importance of centroid and centre of gravity, methods of determining the centroid, locating the centroid of plane lamina from first principles, centroid of built-up sections. Numerical examples	
UNIT - IV	**10 Hrs**
Moment of inertia: Importance of Moment of Inertia, method of determining the second moment	

of area (moment of inertia) of plane sections from first principles, parallel axis theorem and perpendicular axis theorem, radius of gyration, moment of inertia of built-up sections. Numerical Examples.

Reference books:

1. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 2015, Laxmi Publications.
2. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB
3. Beer F. P. and Johnston E. R., Mechanics for Engineers, Statics and Dynamics,1987, McGraw Hill.
4. Irving H. Shames, Engineering Mechanics, 2019, Prentice-Hall.
5. Hibbler R.C., Engineering Mechanics: Principles of Statics andDynamics,2017, Pearson Press.
6. Timoshenko S, Young D.H., Rao J.V., Engineering Mechanics, 5th Edition, 2017, Pearson Press.
7. Bhavikatti S S, Engineering Mechanics,2019, New Age International

Course Outcomes:

After completion of the course students will be able to,

CO1: Understand the various disciplines of Civil Engineering

CO2: Compute the resultant and equilibrium of force systems.

CO3: Locate the centroid of plane and built-up sections

CO4: Compute the moment of inertia of plane and built-up sections

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

22UEE116N/22UEE216N	Introduction to Electrical Engineering	03-Credits
Hrs/Week: 3:0:0		**CIE Marks:**50
Total Hours: 40Hrs		**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.LTheraja,"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	

Course Outcomes:

After completion of the course students will be able to:

CO1: Understand the working of Hydro-electric, Thermal and Nuclear power plants.

CO2: Apply the electric circuit theorems to DC and AC (single phase and three phase) circuits to determine current , voltage and power in various branches.

CO3: Analyse the working principle and construction and identify the suitable applications of DC generators, motors and transformers by identifying the specifications.

CO4: Identify the safety aspects in different types of wiring mechanisms and evaluate the energy consumption in domestic loads.

Course Outcomes - Programme Outcomes Mapping Table

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
CO2	3	1	1	1		1	1	1		1		1
CO3	3	2	3	1							1	1
CO4	3	3	3	2				1				1

22UEC114N/22UEC214N	Introduction to Electronics Engineering	03-Credits
Hrs/Week: 3:0:0		**CIE Marks:**50
Total Hours: 40Hrs		**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: 40Hrs (28T+12 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, *go to* 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.	
Programming Exercises: **Part – A** 1. Write a C program that aid in evaluating return on investment of Principal amount for 3 years at 9% rate of interest using simple interest and compound interest. SI=PTR/100 and CI=P[1+R/100]t-P. 2. C Program to find Mechanical Energy of a particle using E = mgh+1⁄2 mv2. 3. C Program to convert Kilometers into Meters and Centimeters. 4. Write a C Program to detect whether the nature of solutions is acidic/neutral/base by	

reading value of pH.

5. Write a C program to determine whether a seller has made the profit or incurred the loss and display the amount and percentage of profit or loss.
6. Write a C program to identify whether the entered character belongs to an alphabet, digit or special character.
7. Write a C program to input marks of five subjects Physics, Chemistry, Biology, Mathematics and Computer. Calculate percentage and display the grade according to following:

Percentage	**Grade**
More than or equal to 90%	S
Between 80% - 89.99%	A
Between 70%-79.99%	B
Between 60%-69.99%	C
Between 40%-59.99%	D
Between 35%-40%	E
Below 35%	F

8. Write a C program, to check whether a person is eligible for the marriage or not.
9. Write a C program to identify the quadrant of a point, when coordinates (x,y) are given.
10. Write a C program to compute area of the following of geometric objects based on user's preference using switch case:

i. Circle
ii. Triangle
iii. Parallelogram
iv. Square

Part - B

11. Write a C program to generate multiplication table between 1 to n.
12. Write a C program to generate the prime numbers between 1 to n.
13. Write a C program to Implement Linear Search on Integers.
14. Write a C program to perform addition of 2 Matrix.
15. Sort the given set of N numbers using selection sort.
16. Write functions to implement string operations such as compare, concatenate, and find string length. Use the parameter passing techniques.
17. Write a C program to find the value of a^n using user-defined function.
18. Write a C program to find the factorial of a number using recursive function.
19. Implement structures to read, write and compute average- marks of the students, list the students scoring above and below the average marks for a class of N students.
20. Write a C program to read two numbers and swap them with help of function through call by reference method.

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:

After completion of the course students will be able to:

CO1: Explain the basic architecture and functionalities of a computer and also recognize the hardware parts.

CO2: Apply programming constructs of C language to solve the real world problem.

CO3: Explore user-defined data structures like arrays in implementing solutions to problems like searching, sorting and tabular data processing.

CO4: 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: 40Hrs		**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: 40Hrs		**SEE Marks:**50

Course Objectives:

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: 40Hrs		**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 - Savinous 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, 4th Edition, 2015.
3.G. N. Tiwari and M K. Ghosal, "Fundamentals of Renewable Energy Resources", Alpha Science International Ltd, 1st Edition, 2007.
4. Shobh Nath Singh, "Non-Conventional Energy Resources", Pearson Education, 2nd Edition 2018.
5. Bent Sorensen, "Renewable Energy", Academic Press, 5th Edition, 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, 2nd Edition, 2008 (e-book).

Course Outcomes:

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

CO1: Identify electrical and mechanical devices of solar, wind, biomass, geothermal and ocean energy conversion systems.
CO2: Measure performance parameters related to solar, wind, biomass, geothermal and ocean energy conversion systems.
CO3: Compute the power generation of wind and solar energy correspond to variable data.
CO4: Compare the features of solar, wind, biomass, geothermal and ocean energy conversion systems.

Course Outcomes - Programme Outcomes Mapping Table

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
CO2	3	1	1	1		1	1	1		1		1
CO3	3	2	3	1							1	1
CO4	3	3	3	2				1				1

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

Course Objectives:

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

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:

After completion of the course students will be able to:

CO1: Select different building materials for cost effective construction

CO2: Apply effective environmental friendly building technology to reduce global warming

CO3: Analyse buildings for green rating systems.

CO4: Use alternate source of energy and effective use of water.

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: 40Hrs		**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

Refuse, Source Reduction, Reuse, Product Recovery and Recycling (SR's): 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:

After completion of the course students will be able to:

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 5Rs, 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: 40Hrs		**SEE Marks:**50

Course Objectives:

1. Understand about the fundamentals of Internet of Things and its building blocks along with their characteristics.
2. 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 Textbook 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. Textbook 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 Textbook 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** Textbook 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:

At the end of the course, the students able to.

CO1: Comprehend the fundamentals of IoT viz…, evolution, networking components, and Addressing strategies.

CO2: Identify various sensing & actuator devices and types driving the characteristics of IoT system.

CO3: Analyse the processing in IoT.

CO4: Use appropriate IoT Technologies to implement an application.

CO5: Illustrate the architectures of IoT application for an open ended problem.

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

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: 40Hrs		**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
Total Hours: 40Hrs		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:

After completion of the course student will be able to

CO1: Solve the numerical problems on modulus of elasticity of the FRP composites. Illustrate the types of composites. Factors influencing the mechanical behaviour.

CO2: Analyse the critical volume fraction of fibres in the FRP composites.

CO3: Synthesize polymer matrix and metal matrix composites.

CO4: Use the abrasive water jet machining of composites. Illustrate the cutting and joining of composites.

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

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

CO1: List and explain the basic elements of industrial robots

CO2: Analyse robot kinematics and its control methods.

CO3: Classify the various sensors used in robots for better performance.

CO4: Summarize various industrial and non-industrial applications of robots.

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

22UBT148B	Biomass and Bioenergy	03-Credits
Hrs/Week: 3:0:0		**CIE Marks:**50
Total Hours: 40Hrs		**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. Samir K. Khanal, Anaerobic Biotechnology for Bioenergy Production: Principles and Applications. Wiley-Blackwell Publishing, 2008.
2. E.J. Dasilva, C Ratledge & A Sasson, Biotechnology, Economic & Social Aspects: Cambridge Univ. Press, Cambridge, 2000
3. Pradipta Kumar Mahopatra, Environmental Biotechnology 2007.

4. Caye M. Drapcho, Nghiem Phu Nhuan, Terry H. Walker, Biofuel Engineering Process technology Mc Grow Hill company, 2008.

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

Course Outcomes:

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

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: 15Hrs		**SEE Marks:**50

Course Objectives:

1.To know about Fundamentals of Communicative English and Communication Skills in general.
2. To train to 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 to English 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

22UHS129C	Innovation and Design Thinking	01-Credit
Hrs/Week: 1:0:0		**CIE Marks:**50
Total Hours: 15Hrs		**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	-	-	-	-	-	-	-	-

22UMA204C	**Mathematics for Mechanical Sciences –II (Integrated)**	**04-Credits**
Hrs/Week: 3:0:2		**CIE Marks:**50
Total Hours: 60Hrs (40 T+20 L)		**SEE Marks:**50

Course Objectives:

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

UNIT – I	**10 Hrs**

Introduction to Integral Calculus in Mechanical 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 Mechanical 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 Stoke's theorem. Problems.

Self-Study: Volume integral and Gauss divergence theorem.

Applications: Heat and mass transfer, oil refinery problems, environmental engineering, velocity and acceleration of moving particles, analysis of streamlines.

(RBT Levels: L1, L2 and L3)

UNIT – III	**10 Hrs**

Importance of partial differential equations for Mechanical Engineering application.

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 the one-dimensional heat equation and wave equation by the method of separation of variables.

Applications: Vibration of a rod/membrane.

(RBT Levels: L1, L2 and L3)

UNIT – IV	**10 Hrs**

Importance of numerical methods for discrete data in the field of Mechanical Engineering.

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.

Numerical integration: Trapezoidal, Simpson's (1/3)rd and (3/8)th rules (without proof). Problems.

Introduction to various numerical techniques for handling Mechanical Engineering

applications.

Numerical Solution of Ordinary Differential Equations (ODEs):

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

S**elf-Study:** Bisection method, Lagrange's inverse Interpolation. Adam-Bashforth method.

Applications: Finding approximate solutions to solve mechanical engineering problems involving Numerical data. Finding approximate solutions to solve mechanical engineering problems.

(RBT Levels: L1, L2 and L3)

List of Laboratory experiments:

1.	Program to compute area, surface area, volume and centre of gravity
2.	Evaluation of improper integrals
3.	Finding gradient, divergent, curl and their geometrical interpretation
4.	Computation of basis and dimension for a vector space and Graphical representation of linear transformation
5.	Computing the inner product and orthogonality
6.	Solution of algebraic and transcendental equations by Ramanujan′s, Regula-Falsi and Newton-Raphson method
7.	Interpolation/Extrapolation using Newton′s forward and backward difference formula
8.	Computation of area under the curve using Trapezoidal, Simpson′s $(1/3)_{rd}$ and $(3/8)_{th}$ rule
9.	Solution of ODE of first order and first degree by Taylor′s series and Modified Euler′s Method
10.	Solution of ODE of first order and first degree by Runge-Kutta 4_{th} order and Milne′s predictor-corrector method

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 **N.P Bali and Manish Goyal**: "A textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.

6 **C. Ray Wylie, Louis C. Barrett:** "Advanced Engineering Mathematics" McGraw – Hill Book Co., Newyork, 6th Ed., 2017.

7 **Gupta C.B, Sing S.R and Mukesh Kumar:** "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education (India) Pvt. Ltd 2015.

8 **H. K. Dass and Er. Rajnish Verma:** "Higher Engineering Mathematics" S. Chand Publication, 3rd Ed., 2014.

9 **James Stewart: "**Calculus" Cengage Publications, 7th Ed., 2019.

10 **David C Lay:** "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.

11 **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.

Web links and Video Lectures (e-Resources):

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/
4. VTU e-Shikshana Program
5. VTU EDUSAT Program

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

22UPH108C/22UPH208C	PHYSICS FOR MECHANICAL SCIENCES (ME & IP branches) (Integrated)	Credits -04
Hours/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 and engineering applications of types of oscillations and shock waves
2. To study the basics of lasers and their engineering applications
3. To study the elastic properties of materials and failures of engineering materials
4. To study the concepts of low temperature phenomena and generation of low temperature
5. To study the fundamentals of thermoelectric materials, devices and their applications
6. To study the various material characterization techniques

UNIT – I	10 Hrs

Oscillations :

Oscillations: Simple Harmonic motion (SHM), differential equation for SHM (no derivation), Springs: Stiffness factor and its physical significance, series and parallel combination of springs (derivation), types of springs 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, interaction of radiation with matter (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. Construction and working of carbon dioxide laser. Applications of lasers- industry (cutting, drilling and welding). Numerical problems.

Pre-requisite: Basics of oscillations, Waves and properties of light

Self learning: Simple harmonic motion, differential equation for SHM, Nd:YAG and semiconductor diode lasers

UNIT – II	10Hrs

Elasticity:

Stress-Strain Curve, Stress hardening and softening. Elastic Moduli, Poisson's ratio, relation between Y, n and σ (with derivation), relation between K, Y and σ, limiting values of Poisson's ratio, single cantilever(qualitative). Elastic materials (qualitative). Failures of engineering materials - ductile fracture, brittle fracture, stress concentration, fatigue and factors affecting fatigue (only qualitative explanation). Numerical problems.

Cryogenics :

Production of low temperature – Joule Thomson effect(qualitative), liquefaction of gases, liquefaction of Helium and its properties. Low temperature thermometry. Applications of cryogenics-superconducting magnets, aerospace and food preservation. Numerical problems.

Pre-requisites: Elasticity, stress and strain, basics of thermodynamics

Self learning: Stress-strain curve, laws of thermodynamics, Joule Thomson effect

UNIT – III	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.

Thermoelectric materials and devices:

Thermo emf and thermo current, Seeback effect, Peltier effect, Seeback and Peltier coefficients, figure of merit (mention expression), laws of thermoelectricity. Expression for thermo emf in terms of T1 and T2, thermo couples, thermopile. Construction and working of Thermoelectric generators (TEG) and Thermoelectric coolers (TEC), low, mid and high temperature thermoelectric materials. Applications: Exhaust of automobiles, Refrigerator, Space program (RTG). Numerical problems.

Pre-requisites: Basics of electrical conductivity

Self-learning: Thermo emf and thermo current

UNIT – IV	**10Hrs**

Material Characterization and Instrumentation Techniques:

Introduction to nanomaterials: Nanomaterials and nanocomposites. Principle, construction and working of

X-ray diffractometer, crystallite size determination by Scherrer equation. Principle, construction, working and applications of Atomic Force Microscopy(AFM), X-ray Photo electron Spectroscopy(XPS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Scanning Tunneling Microscopy(STM), Raman Spectrometer. Lithography technique and applications. Numerical problems.

Pre-requisites: Principle and working of optical microscope

Self-learning: X-ray diffractometer

Reference Books :

1 A. P. French, "Vibrations and Waves" (MIT introductory Physics Series),CBS, (2003 Edition)

2 Timoshenko, S. and Goodier J.N.2001 "Theory of Elasticity", (2nd Edition), McGraw Hill Book Co.

3 Sadhu Singh,1997, "Theory of Elasticity", Khanna Publishers

4 Wole Soboyejo, 2002, "Mechanical Properties of Engineered Materials" (1st edition), CRC Press.

5 Singhal, Agarwal & Satyaprakash,2006 "Heat & Thermodynamics and Statistical Physics" (18thEdition), Pragati Prakashan, Meerut

6 D. S. Mathur,1991 "Heat and Thermodynamics" (1st Edition) S.Chand & Company Ltd., New Delhi

7 Brijlal & Subramanyam,1994 "Heat and Thermodynamics" S.Chand & Company Ltd., New Delhi

8 Bahman Zohuri, 2018, "Physics of Cryogenics", Elsevier

9 Sam Zhang, Lin Li, Ashok Kumar, 2008, "Materials Characterization Techniques" (1st edition), CRC Press.

10 Mitra P.K, 2014, "Characterization of Materials", Prentice Hall India Learning Private Limited .

11 M. S. Ramachandra Rao & Shubra Singh,2013, "Nanoscience and Nanotechnology Fundamentals to Frontiers", Wiley India Pvt Ltd.

12 Parameswaranpillai, N.Hameed, T.Kurian, Y. Yu, 2017, "Nano Composite Materials-Synthesis, Properties and Applications", CRC Press

13 Chintoo S Kumar, K Takayama and K P J Reddy, 2014, "Shock waves made simple", Willey India Pvt. Ltd, New Delhi.

14 M.N. Avadhanulu, P. G. Kshirsagar and T. V. S. Arun Murthy, 2019, "A Textbook of Engineering Physics" (11th edition), S. Chand, New Delhi.

Weblinks and Video Lectures (e-Resources):

Simple Harmonic Motion :https://www.youtube.com/watch?v=k2FvSzWeVxQ

Shock waves: https://physics.info/shock/

Shock waves and its applications: https://www.youtube.com/watch?v=tz_3M3v3kxk

Stress-strain curves: https://web.mit.edu/course/3/3.11/www/modules/ss.pdf

Stress curves: https://www.youtube.com/watch?v=f08Y39UiC-o

Fracture in materials : https://www.youtube.com/watch?v=x47nky4MbK8

Thermoelectricity :

https://www.youtube.com/watch?v=2w7NBuu5w9c&list=PLtkeUZItwHK5y6qy1GFxa4Z4RcmzU aaz6

Thermoelectric generator and coolers: https://www.youtube.com/watch? v=NruYdb31xk8

Cryogenics: https://cevgroup.org/cryogenics-basics-applications/

Liquefaction of gases: https://www.youtube.com/watch?v=aMelwOsGpIs

Virtual lab:https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham

Material characterization:https://onlinecourses.nptel.ac.in/noc20_mm14/preview

https://www.encyclopedia.com/science-and-technology/physics/physics/cryogenics

https://www.usna.edu/NAOE/_files/documents/Courses/EN380/Course_Notes/Ch10_Deformation.pdf

Laboratory Component:

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

LIST OF EXPERIMENTS
1. The study of forced mechanical oscillations and resonance
2. Determination of effective string constant of the given springs in series and parallel combinations
3. The study of characteristics of a laser
4. Determination of Young's modulus of metal strip by single cantilever method
5. Determination of rigidity modulus of a wire by torsional pendulum method
6. Determination of Young's modulus of a given metal strip by uniform bending method
7. Determination of specific heat of a solid by using calorimeter
8. Determination of viscosity of a given liquid by Stoke's method
9. The study of frequency response in series and parallel LCR circuits
10. Identification of passive components and estimation of their values in a given black box
11. Determination of velocity of ultrasonic waves in a given liquid using ultrasonic interferometer
12. Determination of dielectric constant of a material in a capacitor by charging and discharging method
13. Determination of Fermi energy for a conductor
14. Determination of energy gap of a semiconductor by four probe method
15. Determination of acceptance angle and numerical aperture of a given optical fiber
16. Determination of the radius of curvature of a given planoconvex lens by Newton rings method
17. Step Interactive physical simulations
18. Study of motion using spread sheets
19. Study of application of statistics using spread sheets
20. PHET Interactive Simulations

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

Course outcomes:

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

CO1: Apply concepts of oscillations and select appropriate properties of lasers for engineering applications

CO2: Apply concepts of elasticity and generation of low temperature for engineering applications

CO3: Select appropriate properties of thermoelectric materials and shock waves for engineering applications

CO4: Apply material characterization techniques for engineering materials

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

22UME223C	Computer Aided Engineering Drawing	03 - Credits
Hrs./Week: 2 :0: 2		CIEMarks:50
Total Hours: 40Hrs **(**28T +12P)		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 of Examination

CIE- Continuous Internal Evaluation - Theory (Using grid sheet)

CIE	Max Marks	Reduced Marks
I	40 Marks	20 Marks
II	40 Marks	20 Marks

	Assignment	10 Marks
Reduced to 50% of Marks		25 Marks

CIE - Continuous Internal Evaluation - Practical (Lab print outs)

Particulars	**Max Marks**	**Reduced Marks**
Lab classes (using sketch book and print outs)	30 Marks	15 Marks
Lab CIE	20 Marks	10 Marks
		25 Marks

Total Marks: C I E (Theory + Practical)

Theory (Using grid sheet)	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 with definite shape and dimensions
CO 2: Recognize and draw the shape and size of objects through different views.
CO 3: Develop the lateral surface of the objects
CO 4: Draw isometric views and freehand sketches of mechanisms and simple machine parts
CO 5: Create a drawing views using CAD software.

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

22UCV118N/22UCV218N	Introduction to Civil Engineering	03-Credits
Hrs/Week: 3:0:0		**CIE Marks:**50
Total Hours: 40Hrs		**SEE Marks:**50

Course Objectives: Develop students' ability

1.To make students learn the scope of various specializations of civil engineering.

2.To develop students' ability to analyze the problems involving forces, moments with their \ applications.

3.To develop the student's ability to find out the center of gravity and its applications.

4.To develop the student's ability to find out the moment of inertia and its applications.

UNIT - I	10 Hrs
Civil Engineering Disciplines and Building Science: **Introduction to Civil Engineering:** Surveying, Structural Engineering, Geotechnical Engineering, Hydraulics & Water Resources, Transportation Engineering, Environmental Engineering, Construction planning & Project management. **Basic Materials of Construction**: Bricks, Cement & mortars, Plain, Reinforced & Pre-stressed Concrete, Structural steel, Construction Chemicals. **Structural elements of a building:** foundation, plinth, lintel, chejja, Masonry wall, column, beam, slab and staircase **Societal and Global Impact of Infrastructure** **Infrastructure**: Introduction to sustainable development goals, Smart city concept, clean city concept, Safe city concept. **Built-environment:** Energy efficient buildings; Smart buildings.	
UNIT – II	**10 Hrs**
Analysis of force systems: Concept of idealization, system of forces, principles of super position and transmissibility, Resolution and composition of forces, Law of Parallelogram of forces, Resultant of concurrent and non-concurrent coplanar force systems, moment of forces, couple, Varignon's theorem, free body diagram, equations of equilibrium, equilibrium of concurrent and non-concurrent coplanar force systems. Numerical examples.	
UNIT - III	**10 Hrs**
Centroid: Importance of centroid and centre of gravity, methods of determining the centroid, locating the centroid of plane lamina from first principles, centroid of built-up sections. Numerical examples.	
UNIT - IV	**10 Hrs**
Moment of inertia: Importance of Moment of Inertia, method of determining the second moment of area (moment of inertia) of plane sections from first principles, parallel axis theorem and	

perpendicular axis theorem, radius of gyration, moment of inertia of built-up sections. Numerical Examples.

Reference books:

1. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 2015, Laxmi Publications.
2. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB
3. Beer F. P. and Johnston E. R., Mechanics for Engineers, Statics and Dynamics,1987, McGraw Hill.
4. Irving H. Shames, Engineering Mechanics, 2019, Prentice-Hall.
5. Hibbler R.C., Engineering Mechanics: Principles of Statics andDynamics,2017, Pearson Press.
6. Timoshenko S, Young D.H., Rao J.V., Engineering Mechanics, 5th Edition, 2017, Pearson Press.
7. Bhavikatti S S, Engineering Mechanics,2019,NewAgeInternational

Course Outcomes:

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

CO1: Understand the various disciplines of Civil Engineering

CO2: Compute the resultant and equilibrium of force systems.

CO3: Locate the centroid of plane and built-up sections

CO4: Compute the moment of inertia of plane and built-up sections

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

22UEE116N/22UEE216N	Introduction to Electrical Engineering	03-Credits
Hrs/Week: 3:0:0		**CIE Marks:**50
Total Hours: 40Hrs		**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 Hours)
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 Hours)**
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 Hours)**
DC Generator, DC Motor, Transformers: Working principle, construction, equations, types and classifications, specifications, applications, cost. Simple numerical.	
UNIT – IV	**(10 Hours)**
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

Course Outcomes:

After completion of the course the students will be able to:

CO1: Understand the working of Hydro –electric, Thermal and Nuclear power plants

CO2: Apply the electric circuit theorems to DC and AC (single phase and three phase) circuits to determine current, voltage, and power in various branches

CO3: Analyze the working principle and construction to identify the suitable applications of DC generators, motors and transformers by identifying the specifications

CO4: Identify the safety aspects in different types of wiring mechanisms and evaluate the energy consumption in domestic loads

Course Outcomes - Programme Outcomes Mapping Table

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

22UEC114N/22UEC214N	Introduction to Electronics Engineering	03-Credits
Hrs/Week: 3:0:0		**CIE Marks:**50
Total Hours: 40Hrs		**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: 40Hrs (28T+12P)		**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, *go to* 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.	

Programming Exercises:

Part – A

1. Write a C program that aid in evaluating return on investment of Principal amount for 3 years at 9% rate of interest using simple interest and compound interest. SI=PTR/100 and CI=P[1+R/100]t-P.
2. C Program to find Mechanical Energy of a particle using E = mgh+1/2 mv2.
3. C Program to convert Kilometers into Meters and Centimeters.

4. Write a C Program to detect whether the nature of solutions is acidic/neutral/base by reading value of pH.
5. Write a C program to determine whether a seller has made the profit or incurred the loss and display the amount and percentage of profit or loss.
6. Write a C program to identify whether the entered character belongs to an alphabet, digit or special character.
7. Write a C program to input marks of five subjects Physics, Chemistry, Biology, Mathematics and Computer. Calculate percentage and display the grade according to following:

Percentage Grade
More than or equal to 90% S
Between 80% - 89.99% A
Between 70%-79.99% B
Between 60%-69.99% C
Between 40%-59.99% D
Between 35%-40% E
Below 35% F

8. Write a C program, to check whether a person is eligible for the marriage or not.
9. Write a C program to identify the quadrant of a point, when coordinates (x,y) are given.
10. Write a C program to compute area of the following of geometric objects based on user's preference using switch case:

i. Circle
ii. Triangle
iii. Parallelogram
iv. Square

Part - B

11. Write a C program to generate multiplication table between 1 to n.
12. Write a C program to generate the prime numbers between 1 to n.
13. Write a C program to Implement Linear Search on Integers.
14. Write a C program to perform addition of 2 Matrix.
15. Sort the given set of N numbers using selection sort.
16. Write functions to implement string operations such as compare, concatenate, and find string length. Use the parameter passing techniques.
17. Write a C program to find the value of an using user-defined function.
18. Write a C program to find the factorial of a number using recursive function.
19. Implement structures to read, write and compute average- marks of the students, list the students scoring above and below the average marks for a class of N students.
20. Write a C program to read two numbers and swap them with help of function through call by reference method.

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:

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

CO1: Explain the basic architecture and functionalities of a computer and also recognize the hardware parts.

CO2: Apply programming constructs of C language to solve the real world problem.

CO3: Explore user-defined data structures like arrays in implementing solutions to problems like searching, sorting and tabular data processing.

CO4: 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: 40Hrs (28T+12P)		**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	08 Hrs.
Fundamentals of WEB: Introduction to Internet, World Wide Web, Web Browsers, Web Servers, Uniform Resource-Locators, MIME, HTTP. Traditional HTML and XHTML: First Look at HTML and XHTML, Hello HTML and XHTML World, HTML and XHTML: Version History, HTML and XHTML DTDs: Document Type Statements and Language Versions, (X) HTML Document Structure, Browsers and (X) HTML, The Rules of (X) HTML, Major Themes of (X) HTML.	
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, HTML5 Form Changes.	
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, , Font Properties, line-height Property, Text Properties, Border Properties, Element Box, padding Property, margin Property .	
UNIT–IV	**08 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. CSS display Property with Table Values, **Links and Images**: a Element, Relative URLs, Navigation Within a Web Page, CSS for Links, Bitmap Image Formats: GIF, JPEG, PNG.	

Reference Books

1. Thomas A. Powell, **The Complete Reference HTML & CSS (**Fifth Edition), Tata McGraw Hill.
2. John Dean, **WEB PROGRAMMING with HTML5** CSS and JavaScript (First Edition), Jones & Bartlett Learning.
3. Chris Bates, **WEB PROGRAMMING (**Second Edition), Wiley.

Programming Assignments:

1. Create an XHTML page to demonstrate the usage of Text Formatting tags, Links, Images,
2. Create a table using XHTML tags. Properly align cells, give suitable cell padding And cell spacing, and apply background color, bold and emphasis necessary
3. Demonstrate the HTML5 Semantic tags for a webpage.
4. Develop and demonstrate the usage of inline and internal style sheet using CSS.
5. Create a simple calculator interface with HTML and CSS
6. Create a web page using HTML and CSS with tabular layout

Course Outcomes
After completion of the course student will be able to
CO1: Analyze historical context and justification for HTML over XHTML.
CO2: Develop HTML5 documents and adding various semantic markup tags.
CO3: Learn various attributes, values and types of CSS.
CO4: Build a web page using links and images.

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

22UCS231B	Introduction to Python Programming	03-Credits
Hrs/Week: 2:0:2		**CIE Marks:**50
Total Hours: 40Hrs (28T+12P)		**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, strings, and dictionaries
3. Demonstrate the use of built-in functions to navigate the file system.

UNIT – I	08 Hrs
Python Basics Our first python script, Comments, Basic data types, Identifiers, Keywords, variables, basic input and output: printing using the print function, Taking input using the input function **Python control structures:** Getting started with programs, decisions, loops, terminating control	
UNIT – II	**06 Hrs**
Lists: Creating lists, Accessing list elements, counting list elements, Iterating through list elements, searching elements within lists, list slices, adding and deleting elements, adding multiplying and copying lists, simple programs on lists, nested lists **Tuples:** Creating Tuples, accessing tuple elements, counting tuple elements, Iterating through tuple elements, searching elements within tuples, tuple slices, adding multiplying and copying tuples, comparison of tuples and lists, simple programs **Introduction to sets:** Creating sets, Accessing set elements, Iterating through set elements	
UNIT – III	**06 Hrs**
Strings: Conversion from and to strings, searching in strings, splitting strings, joining strings, modifying strings, padding strings **Dictionaries:** Creating Dictionaries, accessing Dictionary elements, counting Dictionary elements, Iterating through Dictionary elements, searching elements within Dictionaries, adding and deleting Dictionary, comparison simple programs	
UNIT – IV	**08 Hrs**
Functions: Introduction to functions, function definitions, function call, positional arguments, default arguments, keyword arguments, variable arguments, returning from functions, **Files:** Introduction to file handling, opening and closing files, reading from text files, writing to text files, seeking within files, reading to binary files, wring to binary files	
Programming Exercises: 1. Develop a program to read the student details like Name, USN, and Marks in three subjects. Display the student details, total marks and percentage with suitable messages. 2. b.Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.	

a. Develop a program to generate Fibonacci sequence of length(N). Read N from the console.

b. Write a function to calculate factorial of a number. Develop a program to compute binomial coefficient (Given N and R).

3. Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages.

4. Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with suitable message.

5. Develop a program to print 10 most frequently appearing words in a text file. [Hint: Use dictionary with distinct words and their frequency of occurrences. Sort the dictionary in the reverse order of frequency and display dictionary slice of first 10 items]

6. Develop a program to sort the contents of a text file and write the sorted contents into a separate text file. [Hint: Use string methods strip(), len(), list methods sort(), append(), and file methods open(), read lines(), and write()].

7. Develop a program to backing Up a given Folder (Folder in a current working directory) into a ZIP File by using relevant modules and suitable methods.

8. Write a function named DivExp which takes TWO parameters a, b and returns a value c (c=a/b). Write suitable assertion for a>0 in function DivExp and raise an exception for when b=0. Develop a suitable program which reads two values from the console and calls a function DivExp.

9. Write python program to implement simple library system using dictionary: Library = { ISBN1 : [No of copies, title, author] . . . } to support i) add new look ii) issue book iii) Return book operations

10. Given price list: { item1: amt, item2: amt . . . } and list of items purchased, write python program to find amount to be paid for purchased items.

Ex: pricelist ; { “pen”:10, “Notebook”:50, “book”:100}

Items_purchased = [“pen”, “book”]

o/p: amt_to_be_paid = 110

Reference books:

1. Learning Python, B. Nagesh Rao, Cyberplus publication, 2nd edition
2. Introduction to python programming, Gaowrishankar S., Veena A, CRC press
3. Automate the boring stuff with Python, Al Sweigart, No strarch press

Course Outcomes:

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

CO 1: 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: Develop the solution to a given problem by selecting appropriate data types and modules

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

22UCS232B	Basics of Java Programming	03-Credits
Hrs/Week: 2:0:2		**CIE Marks:**50
Total Hours: 40Hrs (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: At the end of the course the student should be able to:

Programming Exercises:

1. Develop simple java programs to demonstrate the use of conditional statements
2. Develop simple java programs to demonstrate the use
   i) loop statements

ii) Reading & printing different data types in java

3. Develop simple java programs on on arrays(single & multidimensional) & recursion
4. Develop simple java programs to demonstrate Interfaces concept
5. Develop simple java programs to demonstrate Polymorphism mechanisms
6. Develop simple java programs to demonstrate Inheritance concept
7. Develop simple java programs to demonstrate Package concept
8. Develop simple java programs to demonstrate exception handling
9. Develop simple java programs to demonstrate use of Constructors
10. Develop simple java programs to demonstrate Method overloading & overriding

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

CO1: Explain the object-oriented concepts and other features of JAVA.

CO2: Identify classes, objects, members of a class and relationships among them needed for a specific problem.

CO3: Demonstrate the concepts of polymorphism, inheritance and other features of JAVA.

CO4: Write Java application programs using OOP principles and proper program structuring.

CO5: Design and develop standalone applications using Java.

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
No POs -COs															
The students will be able to:															
CO1	3	2													
CO2	3	3											2		1
CO3	3	3		2									3	2	2
CO4	3	3		2									3	3	3
CO5	3	3		3									3	3	3

22UCS233B	Introduction to C++ Programming	03-Credits
Hrs/Week: 2:0:2		**CIE Marks:**50
Total Hours: 40Hrs (28T+12P)		**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 concept of struct and and functions
3. Understand the capability of a class to relay upon another class and functions.
4. Understand about constructors which are special type of functions.
5. Understand the concept of polymorphism and inheritance.

UNIT – I	08 Hrs
Introduction: Features of object oriented programming, C++ and C , C++ overview, Layout of C++ Program, Cin and Cout statements, Preprocessor directives, Comments, Manipulators, Data types, variables, constants, Arithmetical operators, Logical operators, Relational operators, Conditional operators, Loops and Decisions: for- loop, while loop, do-while loop, if statement, if-else statement, else-if statement, switch statement.	
UNIT – II	06 Hrs
Structures: A simple structure, defining a structure, defining structure variables, accessing structure members, Functions: Simple functions, passing arguments to functions, returning value to a function, overloaded functions.	
UNIT – III	06 Hrs
Class and Objects: Class specification, Access Specifiers, Defining Member Function, Objects Declaration, Accessing Data members and Member Function, Constructors, parameterized constructor, Destructors.	
UNIT – IV	08 Hrs
Inheritance& Polymorphism: Derived class Constructors, destructors-Types o inheritance-Defining Derived classes, Single Inheritance, Multiple, Hierarchical Inheritance, Hybrid Inheritance.	
Reference books:	
1. Robert Lafore, “Object Oriented Programming in Turbo C++”, Galgotia Publishing 2. Balagurusamy E, Object Oriented Programming with C++, Tata McGraw Hill Education Pvt.Ltd , Fourth Edition 2010. Web links 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-	

Programming Assignments:

1. a. Write a C++program to find the sum of all the natural numbers from 1to n.

   b. Write a C++ program to find the factorial of a given number

   C. Write a C++ program to find the given number is prime or not

2. Write a C++ program to make a simple calculator.

3. Write a C++ program to declare Strut. initialize and display contents of member variables

4. Write a C++program to demonstrate function overloading for the following prototypes.

Add (int a,int b)

Add (double a , double b)

5. Write a C++ program to find Area of square, rectangle ,circle and triangle using Function Overloading

6.Write a C++ Program to display Names, Roll No., and grades of 3 students who have appeared in the examination. Declare the class of name, Roll No. and grade. Create an array of class objects. Read and display the contents..

7. Given that an EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary and print data member

8. Program to illustrate default constructor, parameterized constructor

9.Develop simple C++ programs to demonstrate Inheritance concept

10. Suppose we have three classes Vehicle, Four Wheeler, and Car. The class Vehicle is the base class, the class Four Wheeler is derived from it and the class Car is derived from the class Four Wheeler. Class Vehicle has a method' vehicle 'that prints I am a vehicle, class Four Wheeler has a method four Wheeler' that prints I have four wheels, and class Car has a method car that prints I am a car .So, as this is a multi-level inheritance; we can have access to all the other classes methods from the object of the class Car. We invoke all the methods from a Car object and print the corresponding outputs of the methods.

So, if we invoke the methods in this order, car(), four Wheeler(), and vehicle(), then the output will be

I am a car

I have four wheels

I am a vehicle

Course Outcomes:

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

CO1: Demonstrate the basic concept of programming.

CO2: Able to understand and design the solution to a problem using struct, function and function overloading concepts.

CO3: Able to understand and design the solution to a problem using object-oriented programming concepts.

CO4: Develop programs using inheritance and polymorphism.

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: 15Hrs		**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. Writing 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's workbook 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 Professional English 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

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

Course Objectives:

1. To realize 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		**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, How to 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	-	-	-	-	-	-