Basaveshwar Engineering College, Bagalkote
B.E I - Semester Scheme of Teaching and Examinations
(Academicyear2023-24)

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

Sl. No.	Category	Code	Title	TD	Teaching (Hours/Week) L	Teaching (Hours/Week) P	Duration in Hours	CIE Marks	SEE Marks	Total Marks	Credits
1.	BSC (IC)	22UMA104C	Mathematics for Mechanical Sciences - I	Mathematics	3	2	3	50	50	100	4
2.	BSC (IC)	22UCH112C	Chemistry for Mechanical Sciences	Chemistry	3	2	3	50	50	100	4
3.	ESC	22UME121C	Elements of Mechanical Engineering	ME	3	0	3	50	50	100	3
4.	ESC - I	22UXXXXXN	Engineering Science Course - I	Respective Engg. Dept	3	0	3	50	50	100	3
					2	2					
5.	ETC - I	22UXXXXXB	Emerging Technology Course - I	Any Engg. Dept	3	0	3	50	50	100	3
	OR										
	PLC-I	22UCSXXXB	Programming language course	Any Engg. Dept	2	2	3	50	50	100	3
6.	HSSC	22UHS124C	Communicative English	Humanities	1	0	1	50	50	100	1
7.	HSSC	22UHS126C 22UHS127C	Samskruthika Kannada* Balake Kannada**	Humanities	1	0	1	50	50	100	1
8.	AEC	22UHS129C	Innovation and Design Thinking	Any Dept	1	0	1	50	50	100	1
				Total	**18/16**	**6/8**		**400**	**400**	**800**	**20**

SDA	:	Skill Development Activities	**TD** : Teaching Department	**BSC**	:	Basic 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	**PLC**	**:**	Programming Language Course

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

UHV-I: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 is not 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 ES C – 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

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

Sl. No.	Category	Code	Title	TD	Theory Lecture L	Practical/Drawing P	Duration in hours	CIE Marks	SEE Marks	Total Marks	Credits
1.	BSC (IC)	22UMA204C	Mathematics for Mechanical Sciences - II	Mathematics	3	2	3	50	50	100	4
2.	BSC (IC)	22UPH208C	Physics for Mechanical Sciences	Physics	3	2	3	50	50	100	4
3.	ESC	22UME223C	CAED	Civil / Mechanical/IP	2	2	3	50	50	100	3
4.	ESC - I	22UXXXXXN	Engineering Science Course-I	Respective Engg. Dept	3	0	3	50	50	100	3
					2	2					
5.	PLC - I	22UCSXXXB	Programming Language Course-I	Any Engg. Dept	2	2	3	50	50	100	3
	OR										
	ETC - I	22UXXXXXB	Emerging Technology Course - I	Any Engg. Dept	3	0	3	50	50	100	3
6.	HSSC	22UHS224C	Professional Writing Skills in English	Humanities	1	0	1	50	50	100	1
7.	HSSC	22UHS225C	Constitution of India	Humanities	1	0	1	50	50	100	1
8.	AEC	22UHS228C	Scientific Foundations of Health	Any Dept	1	0	1	50	50	100	1
				Total	**16/16**	**8/8**		**400**	**400**	**800**	**20**

SDA	: Skill Development Activities	**TD**	: Teaching Department	**BSC**	: Basic 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):

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): (FordetailsrefertoChapter6,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 is not 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
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,

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 in1st 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	CREDITS: 04
L:T:P: 3:0:2		CIE MARKS : 50
TOTAL HOURS : 60HRS. (40L+20 P)		SEE MARKS : 50

Course Objectives:

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self–study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students to group learning to improve their creative and analytical skills.

UNIT-I	**10 Hrs.**

Calculus

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.

UNIT-II	**10 Hrs.**

Series Expansion and Multivariable Calculus

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($0/0,\infty/\infty,\infty-\infty$), 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.

UNIT-III	**10 Hrs.**

Ordinary Differential Equations (ODEs) of first and Higher order

Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations - Integrating factors on $1/N \left(\partial M/\partial y - \partial N/ \right) \ and \ 1/M \left(\partial N/\partial x - \partial M/\partial y \right)$. 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.

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.	
List of 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	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-

22UCH112C/212C	CHEMISTRY FOR MECHANICAL SCIENCE (INTEGRATED)	CREDITS: 04
L:T:P: 3:0:2		**CIE MARKS:50**
TOTAL HOURS: 40 HRS. (40T+ 20P)		**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.

Macromolecules for Engineering Applications

Polymers: Introduction, Monomer, polymer, polymerization, degree of polymerization, Glass transition temperature- factors affecting T_g. Molecular weight; number average and weight average, poly dispersity index, numerical problems. Synthesis, properties and industrial applications of Acrylo-Butadiene Styrene (ABS) plastics and silicone 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 Poly urethene (PU).

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

Self Study: Biodegradable polymer: Introduction, synthesis, properties and applications of polylactic acid(PLA) and polyhydroxybutyrate (PHB).

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 importance. Electroplating: Process, Factors affecting quality of electro deposit. Determination of throwing power by Haring-Blum cell. Numerical problems on throwing Power. Electroplating of chromium (hard and decorative). Electro less plating: Introduction, Comparison between electro plating and electro-less plating, electro-less 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.

Fuels & Analytical Techniques

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.

Bio fuels: Introduction, synthesis of Bio gas, Bio ethanol and biodiesel; Advantages and limitations.

Analytical Techniques: Sensors, Introduction, basic principle of sensor, Types of chemical sensors; Conductometric sensors, Electrochemical sensors and Optical sensors. Potentiometric sensors; Introduction, principle, working and application in the estimation of iron. Colorimetric sensors;Introduction, principle, working and application in the estimation of copper. Conductometric sensors; Introduction, principle, working and application in the estimation of weak acid.

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

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: One component: Water system and Sulphur System.

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

Nano materials: Introduction, Size dependent properties of nanomaterials - surface area and catalytic, Thermal, Electrical, Optical, Magnetic and Mechanical properties. Synthesis of nanomaterials by sol-gel method and co-precipitation method. Synthesis of carbon nanotubes by Chemical Vapour Deposition (CVD) method, properties and engineering applications. Nanomaterials for water treatment, Introduction and example.

Self Study: Phase diagram of two component Pb – Ag system

List of Experiments:

Compulsory conducting experiments

1. Estimation of total hardness of water by EDTA method
2. Potentiometric estimation of FAS using $K_2Cr_2O_7$
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)

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

Open Ended Experiments (suggestive - any one)

1. Precipitation titration.
2. Determination of percentage of copper present in the given brass piece.
3. Determination of percentage of CaO in cement solution.
4. Determination of manganese dioxide in pyrolusite ore.

Reference books:

1. Subha Ramesh etl. " *Engineering Chemistry*", Wiley India Pvt. Ltd. New Delhi, - 2nd Edition, 2013
2. SS Dara & Dr. SS Umare, "*A Text book of Engineering Chemistry*", S Chand & Company Ltd., 12th Edition, 2011.
3. R.V. Gadag and Nityananda Shetty, "*A Text Book of Engineering Chemistry*", I. K. International Publishing house. 2nd Edition, 2016.
4. F.W. Billmeyer, "*Text Book of Polymer Science*", John Wiley & Sons, 4th Edition, 1999.
5. G.A. Ozin & A.C. Arsenault "*Nanotechnology A Chemical Approach to Nanomaterials*", , RSC Publishing, 2nd Edition 2005.
6. M. G. Fontana, N. D. Greene "*Corrosion Engineering*", McGraw Hill Publications, New York, 3rd Edition, 1996.
7. Takatoshi Tsujimura, "*OLED Display Fundamentals and Applications*", Wiley–Blackwell, 1st Edition 2012
8. "*Laboratory Manual, Department of Chemistry*", BEC Bagalkot 2023 Edition
9. Dr. Sudha Rani, Dhanapath Rai "*Laboratory Manual on Engineering Chemistry*", Publishing Co. Ltd., 1st Edition, 1998

Web links and Video Lectures (e-Resources):

- http://libgen.rs/
- https://nptel.ac.in/downloads/122101001/
- https://nptel.ac.in/courses/104/103/104103019/

- https://ndl.iitkgp.ac.in/
- https://www.youtube.com/watch?v=faESCxAWR9k

https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLyhmwFtznRhuz8L1bb3X- 9IbHrDMjHWWh

Course Outcomes:

At the end of the course the students will be able to

CO1: Identify and determine composition of various materials using sensors and synthesis of polymers for specific engineering applications

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

CO3: Identify suitable sensor for the estimation of elements and fuel for future generation.

CO4: Outline the application of structural material for 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	1	1	-	-	-	1	-	-	-	-	-
CO3	3	1	1	-	-	-	1	-	-	-	-	-
CO4	3	1	1	-	-	-	1	-	-	-	-	-

22UME121C	ELEMENTS OF MECHANICAL ENGINEERING	CREDITS: 03
L:T:P: 3:0:0		**CIE MARKS:50**
TOTAL HOURS:40HRS.		**SEE MARKS:50**

Course Objectives:
1. Introduce students to the concepts of energy sources, steam formation and working principles of steam and water turbines.
2. Discuss the basic knowledge on automobile, IC engine, electric and hybrid vehicle and understand the principle working of refrigeration and air conditioning.
3. Discuss the fundamental of machining and understand the different types and principle working of conventional machine tool, CNC and metal joining process.
4. Provide students with opportunities to solve problems on velocity ratio of gear trains and belt drives, also to have the knowledge of different gear drives, belt drive and applications of robotics

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,Formationofsteam,TS,PH,PVdiagram,Typesofsteam,Steamproperties,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 Peltonturbine.

UNIT–II	**10Hrs.**

Automobile Engineering:
Introduction, Classification of IC engines, Parts of IC engine, IC Engine nomenclature, Working of4 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, Gearbox, 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),Workingofvaporabsorptionrefrigerationsystem(VARS)and comparison. Working principle of air conditioning.

UNIT–III	**10Hrs.**

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). Numerical to compute cutting speed, feed and machining time for facing, turning, drilling and milling operation.
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. K R Gopala Krishna Elements of "*Mechanical Engineering*", Subhash Publications, 2008.
2. Hazra Choudhry and Nirzar Roy "*Elements of Workshop Technology*" (Vol. 1 and 2), , Media Promoters and PublishersPvt.Ltd.,2010.
3. Jonathan Wickert and Kemper Lewis, "*An Introduction to Mechanical Engineering*", Third Edition, 2012.
4. P.N.Rao *Manufacturing Technology- "Foundry, Forming and Welding"*, Tata McGraw Hill 3rd Ed., Robotics,Appu Kuttan KKK.International Pvt Ltd,volume1, 2003

Course Outcomes:

At the end of the course the 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 water turbines

CO2:Computer and analyze the performance of IC engines used in automobiles and illustrate the concept
of electric, hybrid vehicles for future mobility and fundamentals of refrigeration system

CO3: Determine the cutting speed, feed and machining time of drilling, turning, facing and milling operations carried on the work piece and identify the different types and working principle of conventional machine tool, CNC and metal joining process.

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

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

22UCV118N/22UCV218N		CREDITS: 03
L:T:P: 3:0:0	INTRODUCTION TO CIVIL ENGINEERING	CIE MARKS:50
TOTAL HOURS: 40 HRS.		SEE MARKS:50

Course Objectives:
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 application ns.
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. Numericalexamples.

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. NumericalExamples.

Reference Books:

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

- Bhavikatti S S, Engineering Mechanics, New Age International, 2019.

Course Outcomes:

At the end of the course the student 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	CREDITS: 03
L:T:P: 3:0:0		CIE MARKS: 50
TOTAL HOURS: 40HRS.		SEE MARKS: 50

Course Objectives:

1. To understand the working of Hydro –electric, Thermal and Nuclear power plants
2. To determine current, voltage, and power in various branches by applying electric circuit theorems to DC and AC (single phase and three phase) circuits
3. To analyze the working principle and construction to identify the suitable applications of DC generators, motors and transformers by identifying the specifications
4. To identify the safety aspects in different types of wiring mechanisms and evaluate the energy consumption in domestic loads

UNIT – I	10 Hrs.

Introduction: General structure of electrical power systems using single line diagram approach.
Power Generation: Hydel, thermal, nuclear power plants (block diagram approach).
DC Circuits: Ohm's law and its limitations, KCL & KVL, series, parallel, series-parallel circuits. Simple Numerical.

UNIT – II	10 Hrs.

AC. Fundamentals:

Equation of AC voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor (only definitions), voltage and current relationship with phasor diagrams in R, L, and C circuits, concept of impedance, analysis of R-L, R-C, R-L-C series circuits, active power, reactive power and apparent power, concept of power factor. (Simple Numerical).

Three Phase Circuits:

Generation of three phase AC quantity, advantages and limitations, star and delta connection, relationship between line and phase quantities (excluding proof)

UNIT – III	10 Hrs.

DC Generator, DC Motor, Transformers:

Working principle, construction, equations, types and classifications, specifications, applications, cost. Simple numerical.

UNIT – IV	10 Hrs.

Domestic Wiring: Requirements, Types of wiring, Two way and three way control of loads.
Electrical Energy Calculation: Power rating of household appliances, two-part electricity tariff, calculation of electricity bill for domestic consumers.
Electrical Safety Measures:
Equipment: Types of equipment, voltage and current issues, safety.
Human: Electric shock, effect of shock on body, factors affecting severity of shock, safety precautions.

Reference Books:

1. B.L Theraja, "Fundamentals of Electrical Engineering and Electronics", S. Chand Publications, 27th
   Edition, 2014.
2. D C Kulshreshtha, "Basic Electrical Engineering", Tata McGraw Hill, 10th Edition, 2019.
3. Edward Hughes, "Electrical and Electronic Technology", Pearson Publications, 10th Edition, 2010.
4. Rajendra Prasad, "Fundamentals of Electrical Engineering", PHI Learning, 2nd Edition, 2009.

| | 5. V.N.Mittle and 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											
	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	CREDITS: 03
L:T:P: 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, Multi vibrators, Single-stage a stable 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.

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. M. Morris Mano, "Digital Logic and Computer Design", PHI Learning, 2008.
3. D.P. Kothari, I. J. Nagrath, "Basic Electronics", 2nd edition, McGraw Hill Education (India), Private Limited, 2018.

Course Outcomes:

After completion of the course the students will 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/ 22UCS220N	INTRODUCTION TO C PROGRAMMING (INTEGRATED)	CREDITS: 03
L:T:P: 2:0:2		CIE MARKS:50
TOTAL HOURS: 46HRS. (26T+20 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	07 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.

Constants, 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. Operationson arrays.

Strings: Introduction, Declaring and initializing string variables, String-handling functions, Array of String.

UNIT – IV	07 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: 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 byreading 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% SBetween 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 stringlength. 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 thestudents 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, 2nd 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 and S. S. Manvi, "Computer Concepts and C programming-AHolistic approach to learning C", 2nd Edition, PHI, 2010.

Course Outcomes:

After completion of the course the 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/22UEC234B	INTRODUCTION TO EMBEDDED SYSTEM	CREDITS: 03
L:T:P: 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:

After completion of the course the students will 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	3	-	-	2	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/22UEC235B	INTRODUCTION TO COMMUNICATION TECHNOLOGY	CREDITS: 03
L:T:P: 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	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

22UEE136B/22UEE236B	RENEWABLE ENERGY SOURCES	CREDITS: 03
L:T:P: 3:0:0		CIE MARKS: 50
TOTAL HOURS: 40HRS.		SEE MARKS: 50

Course Objectives:
1. To identify the parameters required for solar, wind, biomass, geothermal and ocean energy conversion systems.
2. To apply and analyze concepts and theory related to solar, wind, biomass, geothermal and ocean energy conversion systems.
3. To derive power output of solar and wind energy conversion systems based on the corresponding solar irradiation and wind speed respectively.
4. To analyze pros and cons 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											
	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/22UCV238B	GREEN BUILDINGS	CREDITS: 03
L:T:P: 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 and green 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 Environment

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 the 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/22UCV239B	WASTE MANAGEMENT	CREDITS: 03
L:T:P: 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 ANDDISPOSAL 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", Mc Dougall, 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:
Course Outcomes:
CO1: Apply the basics of solid waste management towards sustainable development
CO2: Study the composition and characteristics of the waste and its affect on the environment
CO3: Apply technologies to process waste and dispose the same.
CO4: Study the 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/22UCS240B	INTRODUCTION TO INTERNET OF THINGS (IoT)	CREDITS: 03
L:T:P: 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. Understand the recent application domains of IoT in everyday life.
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

UNIT – II	10 Hrs.

IoT Sensing and Actuation: Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensing Considerations, Actuators, Actuator Types, Actuator Characteristics.
IoT Processing Topologies and Types: Data Format, Importance of Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations, Processing Offloading.

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.
IoT Case Studies
Agricultural IoT – Introduction and Case Studies

UNIT - IV	10 Hrs.

IoT Case Studies and Future Trends
Vehicular IoT – Introduction
Healthcare IoT – Introduction, Case Studies
IoT Analytics – Introduction

Reference Books:

1. Sudip Misra, Anandarup Mukherjee, Arijit Roy, "Introduction to IoT", Cambridge University Press, 2021.
2. S. Misra, C. Roy, and A. Mukherjee, "Introduction to Industrial Internet of things and industry 4.0". CRC Press, 2020.
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, A press Publications, 2013.

Course Outcomes:

After completion of the course the students will be able to,
CO1: Describe the evolution of IoT, IoT networking components and addressing strategies in IoT.
CO2: Classify various sensing devices and actuator types.
CO3: Demonstrate the processing in IoT.
CO4: Explain associated IoT Technologies.
CO5: Illustrate the architectures of IoT application.

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/22UCS241B	INTRODUCTION TO CYBER SECURITY	CREDITS: 03
L:T:P: 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.

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: Introduction, 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, phishing, methods of 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, First Edition, 2011.
2. Rajkumar Singh Rathore, Mayank Bhushan, "Fundamentals of Cyber Security", BPB; First Edition, 2017.
3. Anand Shinde, "Introduction to Cyber Security", Notion Press, First Edition, 2020.
4. Nilakshi Jain and Dhananjay R. Kalbande, "Cyber Security and Cyber Laws", Wiley India Pvt. Ltd., 2020.

Course Outcomes:

After completion of the course the students will be able to,
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/22UME242B	COMPOSITE MATERIALS	CREDITS: 03
L:T:P: 3:0:0		CIEMARKS:50
TOTAL HOURS: 40HRS.		SEEMARKS:50

Corse Objectives:
1. Explain the behavior of constituents in the composite materials
2. Enlighten the students in different types of reinforcement
3. Develop the student's skills in understanding the different manufacturing methods available for composite material.
4. Illuminate the knowledge of macro mechanical analysis and cutting and joining of the composite materials

UNIT-I	10 Hrs.

Introduction to composite materials
Definition and classification of composites based on matrix and reinforcement, Characteristics of composite materials, Fibrous composites, Laminate composites and particulate composites.

Factors which determine the properties of composites, Benefits of composites, properties and types of reinforcements and matrices, Reinforcement-matrix interface.

UNIT–II	10 Hrs.

Polymer matrix composites
Introduction, Polymer matrices, Processing methods like Layup and curing, open and closed mold process- hand layup 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	10 Hrs.

Cutting, Machining and Joining of Composites
Continuous fibers, Iso-stress condition, Iso-strain condition, critical volume fraction of fiber and minimum volume fraction of fiber, Numericals on modulus of rigidity, and mechanics of discontinuous fibers.
Cutting and machining of composites: Reciprocating knife cutting, cutting of cured composite, Joining of composites: Mechanical fastening, Adhesive bonding.

Reference Books:

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

Course Outcomes:
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.
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.

Course Outcomes:	Programme Outcomes											
	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/21UME243B	INTRODUCTIONS TO ROBOTICS	CREDITS: 03
L:T:P: 3:0:0		CIE MARKS: 50
TOTAL HOURS: 40HRS.		SEE MARKS: 50

Course Objectives:
1. Understand robot configuration, structures, basic components, workspace and generations of robots.
2. Get acquainted with performing spatial transformations and solve kinematics of the robot.
3. Learn about various sensors, actuators, robot programming.
4. Understand the present &future applications of a robot.

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.

Reference Books:
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:

After completion of the course student will be able to

CO1: Comprehend 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											
	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/22UBT248B	BIOMASS AND BIOENERGY	CREDITS: 03
L:T:P: 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

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 andpellet burning stoves; wood, pellet and wood chipsboiler. 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 andApplications. 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 Processstechnology Mc Grow Hill company, 2008.
5. Dominik Rutz & Rainer Janssen, Biofuel Technology Handbook 2008.

Course Outcomes:
Course Outcomes:

After completion of the course student will be able to
CO1: Emphasize on the basic aspects of Biomass and Bio-Energy.
CO2: Interpret and describe biomass conversion technologies.
CO3: Acquire knowledge of innovative bioenergy plants.
CO4: Interpret and 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

22UCS130B/22UCS230B	INTRODUCTION TO WEB PROGRAMMING (INTEGRATED)	CREDITS: 03
L:T:P: 2:0:2		CIE MARKS:50
TOTAL HOURS: 46HRS. (26T+20P)		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	06 Hrs.

Tables and CSS, Links and Images: Table Elements, Formatting a Data Table: Borders, Alignment, and Padding, CSS Structural Pseudo- Class Selectors, thead and tbody Elements, Cell Spanning. 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.
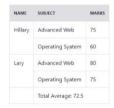
Programming Assignments:

1. To create a simple html file to demonstrate the use of different tags.
   Create an html page named as "Basic_Html_Tags.html" and add the following tags

   a) Different heading tags (h1 to h6)
   b) Paragraph
   c) Horizontal line
   d) Line Break

e) Pre tag
f) Different Logical Style (<b>,<u>,<Sup>,<sub>)

2. Create a HTML code to display the following web page using list.

Learning Web Development

```
I. Background Skills
     A. Unix Commands
     B. Vim Text Editor
II. HTML
     A. Minimal Page
     B. Headings
     C. Tags
     D. Lists
            i. Unordered
           ii. Ordered
          iii. Definition
           iv. Nested
     E. Links
            i. Absolute
           ii. Relative
     F. Images
```

3. Create an html page named as "Table.html" to display the following table.

NAME	SUBJECT	MARKS
Hillary	Advanced Web	75
	Operating Syatem	60
Lary	Advanced Web	80
	Operating Syatem	75
	Total Average: 72.5	

1. Create an internal style sheet to define the following CSS properties for element(s) on your page:
    a. text-decoration
    b. text-align
    c. font-size
    d. font-family
    e. font-weight

2. Create an external style sheet to define the following CSS properties for element(s) on your page:
    a. background-color
    b. color
    c. margin-xxx (left, right, top, or bottom)
    d. padding
    e. border-style , border-color , border-width

3. To create HTML code to insert image and to add a link to a web page.

4. Write a HTML code to perform the following CSS properties
    a. Text Properties
        ▪ text-color
        ▪ text-align
        ▪ text-decoration
        ▪ text-transformation
    b. Font Properties
        • font-style
        • font-size
        • font-family

5. Create a HTML code to display following output(using box properties)

Demonstrating the Box Model

6. Create the following table using CSS properties.

Roll No	Name	Team
1001	John	Red
1002	Peter	Blue
1003	Henry	Green

7. Create a HTML code for simple registration form which include
   i. Firstname ii. Middlename iii.Lastname iv.Course with option button v.Gender with radio button
   vi.Phone No vii.Address viii.Submit and reset button

Course Outcomes:

After completion of the course student will be able to

1. Analyze historical context and justification for HTML over XHTML.

2. Develop HTML5 documents and adding various semantic markup tags.

3. Learn various attributes, values and types of CSS.

4. 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

22UCS131B/22UCS231B	INTRODUCTION TO PYTHON PROGRAMMING	CREDITS: 03
L:T:P: 2:0:2		**CIE MARKS: 50**
TOTAL HOURS: 46HRS. (26T+20P)		**SEE MARKS: 50**

Course objectives

1. Learn the syntax and semantics of the python programming languages
2. Illustrate the process of structuring the data using list, tuples, string and dictionaries
3. Demonstrate the use of built-in function to navigate the file system

UNIT – I	07 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	07 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. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.
3. Develop a program to generate Fibonacci sequence of length (N). Read N from the

console.

4. Write a function to calculate factorial of a number. Develop a program to compute binomial coefficient (Given N and R).
5. Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages.
6. Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with suitable message.
7. Develop a program to print 10 most frequently appearing words in a text file. [Hint: Use
8. 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]
9. 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 ()].
10. 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.
11. 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.
12. 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
13. Given price list: {item1: amt, item2: amt . . .} and list of items purchased, write python program to find amount to be paid for purchased items.
14. Ex: pricelist ; { "pen":10, "Notebook":50, "book":100} Items_purchased = ["pen", "book"]
15. o/p: amt_to_be_paid = 110

Reference Books:

1. B. Nagesh Rao, "Learning Python", Cyberplus publication, 2nd edition
2. Gaowrishankar S., Veena A, "Introduction to python programming", CRC press
3. Al Sweigart, "Automate the boring stuff with Python", No Starch press, 1st Edition, 2015.
4. Allen B. Downey, "Think Python: How to Thik Like a Computer Scientist", Green Tea Press, 2nd Edition, 2015.

Course Outcomes:

After completion of the course the students will 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
CO 4: Able to create, read data from and write data to files

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
CO4	-	3	3	1	2	-	-	-	-	-	-	2

22UCS132B /22UCS232B		CREDITS: 03
L:T:P: 2:0:2	**BASICS OF JAVA PROGRAMMING**	**CIE MARKS: 50**
TOTAL HOURS: 46HRS. (26 T+20 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	07 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

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.

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.

UNIT – IV	07 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:

1. 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

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 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

Course Outcomes:

After completion of the course the students will be able to,
CO1: Explain features of JAVA.
CO2: Analyse the problem statement and Identify the requirement.
CO3: Design and develop standalone applications using Java.

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

22UCS133B /22UCS233B	INTRODUCTION TO C++ PROGRAMMING	CREDITS: 03
L:T:P: 2:0:2		CIE MARKS:50
TOTAL HOURS: 46HRS. (28T+20P)		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 structure 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: 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 Iam a car .So, as this is a multi- inheritance; we can have access to all the other classes methods from the object of the class Car.
11. We invoke all the methods from a Car object and print the corresponding outputs of the methods.
12. So, if we invoke the methods in this order, car(), four Wheeler(), and vehicle(), then the outputwill be
13. I am a car
14. I have four
15. wheels I am a vehicle

Course Outcomes:

After completion of the course the students will 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

22UHS124C	COMMUNICATIVE ENGLISH	CREDIT: 01
L:T:P: 1:0:0		CIE MARKS:50
TOTAL HOURS: 15 HRS.		SEE MARKS:50

Course Objectives:

1. To know about fundamentals of communicative english and communication skills ingeneral.
2. To train the students and identify the nuances of phonetics, intonation and enhance pronunciation skillsfor 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 and 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 and Preposition, kinds of Preposition and Prepositions often Confused. Articles: Use of Articles – Indefinite and Definite Articles, Verbs and 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, Word 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. Infinite Learning Solutions "A Textbook of English Language Communication Skills" (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 2019.
6. English Language Communication Skills – Lab Manual cum Workbook, Cengage learning India Pvt. Limited 2019.

Course Outcomes:

After completion of the course student will be able to

CO1: Apply the Fundamentals of Communicative English 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

22UHS226C		SAMSKRUTHIKA KANNADA	CREDITS: 01
L:T:P: 1:0:0			CIE MARKS:50
TOTAL HOURS:15HRS.			SEE MARKS:50

ಕೋರ್ಸ್ ಉದ್ದೇಶಗಳು :

1. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ' ಪಠ್ಯದ ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಕನ್ನಡ ನಾಡು, ನುಡಿ, ಭಾಷೆ, ಮತ್ತು ಕನ್ನಡಿಗರ

   ಸಾಂಸ್ಕೃತಿಕ ಬದುಕಿನ ಬಗೆಗೆ ಅರಿವು ಮೂಡಿಸುವುದು.

2. ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆ ಹಾಗೂ ಅದಕ್ಕೆ ಪೂರಕವಾಗಿರುವ ಕನ್ನಡ ವ್ಯಾಕರಣಾಂಶಗಳ ಬಗೆಗೆ ಅರಿವು ಮೂಡಿಸುವುದು.

   ಪ್ರಾದೇಶಿಕ ಭಾಷೆಯಲ್ಲಿ ಅರ್ಜಿ ಮತ್ತು ಪತ್ರವ್ಯವಹಾರಗಳನ್ನು ಸಮರ್ಥವಾಗಿ ನಿರ್ವಹಿಸಲು ಪ್ರೇರೇಪಿಸುವುದು. .

3. ತಾಂತ್ರಿಕ ಅಧ್ಯಯನದ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯ ಬರವಣಿಗೆ ಮತ್ತು ಬರವಣಿಗೆಯಲ್ಲಾಗುವ ದೋಷಗಳನ್ನು

   ಗುರುತಿಸುವ ಸಾಮರ್ಥ್ಯವನು ಬೆಳೆಸುವುದು.

4. ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಅಡಗಿರುವ ಸುಪ್ತ ಪ್ರತಿಭೆಯನ್ನು ಅನಾವರಣಗೊಳಿಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಅವರಲ್ಲಿ ಕಲೆ, ಬರವಣಿಗೆ ಮತ್ತು ಭಾಷಾಂತರ

   ಕಲೆಯಲ್ಲಿ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು.ಎಲ್ಲದಕ್ಕೂ ಮೇಲಾಗಿ ಮಾನವೀಯ ಮೌಲ್ಯಗಳೊಂದಿಗೆ ಸರ್ವಾಂಗೀಣವಾಗಿ

   ಸಂವರ್ಧನೆಗೊಳಿಸಿ ಅವರನ್ನು ರಾಷ್ಟ್ರದ ಅಮೂಲ್ಯ ಸಂಪತ್ತನ್ನಾಗಿ ರೂಪಿಸುವುದು.

5. ಕರ್ನಾಟಕ ಸರ್ಕಾರದ ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಯಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯ ಪರೀಕ್ಷೆಯ ಬರೆಯಲು ಸಾಮರ್ಥ್ಯ

   ಹೊಂದಿರುತ್ತಾರೆ.

¨sAUA-I	4 Hrs.

1 ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ   :   ಹಂಪ ನಾಗರಾಜಯ್ಯ

2. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ : ಒಂದುಅಪೂರ್ವಚರಿತ್ರೆ – ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ

3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ :   ಡಾ.ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ.ಎ.ಕೇಶವಮೂರ್ತಿ

¨sAUA-II	

1. ವಚನಗಳು   :   ಜೇಡರದಾಸಿಮಯ್ಯ,ಬಸವಣ್ಣ,ಅಕ್ಕಮಹಾದೇವಿ,ಅಲ್ಲಮಪ್ರಭು,ಆಯ್ದಕ್ಕಿಲಕ್ಕಮ್ಮ.

2. ಕೀರ್ತನೆಗಳು   :   ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೆ–ಕನಕದಾಸರು

3. ತತ್ವಪದಗಳು   :   ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು – ಶಿಶುನಾಳ ಷರೀಫರು

4. ಜನಪದಗೀತೆ   :   ಬೀಸುವ ಪದ

¨sAUA-III	

1. ಮಂಕುತಿಮ್ಮನಕಗ್ಗ   : ಡಿ.ವಿ.ಜಿ.

2. ಕುರುಡುಕಾಂಚಾಣಾ   : ದ.ರಾ. ಬೇಂದ್ರೆ

3. ಹೊಸಬಾಳಿನ ಗೀತೆ   : ಕುವೆಂಪು

4. ಚೋಮನ ಮಕ್ಕಳ ಹಾಡು : ಡಾ.ಸಿದ್ಧಲಿಂಗಯ್ಯ

5. ಆ ಮರ ಈ ಮರ   : ಡಾ.ಚಂದ್ರಶೇಖರ ಕಂಬಾರ

1. ಡಾ.ಸರ್,ಎಂ.ವಿಶ್ವೇಶ್ವರಯ್ಯ : ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ   – ಎ ಎನ್ ಮೂರ್ತಿರಾವ್

2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ :   ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ

3. 'ಕ' ಮತ್ತು 'ಬ' ಬರಹ ತಂತ್ರಾಂಶಗಳು ಕನ್ನಡದ ಟೈಪಿಂಗ್

¥ÀoÀå ¥ÀÅ¸ÀÛPÀUÀ¼ÀÄ

"¸Á0¸ÀÌöÈwPÀ PÀ£ÀßqÀ" (¸À0)

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Prasaranga VTU, Belagavi, Karnataka, 2020

PÉÆÃ¸Àð ¥sÀ°vÁ0±ÀUÀ¼ÀÄ

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

CO1: ವಿದ್ಯಾರ್ಥಿಗಳು ಬೌದ್ಧಿಕವಾಗಿ ಬೆಳೆಯುವುದರೊಂದಿಗೆ ನಮ್ಮ ನಾಡಿನ ಮತ್ತು ದೇಶದ ಸಾಂಸ್ಕೃತಿಕ ವಾರಸುದಾರರಾಗಿ ಬೆಳೆದು ಸ್ವಾವಲಂಬಿಯಾಗಿ ಬದುಕು ಕಟ್ಟಿಕೊಳ್ಳುತ್ತಾರೆ.

CO2: ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಸಮರ್ಥವಾಗಿ ಮಾತನಾಡುವುದರೊಂದಿಗೆ, ಅನ್ಯರನ್ನು ಅರ್ಥೈಸಿಕೊಳ್ಳುವ ಮನೋಬಲ ಬೆಳೆಸಿಕೊಳ್ಳುತ್ತಾನೆ. ಇವತ್ತಿನ ಸಂಕೀರ್ಣವಾದ ಸಾಮಾಜಿಕ ವ್ಯವಸ್ಥೆಯಲ್ಲಿ ಸೌಹಾರ್ದಯುತ ವಾದ ನಡುವಳಿಕೆಯೊಂದಿಗೆ ಸಂಪನ್ಮೂಲ ವ್ಯಕ್ತಿಯಾಗಿ ರೂಪುಗೊಳ್ಳುತ್ತಾನೆ.

CO3: ಜಾಗತಿಕರಣದ ಸಂದರ್ಭದಲ್ಲಿ ವಿದ್ಯಾರ್ಥಿಗಳು ಸ್ವತಂತ್ರವಾಗಿ ಆಲೋಚಿಸುವ, ಸ್ವತಂತ್ರವಾಗಿ ಬರೆಯುವ, ಸ್ವತಂತ್ರವಾಗಿ ಚಿಂತನಶೀಲರಾಗುವ ಸಾಮರ್ಥ್ಯವನ್ನು ಪಡೆದು, ಸಮಯೋಚಿತವಾಗಿ ಸೂಕ್ತ ನಿರ್ಧಾರಗಳನ್ನು ಕೈಗೊಳ್ಳುವಲ್ಲಿ ಈ ಅಧ್ಯಯನ ದೀಪಸ್ಥಂಬವಾಗಿದೆ.

CO4: ವಿದ್ಯಾರ್ಥಿಗಳು ಇಂದಿನ ಜಾಗತಿಕ ವಿದ್ಯಮಾನಗಳನ್ನು ಅರ್ಥೈಸಿಕೊಂಡು, ಸಮಾಜದಲ್ಲಿ ಸಂಘಜೀವಿಯಾಗಿ ಬೆಳೆಯುವ ಮನೋಬಲವನ್ನು, ಮತ್ತು ಆತ್ಮಸ್ಥೈರ್ಯವನ್ನು ತುಂಬುವಲ್ಲಿ ಈ ಅಧ್ಯಯನ ಸೂಕ್ತವಾದ ಮಾರ್ಗದರ್ಶಿಕೆಯಾಗಿದೆ.

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

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

22UHS127C/22UHS227C	BALAKE KANNADA	CREDITS: 01
L:T:P: 1:0:0		CIE MARKS:50
TOTAL HOURS:15HRS.		SEE MARKS:50

ಕೋರ್ಸ್‌ಉದ್ದೇಶಗಳು:

1. 'ಬಳಕೆ ಕನ್ನಡ 'ಪಠ್ಯದ ಅಧ್ಯಯನ ದಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳು ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಅರ್ಥೈಸಿಕೊಂಡು, ಕನ್ನಡದಲ್ಲಿ ಸಂವಹನ ಮಾಡಲು ಸಾಧ್ಯವಾಗುತ್ತದೆ.

2. ಕನ್ನಡ ವರ್ಣಮಾಲೆಯ ಬಗೆಗೆ ಅರಿವು ಮೂಡಿಸುವುದು ಮತ್ತು ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಆಂತರಿಕ ಸಂವಹನ ಕ್ರಿಯೆಯನ್ನು ವೃದ್ಧಿಗೊಳಿಸುವುದು.

3. ಕನ್ನಡ ಸಂಖ್ಯೆಗಳ ಬಗೆಗೆ ಅರಿವು ಮೂಡಿಸಿ, ಅವುಗಳನ್ನು ಸಮಯೋಚಿತವಾಗಿ ಬಳಸುವ ವಿಧಾನವನ್ನು ಕಲಿಸಿಕೊಡುವುದು.

4. ನಮ್ಮ ನಾಡಿನ ಸಾಂಸ್ಕೃತಿಕ ವೈವಿಧ್ಯತೆಯನ್ನುಅರಿತು, ಅರ್ಥೈಸಿಕೊಂಡು ನಾಡಜನರೊಂದಿಗೆ ಸೌಹಾರ್ದಯುತವಾಗಿ ಬದುಕಲು ಕಲಿಸುವುದು.

UNIT-I	4 Hrs.

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

Lessons to teach and Learn Kannada Language

1. ವೈಯಕ್ತಿಕ,ಸ್ವಾಮ್ಯಸೂಚಕ/ಸಂಬಂಧಿತ ಸರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು – Personalpronouns, possessive Forms, Interrogative words

2. ನಾಮಪದಗಳ ಸಂಬಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮ ಪದಗಳು– Possessive forms of nouns, dubitive question and Relative nouns

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

UNIT-II	4 Hrs.

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

2. ನ್ಯೂನ/ ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು ಮತ್ತುವರ್ಣ ಗುಣವಾಚಕಗಳು – Defective/Negative Verbs and Colour Adjectives

3. ಅಪ್ಪಣೆ / ಒಪ್ಪಿಗೆ,ನಿರ್ದೇಶನ,ಪ್ರೋತ್ಸಾಹ ಮತ್ತುಒತ್ತಾಯ ಅರ್ಥ ರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು Permission, Commands, encouraging and Urging words Imparative words and sentences

4. ಹೋಲಿಕೆ (ತರತಮ). ಸಂಬಂಧ ಸೂಚಕ ಮತ್ತು ವಸ್ತುಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಪದಗಳ ಬಳಕೆ – Comparitive, Relationship, identification and Negation words

UNIT-III	4 Hrs.

1. ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿದ ಪ್ರಕಾರಗಳು
   Different types of forms of Tense, Time and Verbs
2. ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು – Kannada words in Conversation
3. ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮತ್ತು ರಾಜ್ಯದ ಬಗ್ಗೆ ಕುರಿತಾದ ಇತರೆ ಮಾಹಿತಿಗಳು–
   Karnataka State and General information about the State
4. ಭಾಷೆ ಕಲಿಯಲು ಏನನ್ನುಮಾಡಬೇಕು ಮತ್ತು ಮಾಡಬಾರದು – Do's and don'ts in learning a language

UNIT-IV	4 Hrs.

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

¥ÀoÀå ¥ÀÅ¸ÀÛPÀUÀ¼ÀÄ

ಬಳಕೆ ಕನ್ನಡ –"Balake Kannada" -
Author : Dr. L Thimmesha
Published by Prasaranga,
Visvesvara a Technolo ical Universi , Bela avi, Karnataka.

PÉÆÃ¸Àð ¥sÀ°vÁ0±ÀUÀ¼ÀÄ

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

CO1: ವಿದ್ಯಾರ್ಥಿಗಳು ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಸುಲಭವಾಗಿ ಅರ್ಥೈಸಿಕೊಂಡು, ಸಾಮಾಜಕವಾಗಿ,ಆರ್ಥಿಕವಾಗಿ ಆಯಾ ಪ್ರದೇಶದ ಜನರೊಂದಿಗೆ ಅನ್ಯೋನ್ಯವಾಗಿ ವ್ಯವಹರಿಸುತ್ತಾರೆ.

CO2: ಈ ಪಠ್ಯಾಧ್ಯಯನದಿಂದ ವಿದ್ಯಾರ್ಥಿಯು ಆಯಾ ಪ್ರದೇಶಗಳ ನಂಬಿಕೆ,ಸಂಪ್ರದಾಯ ಮತ್ತು ಆಚರಣೆಗಳನ್ನು ಸುಲಭವಾಗಿ ಅರ್ಥಮಾಡಿಕೊಳ್ಳಲು ಸಾಧ್ಯವಾಗುತ್ತದೆ.

CO3: ಕನ್ನಡ ಸಂಖ್ಯೆಗಳ ಪರಿಕಲ್ಪನೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಯು ವಾಣಿಜ್ಯ ವ್ಯವಹಾರಗಳನ್ನು ಸುಲಭವಾಗಿ ನೆರೆವೇರಿಸಲು ಸಾಧ್ಯವಾಗುತ್ತದೆ.

CO4: ಹಂತಹಂತವಾಗಿ ವಿದ್ಯಾರ್ಥಿಯು ಕನ್ನಡ ಭಾಷೆಯಲ್ಲಿ ಬರವಣಿಗೆಯ ಕಲೆಯನ್ನು ಮತ್ತು ಓದುವ ಕಲೆಯನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳುತ್ತಾನೆ.

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

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

22UHS129C/22UHS229C	INNOVATION AND DESIGN THINKING	CREDIT: 01
L:T:P: 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' Brien and 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. Hasso Plattner, Christoph Meinel and Larry Leifer, "Design Thinking : Understand–Improve–Apply",Springer, 2011
4. Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Businessor Design School", John Wiley & Sons 2013.
5. Yousef Haik and Tamer M. Shahin, "Engineering Design Process", Cengage Learning, 2nd edition, 2011.

Course Outcomes:

After completion of the course the students 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.

22UMA204C	MATHEMATICS FOR MECHANICAL SCIENCES –II (INTEGRATED)	CREDITS: 04
L:T:P: 3:0:2		CIE MARKS : 50
TOTAL HOURS : 60 (40L+20 P)		SEE MARKS : 50

Course Objectives:
1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self–study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students to group learning to improve their creative and analytical skills.

UNIT-I	**10 Hrs.**

Integral Calculus

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.

UNIT-II	**10 Hrs.**

Vector Calculus

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.

UNIT-III	**10 Hrs.**

Partial Differential Equations

Importance of partial differential equations for Mechanical Engineering application.

Formation of PDE's by elimination of arbitrary constants and functions. Solution of nonhomogeneous 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.

UNIT-IV	**10 Hrs.**

Numerical Methods

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.

Self-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.

List of experiments

1   Program to calculate double integration of the given function under the given limits

    1. Evaluate double integration of exp(x+y) between the limits (0,1) and (0,1) andverify the answer is 2.9524924.

    2. Evaluate double integration of exp(x+y) between the limits (0,1) and (0,2) andverify the answer is 10.978199.

    3. Evaluate double integration of exp(x+y) between the limits (0,2) and (0,2) andverify the answer is 40.820038.

    4. Evaluate double integration of exp(x+y) between the limits (1,2) and (0,2) andverify the answer is 29.841839.

    5. Evaluate double integration of exp(x+y) between the limits (1,2) and (1,2) andverify the answer is 21.816132.

    6. Evaluate double integration of x^2+y^2 between the limits (1,2) and (1,2) andverify the answer is 4.6666667.

    7. Evaluate double integration of x^2+y^2 between the limits (0,2) and (1,2) andverify the answer is 7.3333333.

    8. Evaluate double integration of x^2+y^2 between the limits (0,2) and (0,2)and verify the answer is 10.666667.

    9. Evaluate double integration of x^2+y^2 between the limits (0,1) and (0,2) andverify the answer is 3.3333333.

    10. Evaluate double integration of x^2+y^2 between the limits (0,1) and (0,1) andverify the answer is 0.6666667.

2   Program

    i.   To calculate the gradient of the tangent to the given angle.

    ii.   To calculate the gradient of the tangent to the given points.

    iii.   To calculate the gradient of the tangent to the given curve usingnumerical derivatives.

    iv.   To calculate the gradient of the tangent to the given curve usingderivatives.

3   Program

    i.   To find the divergence of the given function at the given point.

    ii.   To find the curl of the given function at the given point.

4   Program to find the Solution of algebraic or transcendental equations by Newton-Raphson method

5   Program
     i.   To calculate Newton forward difference for a given point.
     ii.   To calculate Newton backward difference for a given point.
6   Program to calculate trapezoidal rule
7   Program
     i.   To calculate simpsons1/3 rule
     ii.   To calculate simpsons3/8 rule
8   Program
     i.   To calculate ode by Taylors series.
     ii.   To calculate ode by modified Euler's method
9   Program to find the solution of ode by Runge Kutta method
10. Program to find the solution of ode by Milne 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.

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

22UPH108C/22UPH208C	PHYSICS FOR MECHANICAL SCIENCES (INTEGRATED)	CREDITS - 04
L:T:P: 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 shockwaves
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 andsemiconductor 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, See back 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 conductivitySelf-learning: Thermo emf and thermo current

UNIT – IV	10 Hrs.

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 microscopeSelf-learning: X-ray diffractometer

LIST OF EXPERIMENTS:

Any Ten experiments have to be completed from the 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 parallelcombinations
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 dischargingmethod
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,prottype

Reference Books :

1 A. P. French, "Vibrations and Waves" (MIT introductory Physics Series),CBS, 2003 Edition
2 Timoshenko, S. and Goodier J.N. "Theory of Elasticity", McGraw HillBook Co. 2nd Edition,2001
3 Sadhu Singh, , "Theory of Elasticity", Khanna Publishers, 1997

4   Wole Soboyejo, "Mechanical Properties of Engineered Materials" CRCPress, 1st edition, 2002

5   Singhal, Agarwal & Satyaprakash, "Heat & Thermodynamics and Statistical Physics" Pragati Prakashan, 18th Edition, Meerut, 2006

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

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

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

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

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

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

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

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

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

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=PLtkeUZItwHK5y6qy
1GFxa4Z4RcmzU aaz6Thermoelectric 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

Materialcharacterization: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

Course outcomes:

At the end of the course the student will be able to:
1. Apply concepts of oscillations and select appropriate properties of lasers for engineering applications
2. Apply concepts of elasticity and generation of low temperature for engineering

applications
3. Select appropriate properties of thermoelectric materials and shock waves for engineeringapplications
4. 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	CREDITS: 03
L:T:P :: 2:0:2		CIE MARKS:50
TOTAL HOURS:46 (26T+20P)		SEE MARKS:50

Course Objectives:
1. To understand the basic principles and conventions of engineering drawing and To generate projection of points and lines
2. To generate orthographic projections of planes using CAD software
3. To generate orthographic projections of solids and development of lateral surfaces of solids using CAD software
4. To understand the isometric projections and freehand sketching

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.

Isometric Projections:
Isometric scale, Isometric Projection of hexahedron (cube), right regular prisms, pyramids, Cylinders, Cones and spheres. Isometric Projection of combination of two simple solids (Co-Axial only).

Free hand Sketching:
True free hand, Guided Free hand, Roads, Buildings, Utensils, Hand tools & Furniture's etc.
Drawing Simple Mechanisms; Bicycles, Tricycles, Gear trains, Ratchets, two-wheeler cart & Four-wheeler carts etc. (Free hand sketches).

Reference Books:

1. K.R.Gopalkrishna, ''*Engineering Drawing*', vol. I and II, 23rd edition, Subhas, 2014.
2. N.D.Bhat "*Engineering Drawing*" 2011.
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:

CO1: Draw and communicate the objects with definite shape and dimensions

CO2: Recognize and draw the shape and size of objects through different views.

CO3: Develop the lateral surface of the objects

CO4: Draw isometric views and freehand sketches of mechanisms and simple machine parts

CO5: 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	-	-	3	-	1
CO5	3	2	-	-	3	1	-	-	-	-	-	1

22UCV118N/22UCV218N	INTRODUCTION TO CIVIL ENGINEERING	CREDITS: 03
L:T:P: 3:0:0		CIE MARKS:50
TOTAL HOURS: 40 HRS.		SEE MARKS:50

Course Objectives:
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 application ns.
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. Numericalexamples.

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. NumericalExamples.

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

Course Outcomes:
Course Outcomes:
At the end of the course the student 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	CREDITS: 03
L:T:P: 3:0:0		CIE MARKS: 50
TOTAL HOURS: 40HRS.		SEE MARKS: 50

Course Objectives:
1. To understand the working of Hydro –electric, Thermal and Nuclear power plants
2. To determine current, voltage, and power in various branches by applying electric circuit theorems to DC and AC (single phase and three phase) circuits
3. To analyze the working principle and construction to identify the suitable applications of DC generators, motors and transformers by identifying the specifications
4. To identify the safety aspects in different types of wiring mechanisms and evaluate the energy consumption in domestic loads

UNIT – I	10 Hrs.

Introduction: General structure of electrical power systems using single line diagram approach.
Power Generation: Hydel, thermal, nuclear power plants (block diagram approach).
DC Circuits: Ohm's law and its limitations, KCL & KVL, series, parallel, series-parallel circuits. Simple Numerical.

UNIT – II	10 Hrs.

AC. Fundamentals:
Equation of AC voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor (only definitions), voltage and current relationship with phasor diagrams in R, L, and C circuits, concept of impedance, analysis of R-L, R-C, R-L-C series circuits, active power, reactive power and apparent power, concept of power factor. (Simple Numerical).

Three Phase Circuits:
Generation of three phase AC quantity, advantages and limitations, star and delta connection, relationship between line and phase quantities (excluding proof)

UNIT – III	10 Hrs.

DC Generator, DC Motor, Transformers:
Working principle, construction, equations, types and classifications, specifications, applications, cost. Simple numerical.

UNIT – IV	10 Hrs.

Domestic Wiring: Requirements, Types of wiring, Two way and three way control of loads.
Electrical Energy Calculation: Power rating of household appliances, two-part electricity tariff, calculation of electricity bill for domestic consumers.
Electrical Safety Measures:
Equipment: Types of equipment, voltage and current issues, safety.
Human: Electric shock, effect of shock on body, factors affecting severity of shock, safety precautions.

Reference Books:
1. B.L Theraja, "Fundamentals of Electrical Engineering and Electronics", S. Chand Publications, 27th Edition, 2014.
2. D C Kulshreshtha, "Basic Electrical Engineering", Tata McGraw Hill, 10th Edition, 2019.
3. Edward Hughes, "Electrical and Electronic Technology", Pearson Publications, 10th Edition, 2010.
4. Rajendra Prasad, "Fundamentals of Electrical Engineering", PHI Learning, 2nd Edition, 2009.
5. V.N.Mittle and A.Mittal, "Basic Electrical Engineering", Tata McGraw-Hill Education, 2005.

Course Outcomes:
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											
	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		CREDITS: 03
L:T:P: 3:0:0	**INTRODUCTION TO ELECTRONICS ENGINEERING**	**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, Multi vibrators, Single-stage a stable 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.

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. M. Morris Mano, "Digital Logic and Computer Design", PHI Learning, 2008.
3. D.P. Kothari, I. J. Nagrath, "Basic Electronics", 2nd edition, McGraw Hill Education (India), Private Limited, 2018.

Course Outcomes:

After completion of the course the students will 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/ 22UCS220N		CREDITS: 03
L:T:P: 2:0:2	**INTRODUCTION TO C PROGRAMMING (INTEGRATED)**	CIE MARKS:50
TOTAL HOURS: 46HRS. (26T+20 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 toproblems
4. Design and Develop Solutions to problems using structured programming constructs such asfunctions and procedures

UNIT – I	07 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.
Constants, 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. Operationson arrays.
Strings: Introduction, Declaring and initializing string variables, String-handling functions, Array of String.

UNIT – IV	07 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: 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 byreading 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% SBetween 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:
v. Circle
vi. Triangle
vii. Parallelogram
viii.   Square

Part - B

1. Write a C program to generate multiplication table between 1 to n.
2. Write a C program to generate the prime numbers between 1 to n.
3. Write a C program to Implement Linear Search on Integers.
4. Write a C program to perform addition of 2 Matrix.
5. Sort the given set of N numbers using selection sort.
6. Write functions to implement string operations such as compare, concatenate, and find stringlength. Use the parameter passing techniques.
7. Write a C program to find the value of a^n using user-defined function.
8. Write a C program to find the factorial of a number using recursive function.
9. Implement structures to read, write and compute average- marks of the students, list thestudents scoring above and below the average marks for a class of N students.
10. 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, 2nd 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 and S. S. Manvi, "Computer Concepts and C programming-AHolistic approach to learning C", 2nd Edition, PHI, 2010.

Course Outcomes:

After completion of the course the 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/22UEC234B	INTRODUCTION TO EMBEDDED SYSTEM	CREDITS: 03
L:T:P: 3:0:0		CIE MARKS:50
TOTAL HOURS: 40HRS.		SEE MARKS:50

Course Objectives:

1. To provide knowledge of embeddedsystems, applications, purpose and processor architectures.
2. To provide background knowledge of communication interfaces, characteristics and qualityattributes 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, Basicsof 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", Westpublishing company, college and school division, 1997.
4. Rajkamal, "Embedded systems: architecture, programming and design", Tata McGraw Hill private limited, second edition

Course Outcomes:
Course Outcomes:
After completion of the course the students will 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	3	-	-	2	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/22UEC235B	INTRODUCTION TO COMMUNICATION TECHNOLOGY	CREDITS: 03
L:T:P: 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", TataMcGraw 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	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

22UEE136B/22UEE236B	RENEWABLE ENERGY SOURCES	CREDITS: 03
L:T:P: 3:0:0		CIE MARKS: 50
TOTAL HOURS: 40HRS.		SEE MARKS: 50

Course Objectives:
1. To identify the parameters required for solar, wind, biomass, geothermal and ocean energy conversion systems.
2. To apply and analyze concepts and theory related to solar, wind, biomass, geothermal and ocean energy conversion systems.
3. To derive power output of solar and wind energy conversion systems based on the corresponding solar irradiation and wind speed respectively.
4. To analyze pros and cons 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											
	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/22UCV238B	GREEN BUILDINGS	CREDITS: 03
L:T:P: 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 and green 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 Environment

Reference Books:

1. K. S Jagadish, B. V. Venkataramana Reddy, K. N Nanjundarao "Alternative Building Materialsand 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 the 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/22UCV239B	WASTE MANAGEMENT	CREDITS: 03
L:T:P: 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 ANDDISPOSAL 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", Mc Dougall, P. John Wiley & Sons, 2001.
4. Nicholas, P., & Cheremisinoff, P. D., "Handbook of solid waste management and waste minimization technologies", Imprint of Elsevier Science, 2005.

Course Outcomes:
CO1: Apply the basics of solid waste management towards sustainable development
CO2: Study the composition and characteristics of the waste and its affect on the environment
CO3: Apply technologies to process waste and dispose the same.
CO4: Study the 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/22UCS240B	INTRODUCTION TO INTERNET OF THINGS (IoT)	CREDITS: 03
L:T:P: 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. Understand the recent application domains of IoT in everyday life.
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

UNIT – II	**10 Hrs.**

IoT Sensing and Actuation: Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensing Considerations, Actuators, Actuator Types, Actuator Characteristics.
IoT Processing Topologies and Types: Data Format, Importance of Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations, Processing Offloading.

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.
IoT Case Studies
Agricultural IoT – Introduction and Case Studies

UNIT - IV	**10 Hrs.**

IoT Case Studies and Future Trends
Vehicular IoT – Introduction
Healthcare IoT – Introduction, Case Studies
IoT Analytics – Introduction

Reference Books:

1. Sudip Misra, Anandarup Mukherjee, Arijit Roy, "Introduction to IoT", Cambridge University Press, 2021.
2. S. Misra, C. Roy, and A. Mukherjee, "Introduction to Industrial Internet of things and industry 4.0". CRC Press, 2020.
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, A press Publications, 2013.

Course Outcomes:

After completion of the course the students will be able to,
CO1: Describe the evolution of IoT, IoT networking components and addressing strategies in IoT.
CO2: Classify various sensing devices and actuator types.
CO3: Demonstrate the processing in IoT.
CO4: Explain associated IoT Technologies.
CO5: Illustrate the architectures of IoT application.

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/22UCS241B		CREDITS: 03
L:T:P: 3:0:0	**INTRODUCTION TO CYBER SECURITY**	**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.

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: Introduction, 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, phishing, methods of 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, First Edition, 2011.
2. Rajkumar Singh Rathore, Mayank Bhushan, "Fundamentals of Cyber Security", BPB; First Edition, 2017.
3. Anand Shinde, "Introduction to Cyber Security", Notion Press, First Edition, 2020.
4. Nilakshi Jain and Dhananjay R. Kalbande, "Cyber Security and Cyber Laws", Wiley India Pvt. Ltd., 2020.

Course Outcomes:

After completion of the course the students will be able to,
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/22UME242B	COMPOSITE MATERIALS	CREDITS: 03
L:T:P: 3:0:0		CIEMARKS:50
TOTAL HOURS: 40HRS.		SEEMARKS:50

Corse Objectives:
1. Explain the behavior of constituents in the composite materials
2. Enlighten the students in different types of reinforcement
3. Develop the student's skills in understanding the different manufacturing methods available for composite material.
4. Illuminate the knowledge of macro mechanical analysis and cutting and joining of the composite materials

UNIT-I	**10 Hrs.**

Introduction to composite materials
Definition and classification of composites based on matrix and reinforcement, Characteristics of composite materials, Fibrous composites, Laminate composites and particulate composites.

Factors which determine the properties of composites, Benefits of composites, properties and types of reinforcements and matrices, Reinforcement-matrix interface.

UNIT–II	**10 Hrs.**

Polymer matrix composites
Introduction, Polymer matrices, Processing methods like Layup and curing, open and closed mold process- hand layup 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	**10 Hrs.**

Cutting, Machining and Joining of Composites
Continuous fibers, Iso-stress condition, Iso-strain condition, critical volume fraction of fiber and minimum volume fraction of fiber, Numericals on modulus of rigidity, and mechanics of discontinuous fibers.
Cutting and machining of composites: Reciprocating knife cutting, cutting of cured composite, Joining of composites: Mechanical fastening, Adhesive bonding.

Reference Books:

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

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.

Course Outcomes:	Programme Outcomes											
	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/21UME243B	INTRODUCTIONS TO ROBOTICS	CREDITS: 03
L:T:P: 3:0:0		CIE MARKS: 50
TOTAL HOURS: 40HRS.		SEE MARKS: 50

Course Objectives:

1. Understand robot configuration, structures, basic components, workspace and generations of robots.
2. Get acquainted with performing spatial transformations and solve kinematics of the robot.
3. Learn about various sensors, actuators, robot programming.
4. Understand the present &future applications of a robot.

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.

Reference Books:

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:

After completion of the course student will be able to

CO1: Comprehend 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											
	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/22UBT248B		CREDITS: 03
L:T:P: 3:0:0	**BIOMASS AND BIOENERGY**	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

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 andpellet burning stoves; wood, pellet and wood chipsboiler. 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 andApplications. 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 Processtechnology Mc Grow Hill company, 2008.
5. Dominik Rutz & Rainer Janssen, Biofuel Technology Handbook 2008.

Course Outcomes:

After completion of the course student will be able to
CO1: Emphasize on the basic aspects of Biomass and Bio-Energy.
CO2: Interpret and describe biomass conversion technologies.
CO3: Acquire knowledge of innovative bioenergy plants.
CO4: Interpret and 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

22UCS130B/22UCS230B	INTRODUCTION TO WEB PROGRAMMING (INTEGRATED)	CREDITS: 03
L:T:P: 2:0:2		**CIE MARKS:50**
TOTAL HOURS: 46HRS. (26T+20P)		**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	**06 Hrs.**

Tables and CSS, Links and Images: Table Elements, Formatting a Data Table: Borders, Alignment, and Padding, CSS Structural Pseudo- Class Selectors, thead and tbody Elements, Cell Spanning. 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:

2. To create a simple html file to demonstrate the use of different tags.

   Create an html page named as "Basic_Html_Tags.html" and add the following tags

   a) Different heading tags (h1 to h6)
   b) Paragraph
   c) Horizontal line
   d) Line Break
   e) Pre tag
    f) Different Logical Style (<b>,<u>,<Sup>,<sub>)

2. Create a HTML code to display the following web page using list.

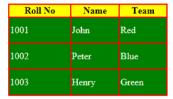3. Create an html page named as "Table.html" to display the following table.

8. Create an internal style sheet to define the following CSS properties for element(s) on your page:
   a. text-decoration
   b. text-align
   c. font-size
   d. font-family
   e. font-weight

9. Create an external style sheet to define the following CSS properties for element(s) on your page:
   a. background-color
   b. color
   c. margin-xxx (left, right, top, or bottom)
   d. padding

e. border-style , border-color , border-width

10. To create HTML code to insert image and to add a link to a web page.

11. Write a HTML code to perform the following CSS properties
    a. Text Properties
        - text-color
        - text-align
        - text-decoration
        - text-transformation
    b. Font Properties
        - font-style
        - font-size
        - font-family

12. Create a HTML code to display following output(using box properties)

Demonstrating the Box Model

BOX MODEL

13. Create the following table using CSS properties.

Roll No	Name	Team
1001	John	Red
1002	Peter	Blue
1003	Henry	Green

14. Create a HTML code for simple registration form which include
    i. Firstname ii. Middlename iii.Lastname iv.Course with option button v.Gender with radio button
        vi.Phone No vii.Address viii.Submit and reset button

Registration Form

Firstname:
Middlename:
Lastname:
Course : Course ▾
Gender :
○ Male
○ Female
○ Other
Phone : +91
Address

Submit reset

Course Outcomes:

After completion of the course student will be able to
    5. Analyze historical context and justification for HTML over XHTML.

    6. Develop HTML5 documents and adding various semantic markup tags.

7. Learn various attributes, values and types of CSS.

8. 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

22UCS131B/22UCS231B		CREDITS: 03
L:T:P: 2:0:2	**INTRODUCTION TO PYTHON PROGRAMMING**	**CIE MARKS: 50**
TOTAL HOURS: 46HRS. (26T+20P)		**SEE MARKS: 50**

Course objectives
1. Learn the syntax and semantics of the python programming languages
2. Illustrate the process of structuring the data using list, tuples, string and dictionaries
3. Demonstrate the use of built-in function to navigate the file system

UNIT – I	07 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	07 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. Develop a program to read the name and year of birth of a person. Display whether theperson is a senior citizen or not.
3. Develop a program to generate Fibonacci sequence of length (N). Read N from the console.
4. Write a function to calculate factorial of a number. Develop a program to compute

binomial coefficient (Given N and R).

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

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

7. Develop a program to print 10 most frequently appearing words in a text file. [Hint: Use

8. 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]

9. 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 ()].

10. 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.

11. 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 callsa function DivExp.

12. 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

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

14. Ex: pricelist ; { "pen":10, "Notebook":50, "book":100} Items_purchased = ["pen", "book"]

15. o/p: amt_to_be_paid = 110

Reference Books:

1. B. Nagesh Rao, "Learning Python", Cyberplus publication, 2nd edition
2. Gaowrishankar S., Veena A, "Introduction to python programming", CRC press
3. Al Sweigart, "Automate the boring stuff with Python", No Starch press, 1st Edition, 2015.
4. Allen B. Downey, "Think Python: How to Thik Like a Computer Scientist", Green Tea Press, 2nd Edition, 2015.

Course Outcomes:

After completion of the course the students will 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
CO 4: Able to create, read data from and write data to files

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
CO4	-	3	3	1	2	-	-	-	-	-	-	2

22UCS132B /22UCS232B		CREDITS: 03
L:T:P: 2:0:2	**BASICS OF JAVA PROGRAMMING**	**CIE MARKS: 50**
TOTAL HOURS: 46HRS. (26 T+20 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	07 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

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.

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.

UNIT – IV	07 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:

2. 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

Programming Exercises

1. Develop simple java programs to demonstrate the use of conditional statements
2. Develop simple java programs to demonstrate the use
   a. loop statements
   b. Reading & printing different data types in java
3. Develop simple java programs 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

Course Outcomes:

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

CO1: Explain features of JAVA.

CO2: Analyse the problem statement and Identify the requirement.

CO3: Design and develop standalone applications using Java.

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

22UCS133B /22UCS233B	INTRODUCTION TO C++ PROGRAMMING	CREDITS: 03
L:T:P: 2:0:2		CIE MARKS:50
TOTAL HOURS: 46HRS. (28T+20P)		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 structure 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):
3. Basics of C++ - https://www.youtube.com/watch?v=BClS40yzssA
4. Functions of C++ - https://www.youtube.com/watch?v=p8ehAjZWjPw
5. Tutorial Link: https://www.w3schools.com/cpp/cpp_intro.asp
   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.
   a. b. Write a C++ program to find the factorial of a given number
   b. 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 Iam a car .So, as this is a multi- inheritance; we can have access to all the other classes methods from the object of the class Car.
11. We invoke all the methods from a Car object and print the corresponding outputs of the methods.
12. So, if we invoke the methods in this order, car(), four Wheeler(), and vehicle(), then the outputwill be
13. I am a car
14. I have four
15. wheels I am a vehicle

Course Outcomes:

After completion of the course the students will 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	CREDIT: 01
L:T:P: 1:0:0		CIE MARKS:50
TOTAL HOURS:15HRS.		SEE MARKS:50

Course Objectives:
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 and write 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 Error in Writing and Speaking of English: Common error 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 in a paragraph. 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, EffectiveTechnical Reading and Writing, Technical Reports and proposal writing-Introduction, types, types of technical proposals. Effective reading and writing of technical reports and 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. Types of Resume. Resume vs Bio Data, Profile & CV. Writing effective resume for employement, 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. - 2020.
3. A Course in Technical English, Cambridge University Press – 2020.
4. Sanjay Kumar and Pushplata, 'Communication Skills', Oxford University Press - 2018.
5. "Communication Skills – I (A Workbook)" Oxford University Press – 2018.
6. Meenakshi Raman and Sangeetha Sharma, 'Technical Communication – Principles and Practice', 3rd edition, Oxford University Press 2017.

Course Outcomes:

After completion of the course the students will 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/22UHS225C	CONSTITUTION OF INDIA	CREDIT: 01
L:T:P: 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, 2010.
4. K. R. Phaneesh, 'The Constitution of India and Profession of Ethics', Sudha Publication, Bangalore, 2010.

Course Outcomes:

After completion of the course student will 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/22UHS228C		CREDIT: 01
L:T:P: 1:0:0	**SCIENTIFIC FOUNDATIONS OF HEALTH**	**CIE MARKS:50**
TOTAL HOURS:15 HRS.		**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 theirbright 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. Stressand 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. Charles Abraham, Mark Conner, Fiona Jones and Daryl O'Connor, Health Psychology(Second edition) 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. Shelley E. Taylor, Health Psychology (Ninth Edition),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:

After completion 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	-	-	-	-	-	-