

MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution Affiliated to VTU, Belagavi)



Autonomous programme

Bachelor of Engineering



**DEPARTMENT OF COMPUTER SCIENCE AND
ENGINEERING**

SCHEME

I Semester to VIII Semester

2022-23 Admitted Batch

Scheme of Teaching and Examinations 2022-23

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2022-23)

I semester		CHEMISTRY CYCLE				STREAMS: Computer Science				
Sl. No	Course Code	Course Title	TD	Teaching Hours/Week			Examination			Credits
				L	T	P	CIE Marks	SEE Marks	Total Marks	
1	22MATS11	Mathematics for CSE Stream	Mathematics	2	2	2	50	50	100	04
2	22CHES12	Chemistry for CSE Stream	Chemistry	2	2	2	50	50	100	04
3	22CED13	Computer-Aided Engineering Drawing	CV/ME	2	0	2	50	50	100	03
4	22ESC14x	Engineering Science Course-I	Respective Engg. department	3	0	0	50	50	100	03
5	22PLC15x	Programming Language Course	Any department	2	0	2	50	50	100	03
6	22ENG16	Communicative English	Humanities	1	0	0	50	50	100	01
7	22ICO17	Indian Constitution	Humanities	1	0	0	50	50	100	01
8	22SFH18	Scientific Foundations of Health	Sports	1	0	0	50	50	100	01
TOTAL				14	04	08	400	400	800	20

TD- Teaching Department, **L**-Lecture, **T**-Tutorial, **P**-Practical, **CIE**–Continuous Internal Evaluation, **SEE**- Semester End Examination,

Scheme of Teaching and Examinations 2022-23

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2022-23)

II Semester		PHYSICS CYCLE				STREAMS: Computer Science				
Sl. No	Course Code	Course Title	TD	Teaching Hours/Week			Examination			Credits
				L	T	P	CIE Marks	SEE Marks	Total Marks	
1	22MATS21	Mathematics for CS Stream-II	Mathematics	2	2	2	50	50	100	04
2	22PHYS22	Physics for CS stream	Physics	2	2	2	50	50	100	04
3	22PPC23	Principles of Programming Using C	CS	2	0	2	50	50	100	03
4	22ESC24x	Engineering Science Course-II	Respective Engg. department	3	0	0	50	50	100	03
5	22ETC25x	Emerging Technology Course	Any department	3	0	0	50	50	100	03
6	22PWS26	Professional Writing Skills in English	Humanities	1	0	0	50	50	100	01
7	22KSK27/ 22KBK27	Samskrutika Kannada/ Balake Kannada	Humanities	1	0	0	50	50	100	01
8	22IDT28	Innovation and Design Thinking	Physics (Coordinating Dept)	0	0	2	50	50	100	01
TOTAL				14	04	08	400	400	800	20

TD- Teaching Department, L-Lecture, T-Tutorial, P-Practical, CIE–Continuous Internal Evaluation, SEE- Semester End Examination,

Malnad College of Engineering, Hassan

List of Elective Courses

I Semester B. E.

(ESC-I) Engineering Science Courses-I					(ETC-I) Emerging Technology Courses-I				
Code	Title	L	T	P	Code	Title	L	T	P
22ESC141	Introduction to Civil Engineering	3	0	0	22ETC15A	Smart Materials and Systems	3	0	0
22ESC142	Introduction to Electrical Engineering	3	0	0	22ETC15B	Green Buildings	3	0	0
22ESC143	Introduction to Electronics Engineering	3	0	0	22ETC15C	Introduction to Nano Technology	3	0	0
22ESC144	Introduction to Mechanical Engineering	3	0	0	22ETC15D	Introduction to Sustainable Engineering	3	0	0
22ESC145	Introduction to C Programming	2	0	2	22ETC15E	Renewable Energy Sources	3	0	0
					22ETC15F	Waste Management	3	0	0
					22ETC15G	Emerging Applications of Biosensors	3	0	0
					22ETC15H	Introduction to Internet of Things (IOT)	3	0	0
					22ETC15I	Introduction to Cyber Security	3	0	0
					22ETC15J	Introduction to Electric Vehicle Technology	3	0	0
(PLC-I) Programming Language Courses-I					22ETC15K	Introduction to Embedded System	3	0	0
Code	Title	L	T	P					
22PLC15A	Introduction to Web Programming	2	0	2					
22PLC15B	Introduction to Python Programming	2	0	2					
22PLC15C	Basics of JAVA programming	2	0	2					
22PLC15D	Introduction to C++ Programming	2	0	2					

Malnad College of Engineering, Hassan

List of Elective Courses

II Semester B. E.

(ESC-I) Engineering Science Courses-II					(ETC-I) Emerging Technology Courses-II				
Code	Title	L	T	P	Code	Title	L	T	P
22ESC241	Introduction to Civil Engineering	3	0	0	22ETC25A	Smart Materials and Systems	3	0	0
22ESC242	Introduction to Electrical Engineering	3	0	0	22ETC25B	Green Buildings	3	0	0
22ESC243	Introduction to Electronics Engineering	3	0	0	22ETC25C	Introduction to Nano Technology	3	0	0
22ESC244	Introduction to Mechanical Engineering	3	0	0	22ETC25D	Introduction to Sustainable Engineering	3	0	0
22ESC245	Introduction to C Programming	2	0	2	22ETC25E	Renewable Energy Sources	3	0	0
					22ETC25F	Waste Management	3	0	0
					22ETC25G	Emerging Applications of Biosensors	3	0	0
					22ETC25H	Introduction to Internet of Things (IOT)	3	0	0
					22ETC25I	Introduction to Cyber Security	3	0	0
					22ETC25J	Introduction to Electric Vehicle Technology	3	0	0
(PLC-I) Programming Language Courses-II					22ETC25K	Introduction to Embedded System	3	0	0
Code	Title	L	T	P					
22PLC25A	Introduction to Web Programming	2	0	2					
22PLC25B	Introduction to Python Programming	2	0	2					
22PLC25C	Basics of JAVA programming	2	0	2					
22PLC25D	Introduction to C++ Programming	2	0	2					

Scheme & Syllabus for II Year

THIRD SEMESTER					
Course Category	Course Code	Course Title	L-T-P	Credits	Contact Hours
BSC	22MAC301	Mathematics for Computer Science	2-2-0	3	4
PCC	22CS302	Digital Design and Computer Organization	3-0-2	4	5
PCC	22CS303	Operating Systems	3-0-0	3	3
PCC	22CS304	Data Structures and its Applications	3-0-0	3	3
PCC	22CS305	Data Structures Laboratory	0-0-2	1	2
PCC	22CS306	Unix and Shell Programming Laboratory	0-0-2	1	2
(ESC/ETC/PLC)	22CS307X	Engineering Science Course (ESC/ETC/PLC)	2-0-2	3	4
UHV	22SCR	Social Connect and Responsibility	0-2-0	1	2
AEC	22CS308X	Ability Enhancement Course	0-0-2	1	2
BSC	22BCM301	Bridge Course Mathematics -I (Mandate Non-Credit Course)	3(A)-0-0	AUDIT	3
Total				20	29

Engineering Science Course (ESC/ETC/PLC)		
ESC/ETC/PLC	22CS307A	OOP with Java
ESC/ETC/PLC	22CS307B	OOP with C++

Ability Enhancement Course		
AEC	22CS308A	R Programming
AEC	22CS308B	Data Analytics with Excel
AEC	22CS308C	Data Visualization with Python
AEC	22CS308D	Version Controller with GiT

FOURTH SEMESTER					
Course Category	Course Code	Course Title	L-T-P	Credits	Contact Hours
BSC	22MA401	Statistics and Probability	2-2-0	3	4
PCC	22CS402	Design and Analysis of Algorithms	3-0-0	3	3
PCC	22CS403	Microcontroller and Embedded Systems	3-0-2	4	5
PCC	22CS404	Database Management Systems	3-0-2	4	5
PCC	22CS405	Algorithms Laboratory	0-0-2	1	2
ESC/ETC/PLC	22CS406X	Engineering Science Course (ESC/ETC/PLC)	2-0-2	3	4
AEC	22CS407X	Ability Enhancement Course	0-0-2	1	2
BSC	22CS408	Biology for Engineers	2-0-0	1	2
UHV	22CS409	Universal Human Values	1-0-0	1	1
BSM	22BCM401	Bridge Course Mathematics - II (Mandate Non-Credit Course)	3(A)-0-0	AUDIT	3
Total				21	31

Engineering Science Course (ESC/ETC/PLC)		
ESC/ETC/PLC	22CS406A	Optimization Techniques
ESC/ETC/PLC	22CS406B	Discrete Mathematical Structures
ESC/ETC/PLC	22CS406C	Graph Theory and Combinatorics

Ability Enhancement Course		
AEC	22CS407A	Computer Assembly and Networking
AEC	22CS407B	UI/UX Laboratory
AEC	22CS407C	Technical writing using Latex

Admitted Batch : 2022-23
Academic Year : 2024-25
Scheme & Syllabus for III Year

FIFTH SEMESTER					
Course Category	Course Code	Course Title	L-T-P (Hours)	Credits	Contact Hours
HSMC	22CS501	Technology Management and Entrepreneurship	3-1-0	3	4
PCC	22CS502	Software Engineering and Project Management	3-2-0	4	5
PCC	22CS503	Data Communications	3-0-0	3	3
IPCC	22CS504	Computer Graphics and Visualization	3-0-2	4	5
PCC	22CS505	Web Programming	0-0-4	2	4
PEC	22CS55X	Professional Elective Course - I	3-0-0	3	3
AEC	22RIP	Research Methodology and IPR	3-0-0	3	3
HSMC	22EVS	Environmental Studies	0-0-2	1	2
Total				23	29
The course Analytical ability & soft skills 22ASK will be conducted by the TAP coordinator during the vacation period of fifth semester for one credit. The Marks for the same will be entered in sixth semester grade card.					

Sl. No.	Professional Elective Course - I	
	Course Code	Course Title
1.	22CS551	Digital Image Processing
2.	22CS552	Data Mining and Warehousing
3.	22CS553	Internet of Things
4.	22CS554	Object Oriented Modelling and Design
5.	22CS555	Advance Java
6.	22CS556	Operations Research

SIXTH SEMESTER					
Course Category	Course Code	Course Title	L-T-P (Hours)	Credits	Contact Hours
IPCC	22CS601	Machine Learning	3-0-2	4	5
IPCC	22CS602	Computer Networks	3-0-2	4	5
PCC	22CS603	Finite Automata and Formal Languages	3-1-0	3	4
PI	22CS604	Mini Project	0-0-4	2	4
PI	22CS605	Main Project Phase - I	0-0-4	2	4
AEC	22CS606X	Ability Enhancement Course	0-0-2	1	2
PEC	22CS66X	Professional Elective Course - II	3-0-0	3	3
OEC	22OEC6X	Open Elective – I	3-0-0	3	3
OEC	22SWY	SWAYAM (NPTEL Only)	-	AUDIT	-
AEC/SDC	22ASK	Analytical Ability and Soft Skills	0-0-2	1	2
Total				23	32
22CS604 - Mini Project: Student must develop a web based application using the concepts learnt in the courses - Database Management System (22CS404) and Web Programming (22CS505)					

Sl. No.	Professional Elective Course - II	
	Course Code	Course Title
1.	22CS661	Introduction to Computer Vision
2.	22CS662	Artificial Intelligence
3.	22CS663	Wireless Networks
4.	22CS664	Software Architecture
5.	22CS665	C# Programming and .NET
6.	22CS666	Management Information System

Sl. No.	Open Electives	
	Course Code	Course Title
1.	22OEC61	Introduction to Cloud Computing
2.	22OEC62	Introduction to JAVA programming

Sl. No.	Ability Enhancement Course	
	Course Code	Course Title
1.	22CS606A	Application Development Laboratory
2.	22CS606B	Full Stack Web Development

Academic Year 2025-2026

Scheme for IV Year

SEVENTH SEMESTER					
Course Category	Course Code	Course Title	L-T-P	Credits	Contact Hours
PCC	22CS701	System Software and Compiler Design	2-2-0	3	4
PCC	22CS702	Network Security and Cyber Law	3-0-0	3	3
PI	22CS703	Main Project Phase - II	0-0-4	2	4
PEC	22CS77X	Professional Elective Course - III	3-0-0	3	3
PEC	22CS78X	Professional Elective Course - IV	3-0-0	3	3
OEC	22OECS7X	Open Elective - II	3-0-0	3	3
Total				17	20

Sl. No.	Professional Elective Course - III		Professional Elective Course - IVI		
	Course Code	Course Title	Sl. No.	Course Code	Course Title
1.	22CS771	Deep Learning	1.	22CS781	Pattern Recognition
2.	22CS772	Data Science	2.	22CS782	Big Data Analytics
3.	22CS773	Mobile Communications	3.	22CS783	Cloud Computing
4.	22CS774	Software Testing	4.	22CS784	Green Computing

Sl. No.	Open Electives	
	Course Code	Course Title
1.	22OECS71	Introduction to Data Science
2.	22OECS72	IOT and its Applications
3.	22OECS73	Introduction to Big Data

EIGHTH SEMESTER					
Course Category	Course Code	Course Title	L-T-P	Credits	Contact Hours
PEC	22SW01	Professional Elective (Online Course)	3-0-0	3	3
PEC	22SW02	Open Elective (Online course)	3-0-0	3	3
PI	22INT	Internship (Research / Industry)(14-20 weeks)	0-0-24	10	24
Total				16	30

MATHEMATICS COURSES FOR FIRST SEMESTER B. E.

Course Title	MATHEMATICS FOR CIVIL ENGINEERING-1		
Course Code	22MATC11	(L-T-P)C	(3-1-2)4
SEE duration	3 hours	Hours / Week	06
CIE (Theory) marks	30	CIE (Practicals) marks	20
SEE marks	50	Total contact hours	70
Course Objective: To train the students to acquire knowledge in calculus and numerical methods so as to solve basic engineering application problems.			
Course Outcomes (COs): At the end of course, student will be able to:			
COs	Outcomes	PO1	PO2
CO1	Compute Taylor series, partial derivatives and solve simple problems connected with multiple integrals.	3	-
CO2	Inspect for the maximum output of a function (experimental data), analyze the region of integration connected with multiple integrals so as to determine the area, volume.	3	2
CO3	Apply the numerical methods to compute: The area of a region, root of an equation , missing input, or output of the given experimental data (interpolation/extrapolation).	3	-
CO4	Model the real-life problems/engineering application problems and solve the same.	3	2
Course Contents:			
MODULE –1			10 Hrs.

Differential Calculus: Definition of average growth rate and its illustrative examples. Definition of differentiability, Statement of Taylor's theorem, Taylor's series for a function of one variable - Illustrative examples. Partial Differentiation: Definition of Partial derivative, Physical and geometrical interpretation of partial differentiation and Illustrative examples, Statement of Taylor theorem for a function of two variables and illustrative examples on Taylor's series. Extreme values of functions of two variables. Self-learning topics: Evaluation of Jacobians, Expansion of a function as a Maclaurin's series for function of one variable and two variables-illustrative examples. Brief introduction to curvature, radius of curvature, polar curves.	
MODULE –2	10 Hrs.
Numerical Methods: Numerical Solution of algebraic & transcendental equations by Bisection method, Newton Raphson method, Interpolation-Definition of forward, backward differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation formulae. Numerical Integration: Evaluation of a line integral by Trapezoidal rule, Simpson's 1/3rd and 3/8th rule, Weddle's rule. Illustrative examples from engineering field. Self-learning topics: Quadrature formula, Inverse Lagrange's interpolation formula, central difference formula- Bessel's formula, to find the relation between the input and output of an experimental data using suitable interpolation formula.	
MODULE –3	10 Hrs.
Multiple Integrals: Introduction to coordinate systems. Double integrals in Cartesian & Polar form, Application to find area and volume. Evaluation of triple integrals in Cartesian & cylindrical and Spherical co-ordinate system.	
MODULE – 4	10 hrs.
Applications of Mathematics in Civil engineering: To express the experimental data in terms of quadratic equation (function of one variable) and hence to find the maximum value of the experimental data (curve fitting). Application of Optimization (extreme values of a single variable)- stiffness of a beam, strength of a beam. Application of line integrals- finding projectile height from its acceleration initial velocity initial	

position.

Application of numerical integration- estimation of discharge in a stream – an application to hydrology, estimation of discharge in a stream – an application to surveying.

Application of multiple integrals- to find mass and moment for the thin plate covering the region in the xy plane.

Self study- Mass and moment for the object in space, moment of inertia of a circle about its diametrical axis- an application to engineering Mechanics, computation of deflection of beams using double integral. application of arc length-application to make sheets of corrugated iron roofing.

application of total derivative- controlling sag in an uniformly loaded beam , Application of line integrals- moment, mass and center of mass of a thin rod.

List of Programmes:

1. computation of roots using - bisection method , Newton raphson method.
2. To compute the extreme values of function of two variables.
3. Interpolation by- Newtons forward & Lagrange's interpolation formula.
4. Numerical integration- line integral (Trapezoidal rule , Weddle's rule)
5. Numerical integration- line integral (Simpson's $1/3^{\text{rd}}$ rule , Simpson's $3/8^{\text{th}}$ rule)
6. Solution of first order differential equation and plotting the graph.
7. Finding angle between polar curves & computing the curvature of a given curve.
8. Finding partial derivatives, Jacobians.
9. Computing area by line integral & double integral.
10. Expressing the function of one variable & two variables using Taylor's & Maclaurin's series.

Text Books :

1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 44th edition, 2016.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India P.v.t. Ltd. 8th Edition, (Wiley student edition) 2004.
3. Thomas Finney, Calculus, 9th edition, Pearson education, 2002

Reference Books:

1. R. K. Jain and S. R. K. Jain & S. R. K. Iyengar, Numerical methods, New age International p.v.t. Publishers, 6th edition, 2014.
2. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

Course Title	MATHEMATICS FOR MECHANICAL ENGINEERING -1		
Course Code	22MATM11	(L-T-P)C	(3-1-2-4)
SEE duration	3 hour	Hours / Week	06
CIE (Theory) marks	30	CIE (Practicals)/Activity marks	20
SEE marks	50	Total contact hours	70

Course Objective: To train the students to acquire knowledge in calculus and numerical methods so as to solve basic engineering application problems.

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

COs	Outcomes	PO1	PO2	
CO1	Compute Taylor series, partial derivatives and solve simple problems connected with multiple integrals.	3	-	
CO2	Inspect for the maximum output of a function (experimental data), analyze the region of integration connected with multiple integrals so as to determine the area, volume.	3	2	
CO3	Apply the numerical methods to compute: The area of a region, root (input) of an equation for the given output, missing input, or output of the given experimental data (interpolation/extrapolation).	3	-	
CO4	Model the real-life problems/engineering application problems and solve the same.	3	2	

Course Contents:	
MODULE –1	10 Hrs.
Differential Calculus: Definition of average growth rate and its illustrative examples. Definition of differentiability. Statement of Taylor's theorem, Taylor series for a function of one variable - Illustrative examples. Partial Differentiation: Definition of Partial derivative, Physical and geometrical interpretation of partial differentiation, and Illustrative examples, Statement of Taylor theorem for a function of two variables and illustrative examples on Taylor series. Extreme values of functions of two variables. Self-learning topics: Evaluation of Jacobians, Expansion of a function as a Maclaurin series for function of one variable and two variables-illustrative examples. Brief introduction to curvature, radius of curvature, polar curves.	
MODULE –2	10 Hrs.
Numerical Methods: Numerical Solution of algebraic & transcendental equations by Bisection method, Newton Raphson method, Interpolation-Definition of forward, backward differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation formula. Numerical Integration: Evaluation of a line integral by Trapezoidal rule, Simpson's 1/3rd and 3/8th rule, Weddle's rule. Illustrative examples from engineering field. Self-learning topics: Quadrature formula, Inverse Lagrange's interpolation formula, central difference formula- Bessel's formula, to find the relation between the input and output of an experimental data using suitable interpolation formula.	
MODULE –3	10 Hrs.
Multiple Integrals: Introduction to coordinate systems. Double integrals in Cartesian & Polar form, Application to find area and volume Evaluation of triple integrals in Cartesian & cylindrical and Spherical co-ordinate system.	
MODULE – 4	10 hrs.
Applications of Mathematics in mechanical engineering: To express the experimental data in terms of quadratic equation (function of one variable) and	

hence to find the maximum value of the experimental data (curve fitting).

application of Optimization (extreme values of a single variable)- stiffness of a beam, strength of a beam, product design, metal fabrication.

Application of line integrals- finding projectile height from its acceleration, initial velocity & initial position. amount of work required to put a satellite in an orbit.

Application of numerical integration- to estimate the total quantity of oil that has escaped after leakage. To estimate the length of the tank in a design of an airplane which has a constant cross sectional area in each wing.

Application to root finding-to locate the submarine.

Application of multiple integrals- to find mass and moment for the thin plate covering the region in the xy plane. computation of deflection of beams using double integral.

Self study: mass and moment for the object in space, moment of inertia of a circle about its diametrical axis- an application to eng. Mechanics, computation of deflection of beams using double integral. application of total derivative- controlling sag in a uniformly loaded beam, Application of line integrals- moment, mass and center of mass of a thin rod. work and kinetic energy, work required in pumping the liquid from containers.

List of Programmes:

1. computation of roots using - bisection method, Newton raphson method.
2. To compute the extreme values of function of two variables.
3. Interpolation by- Newtons forward & Lagrange's interpolation formula.
4. Numerical integration- line integral (Trapezoidal rule, Weddle's rule)
5. Numerical integration- line integral (Simpson's $1/3^{\text{rd}}$ rule, Simpson's $3/8^{\text{th}}$ rule)
6. Solution of first order differential equation and plotting the graph.
7. Finding angle between polar curves & computing the curvature of a given curve.
8. Finding partial derivatives, Jacobians.
9. Computing area by line integral & double integral.
10. Expressing the function of one variable & two variables using Taylor's & Maclaurin's series.

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2. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

Course Title	MATHEMATICS FOR ELECTRICAL AND ELECTRONICS ENGINEERING STREAM-1		
Course Code	22MATE11	(L-T-P)C	(3-1-2-4)
SEE duration	3 hour	Hours / Week	06
CIE (Theory) marks	30	CIE (Practicals)/Activity marks	20
SEE marks	50	Total contact hours	70
Course Objective: To train the students to acquire knowledge in calculus and numerical methods so as to solve basic engineering application problems. Course Outcomes (COs): At the end of course, student will be able to:			
COs	Outcomes	PO1	PO2
CO1	Compute Taylor series, partial derivatives and solve simple problems connected with multiple integrals, Counting principle, bayes theorem on probability.	3	-
CO2	Inspect for the maximum output of a function (experimental data), analyze the region of integration connected with	3	2

	multiple integrals so as to determine the area, volume.		
CO3	Apply the numerical methods to compute: The area of a region, root (input) of an equation for the given output, missing input, or output of the given experimental data (interpolation/extrapolation).	3	-
CO4	Model the real-life problems/engineering application problems and solve the same.	3	2

Course Contents:

MODULE –1		10 Hrs.
Differential Calculus: Definition of average growth rate and its illustrative examples. Definition of differentiability. Statement of Taylor's theorem, Taylor series for a function of one variable - Illustrative examples. Partial Differentiation: Definition of Partial derivative, Physical and geometrical interpretation of partial differentiation, and Illustrative examples, Statement of Taylor theorem for a function of two variables and illustrative examples on Taylor series. Extreme values of functions of two variables. Self-learning topics: Evaluation of Jacobians, Expansion of a function as a Maclaurin series for function of one variable and two variables-illustrative examples. Brief introduction to curvature, radius of curvature, polar curves.		
MODULE –2		10 Hrs.
Numerical Methods: Numerical Solution of algebraic & transcendental equations by Bisection method, Newton-Raphson method, Interpolation-Definition of forward, backward differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation formula. Numerical Integration: Evaluation of a line integral by Trapezoidal rule, Simpson's 1/3rd and 3/8th rule, Weddle's rule. Illustrative examples from engineering field. Self-learning topics: Quadrature formula, Inverse Lagrange's interpolation formula, central difference formula- Bessel's formula, to find the relation between the input and output of an experimental data using suitable interpolation formula.		

MODULE –3	10 Hrs.
Multiple Integrals: Introduction to coordinate systems. Double integrals in Cartesian & Polar form, Application to find area and volume Evaluation of triple integrals in Cartesian & cylindrical and Spherical co-ordinate system.	
MODULE – 4	10 hrs.
Applications of Mathematics in EE engineering: To express the experimental data in terms of quadratic equation (function of one variable) and hence to find the maximum value of the experimental data (curve fitting). Application of Optimization (extreme values of a single variable)- to find the peak current in an alternative circuits. Application of line integrals- forcing electrons together, To estimate the total amount of pollutant produced due to production of electricity by burning oil.. finding projectile height from its acceleration, initial velocity & initial position. Application of root finding- ion concentration. Counting principle - sum rule, product rule, permutation and combination, , review of probability- applications of Baye's theorem. Self study—To express the experimental data in terms of cubic equation (function of one variable) and hence to find the maximum value of the experimental data (curve fitting), applications of differential calculus. Application of multiple integrals- Brief note on the applications connected with field and wave theory. <u>List of Programmes:</u> 1. computation of roots using - bisection method , Newton raphson method. 2. To compute the extreme values of function of two variables. 3. Interpolation by- Newtons forward & Lagrange's interpolation formula. 4. Numerical integration- line integral (Trapezoidal rule , Weddle's rule) 5. Numerical integration- line integral (Simpson's 1/3rd rule , Simpson's 3/8th rule) 6. Solution of first order differential equation and plotting the graph. 7. Finding angle between polar curves & computing the curvature of a given curve. 8. Finding partial derivatives, Jacobians. 9. Computing area by line integral & double integral.	

10. Expressing the function of one variable & two variables using Taylor's & Maclaurin's series.

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2. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

Course Title	MATHEMATICS FOR COMPUTER SCIENCE ENGINEERING STREAM -1		
Course Code	22MATS11	(L-T-P)C	(3-1-2-4)
SEE duration	3 hours	Hours / Week	06
CIE (Theory) marks	30	CIE (Practicals)/Activity marks	20
SEE marks	50	Total contact hours	70
Course Objective: To train the students to acquire knowledge in calculus and numerical methods so as to solve basic engineering application problems. Course Outcomes (COs): At the end of course, student will be able to:			
COs	Outcomes	PO1	PO2

CO1	Compute Taylor series, partial derivatives and solve simple problems connected with multiple integrals, Counting principle, bayes theorem on probability	3	-
CO2	Inspect for the maximum output of a function (experimental data), analyze the region of integration connected with multiple integrals so as to determine the area, volume.	3	2
CO3	Apply the numerical methods to compute: The area of a region, root (input) of an equation for the given output, missing input, or output of the given experimental data (interpolation/extrapolation).	3	-
CO4	Model the real-life problems/engineering application problems and solve the same.	3	2
Course Contents:			
MODULE –1			10 Hrs.
Differential Calculus: Definition of average growth rate and its illustrative examples. Definition of differentiability. Statement of Taylor's theorem, Taylor series for a function of one variable - Illustrative examples. Partial Differentiation: Definition of Partial derivative, Physical and geometrical interpretation of partial differentiation, and Illustrative examples, Statement of Taylor theorem for a function of two variables and illustrative examples on Taylor series. Extreme values of functions of two variables. Self-learning topics: Evaluation of Jacobians, Expansion of a function as a Maclaurin series for function of one variable and two variables-illustrative examples. Brief introduction to curvature, radius of curvature, polar curves.			
MODULE –2			10 Hrs.

Numerical Methods: Numerical Solution of algebraic & transcendental equations by Bisection method, Newton Raphson method, Interpolation-Definition of forward, backward differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation formula.

Numerical Integration: Evaluation of a line integral by Trapezoidal rule, Simpson's 1/3rd and 3/8th rule, Weddle's rule. Illustrative examples from engineering field.

Self-learning topics: Quadrature formula, Inverse Lagrange's interpolation formula, central difference formula- Bessel's formula, to find the relation between the input and output of an experimental data using suitable interpolation formula.

MODULE –3

10 Hrs.

Multiple Integrals: Introduction to coordinate systems, Double integrals in Cartesian & Polar form, Application to find area and volume Evaluation of triple integrals in Cartesian & cylindrical and Spherical co-ordinate system.

MODULE – 4

10 hrs.

Applications of Mathematics in Computer science engineering:

To express the experimental data in terms of quadratic equation (function of one variable) and hence to find the maximum value of the experimental data (curve fitting).

Extreme values of a single variable- cost and revenue.

Application of numerical integration- general applications connected with business cost and revenue.

Counting principle - sum rule, product rule, permutation and combination, review of probability- applications of Baye's theorem.

Self study—To express the experimental data in terms of cubic equation (function of one variable) and hence to find the maximum value of the experimental data (curve fitting), applications of differential calculus and integral calculus.

List of Programmes:

1. computation of roots using - bisection method, Newton raphson method.
2. To compute the extreme values of function of two variables.
3. Interpolation by- Newtons forward & Lagrange's interpolation formula.

4. Numerical integration- line integral (Trapezoidal rule , Weddle's rule)
5. Numerical integration- line integral (Simpson's $1/3^{\text{rd}}$ rule , Simpson's $3/8^{\text{th}}$ rule)
6. Solution of first order differential equation and plotting the graph.
7. Finding angle between polar curves & computing the curvature of a given curve.
8. Finding partial derivatives, Jacobians.
9. Computing area by line integral & double integral.
10. Expressing the function of one variable & two variables using Taylor's & Maclaurin's series.

Text Books :

1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 44th edition, 2016.
 2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India P.v.t. Ltd. 8th Edition, (Wiley student edition) 2004.
 3. Thomas Finney, Calculus, 9th edition, Pearson education, 2002
- Discrete mathematics by J.K. sharma.

Reference Books:

1. R. K. Jain and S. R. K. Jain & S. R. K. Iyengar, Numerical methods, New age International p.v.t. Publishers, 6th edition, 2014.
2. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

PHYSICS COURSES

CourseTitle	PHYSICS FOR CIVIL ENGINEERING		
CourseCode	22PHYC21/22	(L-T-P)C	(3-1-2)4
Exam. duration	3hour	Class Hours/Week	06

CIE (Theory) marks	30	CIE (Practicals) marks	20
SEE marks	50	Total class hours	70
CourseObjective:			
The objectiveofthecourseistomakestudentslearnprinciplesand theories ofphysicsincivil and allied engineering fieldsand to develop effectivesolutionsforengineering problems.			
CourseOutcomes(COs): Uponcompletionofthecourse,studentsshallbeable to			
Sl. No.	Courseoutcomes	Mapping to POs	
1.	Discuss the concepts of vibrations, rigid body dynamics, crystallography, photonics and building acoustics.	1	
2.	Interpret the dynamics of rigid bodies, applications of crystallography and photonics, and characteristics of building acoustics and ultrasonics.	1	
3.	Solve problems on rigid body dynamics, crystallography, laser, and sound waves.	1	
4.	Verify experimentally the laws and concepts of rigid body dynamics, crystallography, photonics, and resonance.	1, 10	
CourseContents:			
MODULE–1			10Hrs.
Vibrations and Rigid Body Dynamics			
Simple harmonic vibrations. Free vibrations. Damped vibrations-derivation of expressions for displacement of damped harmonic motion. Discussion of types of damped vibrations. Forced vibrations-derivation of expression for amplitude and phase-variation with frequency, Resonance. Condition for amplitude resonance. Applications of resonance. Rigid body. Moment of inertia. Torsional pendulum-derivation of expression for time of oscillation. Mention of uses. Bending of beams- derivation of expression for bending moment of a beam. Cantilever-derivation for depression of loaded end of a single cantilever.			
<i>Numerical problems on amplitude and phase of forced vibrations, time-period of oscillation, bending moment and Young’s Modulus/depression of a cantilever</i>			
MODULE–2			10Hrs.
Crystallography			
Space lattice, Bravais lattice–unit cell, primitive cell. Lattice parameters. 7 basic crystal systems. Directions and planes, Miller indices. Expression for interplanar spacing. Coordination number. Atomic packing factors (SC, FCC, BCC). Density of a unit cell. X-rays and their types. Bragg’s law. Bragg’s X-ray spectrometer for identification of crystal structure. Importance of X-ray diffraction in material characterisation. De Broglie’s concept of matter waves. Illustratio of wave nature of electrons in SEM, list of other applications			
<i>Numerical problems on Miller indices, Interplanar space, Bragg’s law.</i>			
MODULE–3			10 Hrs

Photonics

Interaction of radiation with matter. Expression for energy density in terms of Einstein's coefficients. Requisites of a Laser system. Conditions for laser action. Types of laser sources (to list out Solid, Gas and Semiconductor lasers and to list the contrast between them). CO₂ laser – construction and working, Measurement of pollutants (LIDAR), List of other applications: laser fencing, laser cutting, laser drilling, laser welding, laser-guided missiles, LASER Range Finder, Road Profiling, Bridge Deflection, Speed Checker.

Optical fibres. Construction and principle. Ray propagation mechanism. Angle of acceptance and numerical aperture - their relationship with refractive indices of core and clad and condition for ray propagation. Modes of transmission: V-number and number of modes, Types of optical fibres, Attenuation. List of applications of optical fibers. Merits and demerits of optical fibers.

Numerical problems on Boltzmann factor, V-number, Numerical aperture, and attenuation.

MODULE– 4

10 hrs.

Acoustics and ultrasonics

Introduction to acoustics, Types of Acoustics, reverberation and reverberation time, absorption power and absorption coefficient, Requisites for acoustics in auditorium, Sabine's formula (No derivation), Eyring's formula (No derivation). Comparison of Eyring's and Sabine's formula, measurement of absorption coefficient, factors affecting the acoustics and remedial measures, Noise and its Insulation,

Ultrasonics. Non-destructive testing of materials using ultrasonics. Measurement of velocity of ultrasonic waves and elastic constants in solids and liquids.

Numerical Problems on reverberation time, absorption power and absorption coefficient, Sabine's formula, Eyring's formula.

List of experiments

1. Measurement of electrical resistivity and energy gap of a semiconductor using four probe technique.
2. Determination of dielectric constant by charging and discharging of a capacitor.
3. Determination of wavelength of LASER by diffraction technique.
4. Verification of Stefan's law of radiation.
5. Determination of Planck's constant using Light Emitting Diodes.
6. Estimation of frequencies of vibrating string and AC using Sonometer.
7. Determination of resonance frequency and inductance using LCR circuits.
8. Determination of Young's modulus using single cantilever.
9. Determination of moment of inertia of rigid bodies and rigidity modulus of a string using torsion pendulum.
10. Determination of numerical aperture and modes of transmission of optical fiber.

Text Books:

1. Engineering physics: R K Gaur and S L Gupta, ISBN: 9788189928223, Dhanpat Rai Publishing Company (P) Ltd. Edition, 2011
2. Solid state physics: S O Pillai, ISBN-10: 9386070928, New Age International Pvt. Ltd, Eighth edition, 9 January 2018.

Reference Books:

1. Fiber Optics: A K Ghatak and K Thyagarajan, ISBN-13: 978-0521577854, Cambridge University Press India Pvt. Limited, 1998.
2. Physics laboratory manual, Dept. of Physics, Malnad College of Engineering, Hassan.

CourseTitle	PHYSICS FOR MECHANICAL ENGINEERING		
CourseCode	22PHYM12/22	(L-T-P)C	(3-1-2)4
Exam. duration	3hour	Class Hours/Week	06
CIE (Theory) marks	30	CIE (Practicals) marks	20
SEE marks	50	Total class hours	70
CourseObjective: The objectiveofthecourseistomakestudentslearnprinciplesandtheoriesofphysicsinmechanical and allied engineering fields and to develop effectivesolutionsforengineering problems.			
CourseOutcomes: Uponcompletionofthecourse,students shallbeableto			
Sl. No.	Courseoutcomes		Mapping to PO's
1.	Discuss the concepts of vibrations, rigid body dynamics, crystallography, photonics and thermoelectricity		1
2.	Interpret the dynamics of rigid bodies, applications of crystallography and photonics, and characteristics of thermoelectric materials.		1
3.	Solve problems on rigid body dynamics, crystallography, lasers and thermoelectric materials and devices.		1
4.	Verify experimentally the laws and concepts of rigid body dynamics, crystallography, photonics and resonance.		1,10
CourseContents			
MODULE– 1			10Hrs
Vibrations and Rigid Body Dynamics Simple harmonic vibrations. Free vibrations. Damped vibrations-derivation of expressions for displacement of damped harmonic motion. Discussion of types of damped vibrations. Forced vibrations-derivation of expression for amplitude and phase-variation with frequency. Resonance. Condition for amplitude resonance. Applications of resonance.			

Rigid body. Moment of inertia. Torsional pendulum-derivation of expression for time of oscillation. Mention of uses. Bending of beams- derivation of expression for bending moment of a beam. Cantilever-derivation for depression of loaded end of a single cantilever. <i>Numerical problems on Amplitude and phase of forced vibrations, time-period of oscillation, bending moment and Young's Modulus/depression of a cantilever.</i>	
MODULE– 2	10Hrs
Crystallography Space lattice, Bravais lattice–unit cell, primitive cell. Lattice parameters. 7 basic crystal systems. Directions and planes, Miller indices. Expression for interplanar spacing. Coordination number. Atomic packing factors (SC, FCC, BCC). Density of a unit cell. X-rays and their types. Bragg's law. Bragg's X-ray spectrometer for identification of crystal structure. Importance of X-ray diffraction in material characterisation. De Broglie's concept of matter waves. Exploitation of wave nature of electrons in SEM, list of other applications <i>Numerical problems on Miller indices, Interplanar space, Bragg's law.</i>	
MODULE– 3	10 hrs
Photonics Interaction of radiation with matter. Expression for energy density in terms of Einstein's coefficients. Requisites of a Laser system. Conditions for laser action. Types of laser sources (to list out Solid, Gas and Semiconductor lasers and to list the contrast between them). CO₂ laser – construction and working, Measurement of pollutants (LIDAR), List of other applications: laser fencing, laser cutting, laser drilling, laser welding, laser-guided missiles, LASER Range Finder, Road Profiling, Bridge Deflection, Speed Checker. Optical fibres. Construction and principle. Ray propagation mechanism. Angle of acceptance and numerical aperture - their relationship with refractive indices of core and clad and condition for ray propagation. Modes of transmission: V-number and number of modes, Types of optical fibres, Attenuation. List of applications of optical fibers. Merits and demerits of optical fibers. <i>Numerical problems on Boltzmann factor, V-number, Numerical aperture, and attenuation</i>	
MODULE– 4	10 hrs
Thermoelectric materials and devices Thermoelectric phenomena. Thermo emf and thermo current, Seebeck effect. Variation of thermo emf with temperature, Peltier effect, Seebeck, Peltier and Thomson coefficients (Mention Expression), laws of thermoelectricity. Experimental demonstration of Peltier effect. Explanation of thermo emf based on Peltier effect. Thermo-electric power. Construction and Working of Thermoelectric generators (General). Construction and working of Thermoelectric coolers (Refrigerators), Construction and working of Exhaust (Automobiles). <i>Numerical Problems</i>	

List of experiments

1. Measurement of electrical resistivity and energy gap of a semiconductor using four probe technique.
2. Determination of dielectric constant by charging and discharging of a capacitor.
3. Determination of wavelength of LASER by diffraction technique.
4. Verification of Stefan's law of radiation.
5. Determination of Planck's constant using Light Emitting Diodes.
6. Estimation of frequencies of vibrating string and AC using Sonometer.
7. Determination of resonance frequency and inductance using LCR circuits.
8. Determination of Young's modulus using single cantilever.
9. Determination of moment of inertia of rigid bodies and rigidity modulus of a string using torsion pendulum.
10. Determination of numerical aperture and modes of transmission of optical fiber.

Text Books:

1. Engineering physics: R K Gaur and S L Gupta, ISBN: 9788189928223, Dhanpat Rai Publishing Company (P) Ltd. Edition, 2011
2. Solid state physics: S O Pillai, ISBN-10: 9386070928, New Age International Pvt. Ltd, Eighth edition, 9 January 2018.
3. Brijlal N Subramanyam : Heat and Thermodynamics ISBN: 81-219-2813-3 S. Chand and Co. Ltd. New Delhi, Edition, 2007.

Reference Books:

1. Fiber Optics: A K Ghatak and K Thyagarajan, ISBN-13: 978-0521577854, Cambridge University Press India Pvt. Limited, 1998
2. E-resources; NPTEL courses on Engineering physics.
3. Singal, Agarwal and Prakash : Heat, Thermodynamics and Statistical Physics, ISBN-13-9789350065235, Pragati Prakashan, India, 2017.
4. Physics laboratory manual, Dept. of Physics, Malnad College of Engineering, Hassan.

CourseTitle		PHYSICS FOR ELECTRONICS AND ELECTRICAL ENGINEERING STREAM	
CourseCode	22PHYE12/22	(L-T-P)C	(3-1-2)4
Exam. duration	3hour	Class Hours/Week	06
CIE (Theory) marks	30	CIE (Practicals) marks	20
SEE marks	50	Total class hours	70
CourseObjective: Objective of the course is to make students learn principles and theories of physics in electronics and electrical engineering fields and to develop effective solutions for engineering problems			
CourseOutcomes(COs): Upon completion of the course, students shall be able to:			
#	Courseoutcomes	Mapping to PO's	

1	Discuss the concepts of materials science, photonics and quantum mechanics	1
2	Interpret the laws of materials science, applications of photonics and quantum mechanics.	1
3	Solve problems on materials science, lasers, optical fibers and quantum mechanics.	1
4	Verify experimentally the laws and concepts of materials science, lasers, optical fibers and quantum mechanics.	1,10
CourseContents:		
MODULE– 1		10Hrs
Photonics Interaction of radiation with matter. Expression for energy density in terms of Einstein's coefficients. Requisites of a Laser system. Conditions for laser action. Types of laser sources (to list out Solid, Gas and Semiconductor lasers and to list the contrast between them). CO₂ laser – construction and working, Measurement of pollutants (LIDAR), List of other applications: laser fencing, laser cutting, laser drilling, laser welding, laser-guided missiles, LASER Range Finder, Road Profiling, Bridge Deflection, Speed Checker. Optical fibres. Construction and principle. Ray propagation mechanism. Angle of acceptance and numerical aperture - their relationship with refractive indices of core and clad and condition for ray propagation. Modes of transmission: V-number and number of modes, Types of optical fibres, Attenuation. List of applications of optical fibers. Merits and demerits of optical fibers. <i>Numerical problems on Boltzmann factor, V-number, Numerical aperture, and attenuation.</i>		
MODULE– 2		10Hrs
Electrical Properties of Solids Free electrons in metals. Classical free electron theory-assumptions. Drift velocity, Mean free path, Mean collision time, Relaxation time. Expression for electrical conductivity in metals. Failures of classical free electron theory. Quantum free electron theory-assumptions. Fermi energy. Fermi-Dirac distribution function (Fermi factor). Merits of quantum free electron theory. Dielectric materials. Polarization and its types. Frequency dependence of polarizability and permittivity. Expression for internal field. Claussius-Mossotti equation. Applications of dielectrics in capacitors, transformers, LEDs; OLED and QLED and microwave tunable devices. <i>Numerical problems on electrical conductivity, Fermi energy, and Claussius-Mossotti equation.</i>		
MODULE– 3		10 hrs
Semiconductors and Superconductors Effects of impurity and temperature on electrical resistivity of metals. Effects of impurity and temperature on their electrical resistivity semiconductors. electrical conductivity of a semiconductor (derivation). Applications in development of electronic devices (mention diodes, transistors, LEDs, etc.,) Superconductors. Temperature dependence of electrical resistivity in superconductors. Meissner effect (qualitative). Critical magnetic field. Type I and Type II superconductors. BCS Theory. High temperature superconductors.Applications of superconductors; superconducting magnets, MRI, SQUID (to mention) and Maglev Vehicle (qualitative discussion). <i>Numerical problems on electrical conductivity and critical magnetic field</i>		

MODULE– 4	10 hrs
Quantum mechanics Origin of quantum mechanics - Black body radiation spectrum, Wien's law and Rayleigh Jeans law, assumptions of quantum theory of radiation, Planck's law. Evidence/explanation of dual nature of matter. Louis de Broglie hypothesis of matter waves. Relationship between group velocity, phase velocity, particle velocity and velocity of light. Characteristic properties of matter waves. Expression for de Broglie wavelength of electron, its application in SEM and TEM, and advent of nanotechnology (Qualitative). Schrodinger wave equation, wave function, Probability density & normalization of wave function (Max Born's interpretation). Eigen values and Eigen functions, Application of Schrodinger wave equation for trapped particle and free particle; computation of eigen values and eigen functions. <i>Numerical problems on Louis de Broglie equations, group velocity, phase velocity and Eigenvalue equation.</i>	
List of experiments 1. Measurement of electrical resistivity and energy gap of a semiconductor using four probe technique. 2. Determination of dielectric constant by charging and discharging of a capacitor. 3. Determination of wavelength of LASER by diffraction technique. 4. Verification of Stefan's law of radiation. 5. Determination of Planck's constant using Light Emitting Diodes. 6. Estimation of frequencies of vibrating string and AC using Sonometer. 7. Determination of resonance frequency and inductance using LCR circuits. 8. Determination of Young's modulus using single cantilever. 9. Determination of moment of inertia of rigid bodies and rigidity modulus of a string using torsion pendulum. 10. Determination of numerical aperture and modes of transmission of optical fiber.	
Text Books: 1. Engineering physics: R K Gaur and S L Gupta, ISBN: 9788189928223, Dhanpat Rai Publishing Company (P) Ltd. Edition, 2011 2. Solid state physics: S O Pillai, ISBN-10: 9386070928, New Age International Pvt. Ltd, Eighth edition, 9 January 2018.	
Reference Books: 1. Modern Physics, Kenneth S. Krane, ISBN-13: 9781118061145, John Wiley & Sons, Inc., 3rd Edition, 2012. 2. B.B. Laud - Lasers and non-linear optics, New Age International, ISBN: 9788122430561, 3rd Edition, 2015. 3. Fiber Optics: A K Ghatak and K Thyagarajan, ISBN-13: 978-0521577854, Cambridge University Press India Pvt. Limited, 1998. 4. E-resources; NPTEL courses on Engineering physics. 5. Physics laboratory manual, Dept. of Physics, Malnad College of Engineering, Hassan.	

CourseTitle		PHYSICS FOR COMPUTER ENGINEERING STREAM	
CourseCode	22PHYS12/22	(L-T-P)C	(3-1-2)4
Exam. duration	3hour	Class Hours/Week	06
CIE (Theory) marks	30	CIE (Practicals) marks	20
SEE marks	50	Total class hours	70
CourseObjective: Objective of the course is to make students learn principles and theories of physics in computer science and allied engineering fields and to develop effective solutions for engineering problems			
CourseOutcomes(COs): Upon completion of the course, students shall be able to:			
#	Course outcomes		Mapping to PO's
1	Discuss the concepts of materials science, photonics and quantum mechanics in computation.		1
2	Interpret the laws of materials science, applications of photonics and quantum mechanics.		1
3	Solve problems on materials science, lasers, optical fibers and quantum mechanics.		1
4	Verify experimentally the laws and concepts of materials science, lasers, optical fibers and quantum mechanics.		1,10
CourseContents:			
MODULE 1			10 hrs
Free Electron Theory and Superconductivity for computation Free electron concept in metals. Classical free electron theory-assumptions. Drift velocity, mean free path, Mean collision time, Relaxation time. Mention of expression for electrical conductivity in metals. Failures of classical free electron theory. Quantum free electron theory–assumptions. Fermi-Dirac distribution function. Merits of quantum free electron theory. Effects of impurity and temperature on electrical resistivity of metals. Superconductors. Temperature dependence of electrical resistivity in superconductors. Meissner effect (qualitative). Critical magnetic field. Type I and Type II superconductors. BCS Theory. High temperature superconductors. Applications of superconductors; MRI and SQUID. Role of semiconducting and dielectric properties in computation; Elements of memory and processing of tasks in computation using transistors, resistors, capacitors. <i>Numerical problems on electrical conductivity, Fermi energy, and critical magnetic field</i>			
MODULE 2			10 hrs
Photonics Interaction of radiation with matter. Expression for energy density in terms of Einstein's coefficients. Requisites of a Laser system. Conditions for laser action. Types of laser sources (to list out Solid, Gas and Semiconductor lasers and to list the contrast between them). CO ₂ laser – construction and working, Measurement of pollutants (LIDAR), List of other applications: laser			

fencing, laser cutting, laser drilling, laser welding, laser-guided missiles, LASER Range Finder, Road Profiling, Bridge Deflection, Speed Checker.

Optical fibres. Construction and principle. Ray propagation mechanism. Angle of acceptance and numerical aperture - their relationship with refractive indices of core and clad and condition for ray propagation. Modes of transmission: V-number and number of modes, Types of optical fibres, Attenuation. List of applications of optical fibers. Merits and demerits of optical fibers.

Numerical problems on Boltzmann factor, V-number, Numerical aperture, and attenuation.

MODULE 3

10 hrs

Quantum mechanics for computation

Origin of quantum mechanics - Black body radiation spectrum, Wien's law and Rayleigh Jeans law, assumptions of quantum theory of radiation, Planck's law. Evidence/explanation of dual nature of matter. Louis de Broglie hypothesis of matter waves. **Relationship between group velocity, phase velocity, particle velocity and velocity of light.** Characteristic properties of matter waves. Expression for de Broglie wavelength of electron, its application in SEM and TEM, and advent of nanotechnology (Qualitative). Schrodinger wave equation, wave function, Probability density & normalization of wave function (Max Born's interpretation). Eigen values and Eigen functions, **Application of Schrodinger wave equation for trapped particle and free particle; computation of eigen values and eigen functions.**

Numerical problems on Louis de Broglie equations, group velocity, phase velocity and Eigenvalue equation.

MODULE 4

10 hrs

Elements of Quantum Computing

Introduction to quantum computers, difference between classical and quantum computers, exponential growth of quantum computers for artificial intelligence and deep learning. Qubits and working principle of their different types; SQUID, Photonic, NMR, Ion trap. Dirac bracket notation, Bloch sphere, quantum logic gates; single qubit logic gates and multi qubit logic gates. Heisenberg's uncertainty principle, Quantum tunneling, Quantum entanglement, quantum superposition. Quantum Superposition and Quantum Entanglement; circuit building. Operation of logic gates on single and multi-Qubits. *Game on quantum superposition and quantum entanglement*

Numerical problems on Logic gates operation on Qubits

List of experiments

1. Measurement of electrical resistivity and energy gap of a semiconductor using four probe technique.
2. Determination of dielectric constant by charging and discharging of a capacitor.
3. Determination of wavelength of LASER by diffraction technique.
4. Verification of Stefan's law of radiation.
5. Determination of Planck's constant using Light Emitting Diodes.
6. Estimation of frequencies of vibrating string and AC using Sonometer.
7. Determination of resonance frequency and inductance using LCR circuits.
8. Determination of Young's modulus using single cantilever.
9. Determination of moment of inertia of rigid bodies and rigidity modulus of a string using

torsion pendulum.

10. Determination of numerical aperture and modes of transmission of optical fiber.

Text Books:

1. **Engineering physics: R K Gaur and S L Gupta** ;ISBN: 9788189928223; Dhanpat Rai Publishing Company (P) Ltd. Edition: 2011
2. **Solid state physics: S O Pillai**; ISBN-10: 9386070928; New Age International Pvt. Ltd, Eighth edition: 9 January 2018.

Reference Books:

1. **Modern Physics: Kenneth S. Krane**;ISBN-13: 9781118061145 ; John Wiley & Sons, Inc., ; 3rd Edition, 2012.
2. **Fiber Optics: A K Ghatak and K Thyagarajan**; ISBN-13: 978-0521577854; Cambridge University Press India Pvt. Limited, 1998.
3. **Quantum computation and quantum information** - Michael A. Nielsen, Isaac L. Chuang - Cambridge University Press, 2004.

CHEMISTRY COURSES

Course Title	CHEMISTRY FOR CIVIL ENGINEERING STREAM		
Course Code	22CHEC12/22	(L-T-P)C	(3-1-2)4
SEE duration	3 hour	Hours / Week	06
CIE (Theory) marks	30	CIE(Practicals)/Activity marks	20
SEE marks	50	Total contact hours	70
Course Objective: The objective of this course is to build a strong foundation and basic skills in Engineering Chemistry for technological competence in industries. Course Outcomes: After the completion of the course, students shall be able to:-			
Sl. No.	Course outcomes		Mapping to POs
1.	Describe the terms and chemical process involved in the scientific and engineering application.		PO1, PO2
2.	Illustrate the construction and working of the engineering process using basic concepts of chemistry.		PO1, PO2

3.	Outline the preparation, properties & applications associated with chemical substances in multidisciplinary fields.	PO1, PO2
4.	Apply the various principles and analytical techniques to solve the problems and quantitative analysis of materials in engineering applications.	PO1, PO2 & P10
Course Contents:		
MODULE –1		10 Hrs.
Water and its Treatment Introduction, sources of water, impurities in water, standards of water for industrial supply. Hardness of water, types of hardness determination of total hardness by EDTA method. Boiler feed water and boiler problems , Boiler scales and sludge's- meaning, formation, disadvantages and prevention, priming and foaming. External treatment of boiler feed water - Hot Lime -Soda process and Ion exchange method. Internal treatment of water - phosphate conditioning & calgon treatment. Desalination - Meaning, purification of water by reverse osmosis. Potable water - Meaning, Standards of potable water, treatment of water for town supply. BOD and COD- definition, experimental determination of COD of the industrial waste water sample.		
MODULE –2		10 Hrs.
Chemical Energy Sources and Engineering Materials Fuels - Definition with examples. Characteristics of an ideal fuel. Calorific value- definition, types - Gross and Net calorific values, units in S.I system. Experimental determination of calorific value of a solid fuel using Bomb Calorimeter. Numerical problems on GCV and NCV. Chemical processing of Petroleum : Cracking- Definition. Types of cracking- thermal and catalytic cracking. Fluidized catalytic cracking. Reforming of petrol with reactions (Isomerisation, cyclisation, aromatisation and dehydrogenation). Octane number & Cetane number. Knocking in IC engine. Prevention of knocking - Anti knocking agents (TEL & MTBE). Green fuels: Power alcohol - introduction, advantages and disadvantages. Biodiesel - introduction, synthesis, advantages, and disadvantages. Cement : Introduction, composition, properties, classification, manufacturing process of cement, process of setting and hardening of cement, additives for cement and testing of cement.		
MODULE –3		10 Hrs.

Electrochemistry and Battery Technology

Introduction, electrochemical cells – Definition, Types of electrochemical cells, Construction, working & representation of galvanic cell. Modern sign conventions, single electrode potential, standard electrode potential. E.M.F of a cell, standard E.M.F of a cell, derivation of Nernst's equation.

Concentration cell- Definition with example, derivation of emf of concentration cells.

Electrodes - Types of electrodes-Metal-metal ion electrode, Metal- metal salt ion electrode, gas-electrode and ion selective electrode.

Secondary reference electrodes – Calomel electrode-construction, working and applications.

Ion selective electrode- construction and working of glass electrode. Determination of pH of a solution using glass electrode. Numerical problems on E , E^0 , E_{cell} , E^0_{cell} and concentration cells.

Potentiometric estimation of FAS using $\text{K}_2\text{Cr}_2\text{O}_7$ solution.

Battery technology

Batteries- Definition, classification of batteries- primary & secondary batteries.

Secondary batteries - construction, working and industrial applications of Lead- acid battery and Nickel-metal hydride battery.

Modern battery- construction, working and industrial applications of Li-ion batteries.

Fuel Cells- Introduction, definition, construction, working and industrial applications of $\text{H}_2\text{-O}_2$ fuel cell & Methanol- O_2 fuel cell.

MODULE – 4

10 hrs.

Macromolecules for Engineering Applications

Introduction, definition with examples. **Glass transition temperature (T_g)** - definition, factors affecting T_g and significances of T_g.

Plastics – Compounding of resins in to plastics.

Synthesis, properties and Industrial applications of PMMA and Polyurethane.

Polymer composites- introduction, **fibers**- meaning, synthesis, properties and industrial applications of Kevlar and Polyester.

Adhesives –Meaning, preparation, properties and applications of Epoxy resins & Phenol-formaldehyde resins.

Bio-degradable polymers- Introduction, types of bio-degradable polymers, preparation, properties and applications of polylactic acid (PLA).

Corrosion chemistry

Introduction, electrochemical theory of corrosion, types-differential metal, differential aeration (water line and pitting), factors affecting the nature of corrosion.

Corrosion control-galvanization, anodization and sacrificial anode method.

List of experiments/Activities

A – Demonstration (any two) offline/virtual:

A1. Synthesis of polymer

A2. Synthesis of iron oxide nanoparticles

A3: Chemical Structure drawing using software: ChemDraw or ACD/ChemSketch

A4. Determination of chloride content in the given water sample by Argentometric method

B – Exercise (compulsorily any 4 to be conducted):

B1. Conductometric estimation of acid mixture

B2. Potentiometric estimation of FAS using K₂Cr₂O₇

B3. Determination of p^{Ka} of vinegar using p^H sensor

B4. Determination of rate of corrosion of mild steel by weight loss method

B5. Estimation of total hardness of water by EDTA method

C – Structured Enquiry (compulsorily any 4 to be conducted):

C1. Estimation of Copper present in electroplating effluent by optical sensor

C2. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)

C3. Estimation of iron in TMT bar by diphenyl amine/external indicator method

C4. Estimation of Sodium present in soil/effluent sample using flame photometry

C5. Determination of Chemical Oxygen Demand (COD) of industrial waste water sample

D – Open Ended Experiments (any two):

D1: Evaluation of acid content in beverages by using p^H sensors and simulation

TEXT BOOKS

1. Engineering Chemistry by M.M. Uppal, Khanna Publishers.
2. A text Book of Engineering Chemistry- by P C Jain and Monica Jain, Dhanapatrai Publications, New Delhi.(2015 edition)
3. A Text Book of Engineering Chemistry, R.V. Gadag and Nitthyananda Shetty, I.K. International Publishing house. 2nd Edition, 2016.
4. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah& Pushpa Iyengar., Subash Publications, Bangalore.5th Edition,2014.

REFERENCE BOOKS

1. Principles of Physical Chemistry B.R.Puri, L.R.Sharma&M.S.Pathania, S.Nagin Chand &Co., (2008 edition).
2. Industrial Chemistry by B.K.Sharma, GOEL Publishing House (2014 edition).
3. Industrial Electrochemistry, Second Edition by Derek Pletcher & Frank C. Walsh publisher: Chapman & Hall, USA (1993 edition)X
4. Corrosion Engineering, M.G. Fontana, N.D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.
5. Instrumental Methods of Analysis, Dr. K. R. Mahadik and Dr. L. Sathiyarayanan.
6. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4th Edition, 1999.
7. Vogelstext book of quantitative inorganic analysis, revised by J. Bassett, R.C. Denny, G.H. Jeffery, 4th Ed.

Course Title		CHEMISTRY FOR MECHANICAL ENGINEERING STREAM	
Course Code	22CHEM12/22	(L-T-P)C	(3-1-2)4
SEE duration	3 hour	Hours / Week	06
CIE (Theory) marks	30	CIE(Practicals)/Activity marks	20
SEE marks	50	Total contact hours	70
Course Objective: The objective of this course is to build a strong foundation and basic skills in Engineering Chemistry for technological competence in industries. Course Outcomes: After the completion of the course, students shall be able to:-			
Sl. No.	Course outcomes		Mapping to POs
1.	Describe the terms and chemical process involved in the scientific and engineering application.		PO1, PO2
2.	Illustrate the construction and working of the engineering process using basic concepts of chemistry.		PO1, PO2

3.	Outline the preparation, properties & applications associated with chemical substances in multidisciplinary fields.	PO1, PO2
4.	Apply the various principles and analytical techniques to solve the problems and quantitative analysis of materials in engineering applications.	PO1, PO2 PO10
Course Contents:		
MODULE –1		10 Hrs.
Chemical Energy Sources and Engineering materials Fuels- Definition with examples. Characteristics of an ideal fuel. Calorific value- definition, types - Gross and Net calorific values, units in S.I system. Experimental determination of calorific value of a solid fuel using Bomb Calorimeter. Numerical problems on GCV and NCV. Chemical processing of Petroleum: Cracking- Definition. Types of cracking- thermal and catalytic cracking. Fluidized catalytic cracking. Reforming of petrol with reactions (Isomerisation, cyclisation, aromatisation and dehydrogenation). Octane number & Cetane number. Knocking in IC engine. Prevention of knocking - anti knocking agents (TEL & MTBE). Green fuels: Power alcohol- introduction, advantages and disadvantages. Biodiesel- introduction, synthesis, advantages and disadvantages. Alloys: Introduction, classification, composition, properties and applications of Stainless Steel, Solders, Brass and Alnico.		
MODULE –2		10 Hrs.
Water and its Treatment Introduction, sources of water, impurities in water, standards of water for industrial supply. Hardness of water, types of hardness determination of total hardness by EDTA method. Boiler feed water and boiler problems, Boiler scales and sludges- meaning, formation, disadvantages and prevention, priming and foaming. External treatment of boiler feed water- Hot Lime -Soda process and Ion exchange method. Internal treatment of water- phosphate conditioning & Calgon treatment. Desalination- Meaning, purification of water by reverse osmosis. Potable water- Meaning, Standards of potable water, treatment of water for town supply. BOD and COD- definition, experimental determination of COD of the industrial waste water sample.		
MODULE –3		10 Hrs.

Electrochemistry and Battery Technology

Introduction, electrochemical cells – Definition, Types of electrochemical cells, Construction, working & representation of galvanic cell. Modern sign conventions, single electrode potential, standard electrode potential. E.M.F of a cell, standard E.M.F of a cell, derivation of Nernst equation.

Concentration cell- Definition with example, derivation of emf of concentration cells.

Electrodes - Types of electrodes-Metal-metal ion electrode, Metal- metal salt ion electrode, gas-electrode and ion selective electrode.

Secondary reference electrodes – calomel electrode-construction, working and applications.

Ion-selective electrode- construction and working of glass electrode. Determination of pH of a solution using glass electrode. Numerical problems on E , E^0 , E_{cell} , E^0_{cell} and concentration cells.

Potentiometric estimation of FAS using $\text{K}_2\text{Cr}_2\text{O}_7$ solution.

Battery technology

Batteries- Definition, Classification of batteries- primary & secondary batteries.

Secondary batteries - construction, working and industrial applications of Lead- acid battery and Nickel -metal hydride battery.

Modern battery- construction, working and industrial applications of Li-ion batteries.

Fuel Cells- Introduction, definition, construction, working and industrial applications of $\text{H}_2\text{-O}_2$ fuel cell & Methanol- O_2 fuel cell.

MODULE –4

10 Hrs

Macromolecules for Engineering applications

Introduction, definition with examples. **Glass transition temperature (T_g)** - definition, factors affecting T_g and significances of T_g.

Plastics – Compounding of resins in to plastics.

Synthesis, properties and Industrial applications of PMMA and Polyurethane.

Polymer composites- introduction, **fibers**- meaning, synthesis, properties and industrial applications of Kevlar and polyester.

Adhesives –Meaning, Preparation, properties and applications of Epoxy resins & Phenol-formaldehyde resins.

Bio-degradable polymers- Introduction, types of bio-degradable polymers, preparation, properties and applications of polylactic acid (PLA).

Corrosion chemistry

Introduction, electrochemical theory of corrosion, types-differential metal, differential aeration(water line and pitting), factors affecting the nature of corrosion.

Corrosion control-galvanization, anodization and sacrificial anode method.

List of experiments/Activities

A – Demonstration (any two) offline/virtual:

A1. Synthesis of polymer

A2. Synthesis of iron oxide nanoparticles

A3: Chemical Structure drawing using software: ChemDraw or ACD/ChemSketch

A4. Determination of chloride content in the given water sample by Argentometric method

B – Exercise (compulsorily any 4 to be conducted):

B1. Conductometric estimation of acid mixture

B2. Potentiometric estimation of FAS using K₂Cr₂O₇

B3. Determination of pK_a of vinegar using pH sensor

B4. Determination of rate of corrosion of mild steel by weight loss method

B5. Estimation of total hardness of water by EDTA method

C – Structured Enquiry (compulsorily any 4 to be conducted):

- C1. Estimation of Copper present in electroplating effluent by optical sensor
- C2. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)
- C3. Estimation of iron in TMT bar by diphenyl amine/external indicator method
- C4. Estimation of Sodium present in soil/effluent sample using flame photometry
- C5. Determination of Chemical Oxygen Demand (COD) of industrial waste water sample

D – Open Ended Experiments (any two):

- D1: Evaluation of acid content in beverages by using pH sensors and simulation
- D2. Estimation of copper in e-waste.
- D3.Volumetric estimation of gypsum in Portland cement
- D4. Searching suitable PDB file and target for molecular docking

TEXT BOOKS

1. Engineering Chemistry by M.M. Uppal, Khanna Publishers.
2. A text Book of Engineering Chemistry- by P C Jain and Monica Jain, Dhanapatrai Publications, New Delhi.(2015 edition)
3. A Text Book of Engineering Chemistry, R.V. Gadag and Nitthyananda Shetty, I.K. International Publishing house. 2nd Edition, 2016.
4. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah& Pushpa Iyengar., Subash Publications, Bangalore.5th Edition,2014.

REFERENCE BOOKS

1. Principles of Physical Chemistry B.R.Puri, L.R.Sharma&M.S.Pathania, S.Nagin Chand &Co., (2008 edition).
2. Industrial Chemistry by B.K.Sharma, GOEL Publishing House (2014 edition).
3. Industrial Electrochemistry, Second Edition by Derek Pletcher & Frank C. Walsh publisher: Chapman & Hall, USA (1993 edition)X
4. Corrosion Engineering, M.G. Fontana, N.D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.
5. Instrumental Methods of Analysis, Dr. K. R. Mahadik and Dr. L. Sathiyarayanan.
6. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4th Edition, 1999.
7. Vogelstext book of quantitative inorganic analysis, revised by J. Bassett, R.C. Denny, G.H. Jeffery, 4th Ed.

Course Title	CHEMISTRY FOR ELECTRICAL AND ELECTRONICS ENGINEERING STREAM		
Course Code	22CHEE12/22	(L-T-P)C	(3-1-2)4

SEE duration	3 hour	Hours / Week	06
CIE (Theory) marks	30	CIE (Practicals)/Activity marks	20
SEE marks	50	Total contact hours	70

Course Objective: The objective of this course is to build a strong foundation and basic skills in Engineering Chemistry for technological competence in industries.

Course Outcomes:

After the completion of the course, students shall be able to:-

Sl. No.	Course outcomes	Mapping to POs
1.	Describe the terms and chemical process involved in the scientific and engineering application.	PO1, PO2
2.	Illustrate the construction and working of the engineering process using basic concepts of chemistry.	PO1, PO2
3.	Outline the preparation, properties & applications associated with chemical substances in multidisciplinary fields.	PO1, PO2
4.	Apply the various principles and analytical techniques to solve the problems and quantitative analysis of materials in engineering applications.	PO1, PO2 & PO10

Course Contents:

MODULE –1	10 Hrs.
Electrochemistry and Analytical Techniques Electrochemistry- Introduction, electrochemical cells – Definition, Types of electrochemical cells, Construction, working & representation of galvanic cell. Modern sign conventions, single electrode potential, standard electrode potential. E.M.F of a cell, standard E.M.F of a cell, derivation of Nernst's equation. Concentration cell- Definition with example, derivation of emf of concentration cells. Electrodes - Types of electrodes-Metal-metal ion electrode, Metal-metal salt ion electrode, gas-electrode and ion selective electrode. Secondary reference electrode – Calomel electrode - construction, working and applications. Ion selective electrode- construction and working of the glass electrode. Determination of p^H of a solution using glass electrode. Numerical problems on E , E^0 , E_{cell} , E^0_{cell} and concentration cells. Analytical techniques: Introduction, principle and instrumentation: Colorimetric sensors – estimation of copper, Potentiometric sensors – estimation of iron and Conductometric sensors – estimation of weak acid.	
MODULE –2	10 Hrs.
Energy, Storage and Conversion Batteries- Definition, difference between battery and cell. Classification of batteries – primary & secondary batteries. Battery characteristics. Secondary batteries - construction, working and industrial applications of Lead- acid battery and Nickel-metal hydride battery.	

Modern batteries: Construction, working and industrial applications of Li-ion battery.
Fuel Cells- Introduction, definition, construction, working and industrial applications of H₂-O₂ fuel cell & methanol-oxygen fuel cell. Differences between battery and fuel cells.
Green fuels:Power alcohol-Introduction, advantages and disadvantages. **Biodiesel-** Introduction, synthesis, advantages, and disadvantages.
E-waste management: Introduction, sources, types, effects of e-waste on environment and human health, methods of disposal, advantages of recycling, extraction of copper and gold from e-waste.

MODULE –3

10 Hrs.

Macromolecules for Engineering Applications

Introduction, definition with examples. **Glass transition temperature (T_g)** - definition, factors affecting T_g and significances of T_g.

Plastics – Compounding of resins into plastics. Synthesis, properties and industrial applications of PMMA, Polyurethane & PTFE.

Polymer composites- introduction, **Fibers-** meaning, synthesis, properties and industrial applications of Kevlar and Polyester.

Adhesives –Meaning, Preparation, properties and applications of Epoxy resins & Phenol-formaldehyde resins.

Bio-degradable polymers- Introduction, types of bio-degradable polymers, preparation, properties and applications of polylactic acid (PLA).

Elastomers- Definition, types-natural and synthetic rubber. Preparation of natural rubber from latex, deficiencies of natural rubber, vulcanization of natural rubber.

Synthetic rubbers- Preparation, properties and industrial applications of SBR rubber, Thiokol, and Silicon rubber.

MODULE – 4

10 hrs.

Surface Finishing

Introduction, technological importance of metal finishing. factors affecting the nature of electro deposit - metal ion concentration, current density, complexing agents, organic additives, p^H, temperature & throwing power.

Electroplating – Definition, electroplating process. Methods of cleaning the metal surfaces to be coated. Electroplating of Copper by cyanide bath method and electroplating of Gold.

Electroless plating - Definition, distinction between electroplating and electroless plating. Advantages of electroless plating. Electroless plating of Nickel.

Corrosion chemistry

Introduction, electrochemical theory of corrosion, types-differential metal, differential aeration (water line and pitting), factors affecting the nature of corrosion.

Corrosion control-galvanization, anodization and sacrificial anode method.

List of experiments/Activities

A – Demonstration (any two) offline/virtual:

- A1. Synthesis of polymer
- A2. Synthesis of iron oxide nanoparticles
- A3: Chemical Structure drawing using software: ChemDraw or ACD/ChemSketch
- A4. Determination of chloride content in the given water sample by Argentometric method

B – Exercise (compulsorily any 4 to be conducted):

- B1. Conductometric estimation of acid mixture
- B2. Potentiometric estimation of FAS using $K_2Cr_2O_7$
- B3. Determination of pKa of vinegar using pH sensor
- B4. Determination of rate of corrosion of mild steel by weight loss method
- B5. Estimation of total hardness of water by EDTA method

C – Structured Enquiry (compulsorily any 4 to be conducted):

- C1. Estimation of Copper present in electroplating effluent by optical sensor
- C2. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)
- C3. Estimation of iron in TMT bar by diphenyl amine/external indicator method
- C4. Estimation of Sodium present in soil/effluent sample using flame photometry
- C5. Determination of Chemical Oxygen Demand (COD) of industrial waste water sample

D – Open Ended Experiments (any two):

- D1: Evaluation of acid content in beverages by using p^H sensors and simulation
- D2. Estimation of copper in e-waste.
- D3. Volumetric estimation of gypsum in Portland cement
- D4. Searching suitable PDB file and target for molecular docking

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- 3. A Text Book of Engineering Chemistry, R.V. Gadag and Nitthyananda Shetty, I.K. International Publishing house. 2nd Edition, 2016.
- 4. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar., Subash Publications, Bangalore. 5th Edition, 2014.

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- 2. Industrial Chemistry by B.K.Sharma, GOEL Publishing House (2014 edition).
- 3. Industrial Electrochemistry, Second Edition by Derek Pletcher & Frank C. Walsh publisher: Chapman & Hall, USA (1993 edition)
- 4. Corrosion Engineering, M.G. Fontana, N.D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.
- 5. Instrumental Methods of Analysis, Dr. K. R. Mahadik and Dr. L. Sathiyarayanan.
- 6. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4th Edition, 1999.
- 7. Vogel's text book of quantitative inorganic analysis, revised by J. Bassett, R.C. Denny, G.H. Jeffery, 4th Ed.

Course Title		CHEMISTRY FOR COMPUTER SCIENCE AND ENGINEERING STREAM	
Course Code	22CHES12/22	Course Code	22CHES12
SEE duration	3 hour	SEE duration	3 hour
CIE (Theory) marks	30	CIE (Theory) marks	30
SEE marks	50	SEE marks	50
Course Objective: The objective of this course is to build a strong foundation and basic skills in Engineering Chemistry for technological competence in industries.			
Course Outcomes:			
After the completion of the course, students shall be able to:-			
Sl. No.	Courseoutcomes		Mapping to POs
1.	Describe the terms and chemical process involved in the scientific and engineering application.		PO1, PO2
2.	Illustrate the construction and working of the engineering process using basic concepts of chemistry.		PO1, PO2
3.	Outline the preparation, properties & applications associated with chemical substances in multidisciplinary fields.		PO1, PO2
4.	Apply the various principles and analytical techniques to solve the problems and quantitative analysis of materials in engineering applications.		PO1, PO2 & PO10
CourseContents:			
MODULE–1			10Hrs.
Macromolecules for Engineering Applications			
Introduction , definition with examples. Glass transition temperature (Tg) - definition, factors affecting Tg and significances of Tg.			
Plastics – Compounding of resins into plastics. Synthesis, properties and industrial applications of PMMA, Polyurethane & PTFE.			
Polymer composites - introduction. Fibers - meaning, synthesis, properties and industrial applications of Kevlar and Polyester.			
Adhesives –Meaning, preparation, properties and applications of Epoxy resins & Phenol-formaldehyde resins.			
Bio-degradable polymers - Introduction, types of bio-degradable polymers, preparation, properties and applications of polylactic acid (PLA).			
Elastomers - Definition, types-natural and synthetic rubber. Preparation of natural rubber from latex, deficiencies of natural rubber, vulcanization of natural rubber.			

Synthetic rubbers- Preparation, properties and industrial applications of SBR rubber, Thiokol, and Silicon rubber.	
MODULE–2	10Hrs.
Electrochemistry and Sensors	
Electrochemistry	
Introduction, electrochemical cells – Definition, Types of electrochemical cells, Construction, working & representation of galvanic cell. Modern sign conventions, single electrode potential, standard electrode potential. E.M.F of a cell, standard E.M.F of a cell, derivation of Nernst's equation.	
Concentration cell- Definition with example, derivation of emf of concentration cells.	
Electrodes -Types of electrodes-Metal-metal ion electrode, Metal - metal salt ion electrode, gas electrode and ion selective electrode.	
Secondary reference electrodes – Calomel electrode- construction, working and applications.	
Ion selective electrode- construction and working of the glass electrode. Determination of p^H of a solution using glass electrode. Numerical problems on E , E^0 , E_{cell} , E^0_{cell} and concentration cells. Potentiometric estimation of FAS using $K_2Cr_2O_7$ solution.	
Sensors: Introduction, working principle and applications of electrochemical sensors - Potentiometric sensors, Amperometric sensors, and Conductometric sensors. Optical sensors	
MODULE–3	10 Hrs.
Energy, Storage and Conversion	
Batteries- Definition, difference between battery and cell. Classification of batteries- primary & secondary batteries. Battery characteristics.	
Secondary batteries - construction, working and industrial applications of Lead- acid battery and Nickel-metal hydride battery.	
Modern batteries: Construction, working and industrial applications of Li-ion battery.	
Fuel Cells- Introduction, definition, construction, working and industrial applications of H_2 - O_2 fuel cell & methanol-oxygen fuel cell. Differences between battery and fuel cell.	
Green fuels:Power alcohol- introduction, advantages and disadvantages.	
Biodiesel- Introduction, synthesis, advantages, and disadvantages.	
E-waste management: Introduction, sources, types, effects of e-waste on environment and human health, methods of disposal, advantages of recycling, extraction of copper and gold from e-waste.	
MODULE– 4	10 hrs.

Surface Finishing (PCB preparation)

Introduction, technological importance of metal finishing. factors affecting the nature of electro deposit - metal ion concentration, current density, complexing agents, organic additives, p^H , temperature & throwing power.

Electroplating – Definition, electroplating process. Methods of cleaning the metal surfaces to be coated. Electroplating of Copper by cyanide bath method and electroplating of gold.

Electroless plating - Definition, distinction between electroplating and electroless plating, advantages of electroless plating. Electroless plating of Nickel and electroless plating of Copper in the manufacture of double-sided PCB.

Corrosion chemistry

Introduction, electrochemical theory of corrosion, types-differential metal, differential aeration (water line and pitting), factors affecting the nature of corrosion.

Corrosion control-galvanization, anodization and sacrificial anode method.

List of experiments/Activities**A – Demonstration (any two) offline/virtual:**

A1. Synthesis of polymer

A2. Synthesis of iron oxide nanoparticles

A3: Chemical Structure drawing using software: ChemDraw or ACD/ChemSketch

A4. Determination of chloride content in the given water sample by Argentometric method

B – Exercise (compulsorily any 4 to be conducted):

B1. Conductometric estimation of acid mixture

B2. Potentiometric estimation of FAS using $K_2Cr_2O_7$

B3. Determination of pK_a of vinegar using p^H sensor

B4. Determination of rate of corrosion of mild steel by weight loss method

B5. Estimation of total hardness of water by EDTA method

C – Structured Enquiry (compulsorily any 4 to be conducted):

C1. Estimation of Copper present in electroplating effluent by optical sensor

C2. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)

C3. Estimation of iron in TMT bar by diphenyl amine/external indicator method

C4. Estimation of Sodium present in soil/effluent sample using flame photometry

C5. Determination of Chemical Oxygen Demand (COD) of industrial waste water sample

D – Open Ended Experiments (any two):

D1: Evaluation of acid content in beverages by using pH sensors and simulation

D2. Estimation of copper in e-waste.

D3. Volumetric estimation of gypsum in Portland cement

11. D4. Searching suitable PDB file and target for molecular docking

TEXT BOOKS

1. Engineering Chemistry by M.M. Uppal, Khanna Publishers.
 2. A text Book of Engineering Chemistry- by P C Jain and Monica Jain, Dhanapatrai Publications, New Delhi.(2015 edition)
 3. A Text Book of Engineering Chemistry, R.V. Gadag and Nitthyananda Shetty, I.K. International Publishing house. 2nd Edition, 2016.
 4. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar., Subash Publications, Bangalore. 5th Edition, 2014.
- Expanding the Vision of Sensor Materials. National Research Council 1995, Washington, DC: The National Academies Press. doi: 10.17226/4782.

REFERENCE BOOKS

1. Principles of Physical Chemistry B.R.Puri, L.R.Sharma & M.S.Pathania, S.Nagin Chand & Co., (2008 edition).
 2. Industrial Chemistry by B.K.Sharma, GOEL Publishing House (2014 edition).
 3. Industrial Electrochemistry, Second Edition by Derek Pletcher & Frank C. Walsh publisher: Chapman & Hall, USA (1993 edition)X
 4. Corrosion Engineering, M.G. Fontana, N.D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.
 5. Instrumental Methods of Analysis, Dr. K. R. Mahadik and Dr. L. Sathiyarayanan.
 6. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4th Edition, 1999.
- Vogel's text book of quantitative inorganic analysis, revised by J. Bassett, R.C. Denny, G.H. Jeffery, 4th Ed.

Course Title	Computer Aided Engineering Drawing (CAED)		
Code	22CED13/23	LTPC	2-0-2-3
SEE Duration	3Hours	Hours/ Week	04
CIE (Theory Marks)	20	CIE (Practical/ Activity Marks)	30
SEE Marks	50	Total Hours	52

Course Objective: To introduce the students to “universal language of Engineers” for effective communication and perform drafting exercises of geometrical shapes, solids and machine elements in different systems of Projection using BIS/ISO standards and conventions with the aid of manual drafting and CAD package to effectively take-up the basic industrial/societal drawing needs.

Course Outcomes:

Upon completion of the course, students shall be able to;

COs	Statement	POs
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1	visualize geometrical solids in 3D space through exercises in orthographic projections	5, 10
2	develop the lateral surfaces of geometrical solids	
3	interpret isometric views and draw orthographic views of machine components and perspective projections	
4	visualize engineering components	

Course contents:

MODULE 1

14 Hours

Principles of orthographic Projections: Different planes of projection and views taking point as an example with explanation about distance of a point from planes of projections. Concept of true length and true inclination of a line (emphasis on practical problems).

Orthographic Projection of Planes: Projection of Planes by change of position method only (no combination of planes).

MODULE 2

18 Hours

Orthographic Projection of Solids: Front, top and profile views of geometric solids resting with their base completely on HP (no other positions).

Development of lateral surfaces: Introduction to section planes and section of regular solids, Parallel and Radial line methods.

MODULE 3

12 Hours

Isometric Projections: Isometric projections of geometric solids and simple machine components. Conversion of Isometric views into Orthographic views: Simple machine components.

MODULE 4

08 Hours

Multidisciplinary Applications & Practice

Basic building drawing (Plan and Elevation), 2D Electrical wiring and lighting drawing, 2D Electronic PCB drawings.

Graphs & Charts: (Only for CIE)

Column chart, Pie chart, Line charts, Gantt charts, etc. using Microsoft Excel or any suitable software.

Question Paper Pattern for Semester End Examination (SEE)

Q. No.	Module	Questions on	Sketching	CAD Printouts	Total
Part A (Answer Any Two)					
1	1	Projection of Planes	08	17	25
2	2	Projections of Solids (Polyhedra)	08	17	25
3	2	Projections of Solids (Solids of Revolution)	08	17	25
Part B (Answer Any Two)					
4	2	Development of lateral surfaces	07	18	25
5	3	Isometric projections of geometric solids	07	18	25
6	4	Multidisciplinary Applications & Practice	07	18	25

Total Marks	30	70	100
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TEXT BOOK:

1. Engineering Drawing: N.D.Bhatt &M.Panchal. 37th Edition 1996, Charotar Publishing House. Gujarat.

REFERENCES:

1. Engineering Drawing & Design: Cencil Jensen, Jay D. Helsel, Dennis R. Short, Seventh Edition, Tata McGraw-Hill 2012.
2. Engineering Drawing: K.R. Gopal Krishna, 24th Edition 1999 Subhash Publications, Bangalore.
3. Bhattacharya S. K., Electrical Engineering Drawing, New Age International publishers, second edition 1998, reprint 2005.
4. Chris Schroder, Printed Circuit Board Design using AutoCAD, Newness, 1997.
5. Nainan PKurian Design of foundation systems, Alpha Science International Ltd; 3rd edition, 2005.

Course Title		ENGINEERING MECHANICS	
Course Code	22CIV13/23	(L-T-P)C	(2-1-0)3
SEE duration	3 hour	Hours / Week	04
CIE (Theory) marks	30	CIE (Practicals)/Activity marks	20
SEE marks	50	Total contact hours	50
Course Objective: • To develop students' ability to analyze the problems involving forces, moments with their applications. • To make students to learn the effect of friction on different planes • To develop the student's ability to find out the centre of gravity and moment of inertia and their applications. Course Outcomes (COs): Upon completion of the course, students shall be able to			
Sl. No.	Course outcomes		Mapping to POs
1.	Compute the resultant of a force system and resolution of a force		1,2
2.	Comprehend the action for forces, moments, and other types of loads on rigid bodies and compute the reactive forces		1,2
3.	Analyse the frictional resistance offered by different planes and locate the centroid.		1,2

4.	Compute the moment of inertia of sections and analyse the bodies in motion	1,2
Course Contents:		
MODULE –1		12 Hrs.
Resultant of coplanar force system: Basic dimensions and units, Idealisations, Classification of force system, principle of transmissibility of a force, composition of forces, resolution of a force, Free body diagrams, moment, Principle of moments, couple, Resultant of coplanar concurrent force system, Resultant of coplanar non-concurrent force system, Numerical examples.		
MODULE –2		12 Hrs.
Equilibrium of coplanar force system: Equilibrium of coplanar concurrent force system, Lami's theorem, Equilibrium of coplanar parallel force system, types of beams, types of loadings, types of supports, Equilibrium of coplanar non-concurrent force system, support reactions of statically determinate beams subjected to various types of loads, Numerical examples.		
MODULE –3		12 Hrs.
Friction: Introduction, laws of Coulomb friction, equilibrium of blocks on horizontal plane, equilibrium of blocks on inclined plane, ladder friction, wedge friction Numerical examples. Centroid of Plane areas: Introduction, Locating the centroid of rectangle, triangle, circle, semicircle, quadrant and sector of a circle using method of integration, centroid of composite areas and simple built up sections, Numerical examples.		
MODULE – 4		14 hrs.
Moment of inertia of plane areas: Introduction, moment of inertia of plane lamina, polar moment of inertia, product of inertia, radius of gyration, parallel axes theorem, perpendicular axis theorem, moment of inertia of rectangular, triangular and circular areas from the method of integration, moment of inertia of composite areas and simple built up sections,, Numerical examples. Kinematics and Kinetics Linear motion: Introduction, Displacement, speed, velocity, acceleration, acceleration due to gravity, Numerical examples on linear motion. Projectiles: Introduction, numerical examples on projectiles. D 'Alembert's principle of dynamic equilibrium and its application in-plane motion and		

connected bodies including pulleys, Numerical examples.

Text Books :

1. I B Prasad, “A Textbook of Applied Mechanics Dynamics and Statics”, Khanna Publishers. New Delhi. ISBN No. 978-81-7409-068-1, 19th Edition, Eleventh Reprint 2016.
2. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 2015, Laxmi Publications.
3. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB

Reference Books:

1. Beer F.P. and Johnston E. R., Mechanics for Engineers, Statics and Dynamics, 1987, McGraw Hill.
2. Irving H. Shames, Engineering Mechanics, 2019, Prentice-Hall.
3. Hibbler R.C., Engineering Mechanics: Principles of Statics and Dynamics, 2017, Pearson Press.
4. Timoshenko S, Young D. H., Rao J. V., Engineering Mechanics, 5th Edition, 2017, Pearson Press.
5. Bhavikatti S S, Engineering Mechanics, 2019, New Age International
6. Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, 2011, BS publication.
7. Ramamrutham S: “Text book of Applied Mechanics”, Dhanpat Rai and Sons, New India. 1997.

Course Title		ELEMENTS OF MECHANICAL ENGINEERING	
Course Code	22EME13/23	(L-T-P)C	(3-0-0)3
SEE duration	3 hour	Hours / Week	03
CIE (Theory) marks	30	CIE (Practicals)/Activity marks	20
SEE marks	50	Total contact hours	39
Course Objective: To introduce fresh entrants of mechanical engineering course to the principles and fundamentals of Mechanical Engineering Course Outcomes (COs) {with mapping shown against the Program Outcomes (POs)} Upon completion of the course, students shall be able to:			
Sl No.	Course outcomes		Mapping to POs

1.	explain the purpose of mechanical engineering in industry and society, basics of steam, IC engines and electric vehicles	1, 2, 10
2.	Describe different power transmission systems, and concepts of engineering materials	1, 2, 10
3.	describe traditional manufacturing techniques and illustrate manufacturing components using Lathe, CNC, additive manufacturing, and joining processes	1, 10
4.	understand the basic principles of refrigeration and air-conditioning and mechatronics systems	1, 10
Course Contents:		
MODULE –1		10 Hrs.
Introduction to Mechanical Engineering (Overview) Role of Mechanical Engineers in Industries and Society - Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, Automation, Industry 4.0 and applications in Artificial Intelligence (AI) and Machine Learning (ML) Steam Formation and its properties: Steam formation, Types of steam, Steam properties and applications of steam, Simple numerical problems. IC Engines: Components and working principles, 4-stroke petrol and diesel engines, Applications of IC Engines, Performance of IC engines, Numerical problems on IP, BP, FP, Mechanical Efficiency.		
Activity: 1. Visit to any manufacturing/ aero/ auto industry or any power plant 2. Demonstration of working of IC engine 3. Various pollutants from the IC engine emission and effect on the environment		
MODULE –2		10 Hrs.
Engineering Materials: Classification of Engineering Materials, Composite materials - classification, need, properties, advantages, limitations, and applications. Power Transmission: Gears-spur gears, bevel gears, helical gears, worm gear sets, and rack and pinion, simple and compound gear trains, Belt drives (Flat and V-belt drive), Slip and creep in belt drives, V-belt drive, Velocity ratio, Simple numerical problems. Electric Vehicles: Working, Advantages and disadvantages, Components - Batteries, Chargers, Power devices, Drives and Transmission, Current status of EV vehicle technology in India.		
Activity: 1. Demonstration on tensile testing using UTM 2. Demonstration of power transmission devices 3. Comparison of electric and hybrid vehicles		
MODULE –3		10 Hrs.

Conventional Machining Processes: Introduction, Differences between conventional and non-conventional machining processes. Machine Tool Operations: Lathe: Principle of working of a center lathe, lathe operations - Turning, facing, thread cutting, taper turning by swiveling the compound rest. Drilling Machine: Working principle of simple drilling machine, drilling operations: drilling, boring, reaming, tapping. Milling machine: Working principle of simple milling machine, milling operations: up milling and down milling. (No sketches of machine tools, sketches to be used only for explaining operations) Joining Processes: Basic principle of welding, working principle of Electric Arc-welding and Gas welding and flames, Brazing, and soldering with applications.			
Activity: 1. Demonstration of lathe/ milling/ drilling operations 2. Demonstration of welding operation			
MODULE – 4			10 hrs.
Refrigeration and Air Conditioning: Principle of refrigeration, Refrigerants and their desirable properties, Working principle of VCR refrigeration system, Working principle of room/ window type air conditioner and Applications of air conditioners. Introduction to Advanced Manufacturing Systems: Introduction, Components of CNC, advantages and applications of CNC, Additive Manufacturing. Introduction to Mechatronics: Measurement system, Elements of measurement system, Open-loop and closed loop control systems, Advantages, disadvantages and applications of Mechatronics.			
Activity: 1. Demonstration of working of refrigerator 2. Visit to air conditioning unit 3. Demonstration of CNC operations and 3D printing			
TEXTBOOK: 1. Elements of Mechanical Engineering, K R Gopala Krishna, Subhash Publications, 2008 2. Elements of Workshop Technology (Vol. 1 and 2), Hazra Choudhry and Nirzar Roy, Media Promoters and Publishers Pvt. Ltd., 2010. REFERENCES: 1. An Introduction to Mechanical Engineering, Jonathan Wickert, 2nd edition, Cengage Learning 2006, ISBN-10: 1-111-57682 2. Elements of Mechanical Engineering - K P Roy, S K H Choudhry, A K H Choudhry, Roy Media promoters and publishers, Mumbai, 7th edition, ISBN: 4567145216, 1234567145210. 3. Electric and Hybrid vehicles by A. K. Babu Khanna Publications 4. Introduction to Mechatronics, AppuuKuttan K K, Oxford University Press, 2007.			

Course Title	BASIC ELECTRONICS		
Course Code	22BEE13/23	(L-T-P) C	(3-0-0)

			3
SEE duration	3 hours	Hours / Week	03
CIE (Theory) marks	30	Activity marks	20
SEE marks	50	Total contact hours	40
Course Objective: The objective of the course is to equip students with a basic foundation in electronic engineering required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communications systems.			
Course Outcomes (COs): Upon completion of the course, students shall be able to			
Sl. No.	Course outcomes	Mapping to POs	
1.	Develop the basic knowledge on construction, operation and characteristics of semiconductor devices.	1,2	
2.	Apply the acquired knowledge to construct small scale circuits consisting of semiconductor devices.	1,2, 5, 9	
3.	Develop competence knowledge to construct basic digital circuit by making use of basic gate and its function.	1, 5, 9	
4.	Apply the knowledge of various transducers for basic communications system.	1,2	
Course Contents:			
MODULE –1			10 Hrs.
Semiconductor Diodes: Introduction, PN Junction diode, Characteristics and Parameters, Diode Approximations, DC Load Line analysis (Text 1:2.1,2.2,2.3,2.4) Diode Applications: Introduction, Half Wave Rectification, Full Wave Rectification, Full Wave Center tapped and bridge Rectifier Power Supply: Capacitor Filter Circuit, RC π Filter (includes numerical) (Text 1:3.1,3.2,3.4,3.5) Zener Diodes: Junction Breakdown, Circuit Symbol and Package, Characteristics and Parameters, Equivalent Circuit, Zener Diode Voltage Regulator. (Text 1:2.9,3.7)			
MODULE –2			10 Hrs.

Bipolar Junction Transistors: Introduction, BJT Voltages & Currents, BJT Amplification, Common Base Characteristics, Common Emitter Characteristics, Common Collector Characteristics, BJT Biasing: Introduction, DC Load line and Bias point - Self bias, fixed bias and voltage divider bias (Text1:4.2,4.3,4.5,4.6, 4.7, 5.1, 5.2, 5.3, 5.4) Field Effect Transistor: Junction Field Effect Transistor, JFET Characteristics, MOSFETs: Enhancement MOSFETs, Depletion Enhancement MOSFETs (Text1:9.1,9.2,9.5)			
MODULE – 3			10 Hrs.
Operational Amplifiers: Introduction, The Operational Amplifier, Block Diagram Representation of Typical Op-Amp, Schematic Symbol, Op-Amp parameters - Gain, input resistance, Output resistance, CMRR, slew rate, Bandwidth, input offset voltage, Input bias Current and Input offset Current, The Ideal Op-Amp, Equivalent Circuit of Op-Amp, Open Loop Op-Amp configurations, Differential Amplifier, Inverting & Non-Inverting Amplifier. Op-Amp Applications: Inverting Configuration, Non-Inverting Configuration, Differential Configuration, Voltage Follower, Integrator, Differentiator, Summer and subtractor (Text2:1.1,1.2,1.3,1.5,2.2,2.3,2.4,2.6,6.5.1,6.5.2,6.5.3, 6.12, 6.13).			
MODULE – 4			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. Digital Logic Gates (Text3:1.2, 1.3,1.4,1.5,2.1,2.2,2.3,2.4,2.5,2.6,2.7) Combinational logic: Introduction, Design procedure, Adders - Half adder, Full adder (Text3:4.1,4.2,4.3)			
Introduction to Transducers: Introduction, Resistive Transducers, Piezoelectric transducers (Text4: Chapter 18:18.1,18.6) Communications: Introduction to communication, Communication System, Modulation - AM and FM (Textbook 5:1.1,1.2,1.3, 3.1, 5.1)			
List of Activities			
Activity Number	Activity Name	Description	Marks
1	Analog Circuit design and implementation using open source Simulator	- Use Multisim Live Circuit Simulator (Online Simulation) - A group of 3 students should solve assigned experiment - Demonstration of the circuit with results	10

2	Digital Circuit design and implementation using open-source Simulator	• Use Multisim Live Circuit Simulator (Online Simulation) • A group of 3 students should solve assigned experiment • Demonstration of the circuit with results	10
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Activity 1 Details:

Following are the experiments list of analog circuit design and implementation using open-source simulator.

1. For a mobile charger design a zener voltage regulator that takes ripple DC voltage produced by bridge rectifier circuit and delivers a DC regulated supply of 5 V, 5 mA across load resistor.
2. Construct an audio amplifier which takes 20 mV audio signal and delivers 2 V output signal to a loudspeaker inside a radio system.
3. Construct a sinusoidal wave generator circuit using crystal oscillator to generate an audio signal frequency of 2 kHz.
4. Design an inverting amplifier to have a voltage gain of 50 and the output voltage amplitude is to be 2.5 V.
5. A direct-coupled noninverting amplifier with a ± 25 mV input is to produce a ± 5 V output. Design the circuit with suitable resistance values.
6. Design a bridge full wave rectifier circuit to produce 12 V unregulated DC voltage using a capacitor filter used in an electric vehicle charger circuit.
7. The difference of two input signals is to be amplified by a factor of 20. Design the circuit with suitable resistance values.
8. Design a three-input inverting summing amplifier circuit and show how it can be converted into an averaging circuit.

Activity 2 Details:

Following are the experiments list of circuit design and implementation using open source simulator.

1. Realization of Boolean expressions using basic gates.
2. Realization of half adder circuit.
3. Realization of full adder circuit.
4. Realization of 4-bit parallel adder.
5. Realization of SR and D flip flops.
6. Realization of JK and T flip flop.
7. Conversion of JK flip flop into D flip flop.
8. Realization of 4 x 2 encoder and 2 x 4 decoder.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Electronic Devices and Circuits, David A Bell, 5th Edition, Oxford, 2016
2. Op-amps and Linear Integrated Circuits, Ramakanth A Gayakwad, Pearson Education, 4th Edition
3. Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203-0417-8

4. Electronic Instrumentation and Measurements (3rd Edition) – David A. Bell, Oxford University Press, 2013
 Electronic Communication Systems, George Kennedy, 4th Edition, TMH

Weblinks and Video Lectures (e-Resources):

- <https://nptel.ac.in/courses/122106025>
- <https://nptel.ac.in/courses/108105132>
- <https://nptel.ac.in/courses/117104072>

Course Title		ELEMENTS OF ELECTRICAL ENGINEERING	
Course Code	22EEE13/23	(L-T-P)C	(2-1-0)3
SEE duration	3 Hours	Hours / Week	03
CIE (Theory) marks	30	CIE (Practicals)/Activity marks	20
SEE marks	50	Total Contact Hours	40
Course Objective: The student will acquire basic knowledge of electrical circuits, electromagnetism, protective devices and electric tariffs.			
Course Outcomes (COs): Upon completion of the course, students shall be able to			
Sl. No.	Course outcomes		Mapping to POs
1.	Describe the basic laws used in the electromagnetism and DC circuits.		1, 2
2.	Apply the fundamentals of single phase and three phase AC circuits and perform related calculations.		1, 2
3.	Explain the concept of domestic wiring and Electrical safety measures		1, 2
4.	Analyse the power rating of household appliances and electricity billing		1, 2
Course Contents:			
MODULE –1			10 Hrs.

Electrical Energy: Significance of electrical energy, sources of energy, Conventional and renewable energy sources. Electromagnetism: Faraday's Laws of Electromagnetic Induction, Lenz's Law, Flemings rules, statically and dynamically induced EMF; concepts of self and mutual inductance. Coefficient of Coupling. Energy stored in magnetic field. Simple Numerical problems. DC circuits: Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits, Power and energy. Maxwells loop and node equations. Self-learning topics: Simple applications electromagnetic induction, self and mutual inductances	
MODULE –2	10 Hrs.
Single-phase AC circuits: Generation of sinusoidal voltage, frequency of generated voltage, average value, RMS value, form factor and peak factor of sinusoidal voltage and currents. Phasor representation of alternating quantities. Analysis of R, L, C, R-L, R-C and R-L-C circuits with phasor diagrams, Real power, reactive power, apparent power, and Power factor. Series, Parallel and Series-Parallel circuits. Simple Numerical problems. Self-learning topics: Measurement of Voltage, current, power and power factor in single phase AC system	
MODULE –3	10 Hrs.
Three-phase AC circuits: Necessity and advantage of 3-phase system. Generation of 3-phase power. Definition of phase sequence. Balanced supply and balanced load. Relationship between line and phase values of balanced star and delta connections. Power in balanced 3-phase circuits. Measurement of 3-phase power by 2-wattmeter method. Simple Numerical. Self-learning topics: Measurement of Voltage, current, power and power factor in three phase AC systems	
MODULE – 4	10 hrs.
Domestic Wiring: Requirements, Types of wiring, Two way and three way control. General types of wires and cables. Specifications of wires used for domestic wiring and their selection. Electrical Safety measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits, Electric Shock, General concept of Earthing, Types of earthing, Safety Precautions to avoid shock, Residual Current Circuit Breaker (RCCB) and Earth Leakage Circuit Breaker (ELCB). General types of wires and cables and selection Electricity bill: Power rating of household appliances like lights, fans, Air Conditioners, Personal Computers etc. Definition of “unit” used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.	
<u>Text Books :</u> 1. Rajendra Prasad, Fundamentals of Electrical Engineering, Prentice-Hall of India Pvt. Ltd.,	

ISBN: 81-203-2729-2, 2005.

Reference Books:

1. D. C. Kulshreshtha, *Basic Electrical Engineering*, McGraw Hill, 2nd edition, 2019
2. E. Hughes, *Electrical and Electronics Technology*, Pearson 2010
3. D.P. Kothari, I.J. Nagrath, *Basic Electrical Engineering*, McGraw Hill Education, 4th Ed., 2019

COMMUNICATIVE ENGLISH

Course Title:		Communicative English	
Course Code:		CIE Marks	50
		SEE marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: C)		1:0:0:1	Exam Hours 3 hours
Total Hours of Pedagogy		15 hours	Credits 01
CO1	Understand and apply the Fundamentals of Communication Skills in their communication skills.		
CO2	Identify the nuances of phonetics, intonation and enhance pronunciation skills.		
CO3	To impart basic English grammar and essentials of language skills as per present requirement.		
CO4	Understand and use all types of English vocabulary and language proficiency.		
CO5	Adopt the Techniques of Information Transfer through presentation.		
Course objectives: The course Communicative English (22ENG16) will enable the students, 1. To know about Fundamentals of Communicative English and Communication Skills ingeneral. 2. To train to identify the nuances of phonetics, intonation and enhance pronunciation skills for better Communicationskills. 3. To impart basic English grammar and essentials of important languageskills. 4. To enhance with English vocabulary and language proficiency for better communicationskills. 5. To learn about Techniques of Information Transfer throughpresentation.			
Teaching-Learning Process : These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective: Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools and software’s to meet the present requirements of the Global employment market. (i) Direct instructional method (Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation based learning, (v) Personalized learning, (vi) Problems based learning through discussion, (vii) Following the method of expeditionary learning Tools and techniques, (viii) Use of			

audio visual methods through language Labs in teaching of of LSRW skills. Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills in teaching of communicative skills in general.	
Language Lab :To augment LSRW, grammar and Vocabulary skills (Listening, Speaking, Reading, Writing and Grammar, Vocabulary) through tests, activities, exercises etc., comprehensive web-based learning and assessment systems can be referred as per the AICTE / VTU guidelines.	
Module-1	(04 hours)
Introduction to Communicative English :Communicative English, Fundamentals of Communicative English, Process of Communication, Barriers to Effective Communicative English, Different styles and levels in Communicative English. Interpersonal and Intrapersonal Communication Skills.	
Module-2	(04 hours)
Introduction to Phonetics :Phonetic Transcription, English Pronunciation, Pronunciation Guidelines to consonants and vowels, Sounds Mispronounced, Silent and Non silent Letters, Syllables and Structure. Word Accent, Stress Shift and Intonation, Spelling Rules and Words often Misspelt. Common Errors in Pronunciation.	
Module-3	(04hours)
Basic English Communicative Grammar and Vocabulary PART - I :Grammar: Basic English Grammar and Parts of Speech, Articles and Preposition. Question Tags, One Word Substitutes, Strong and Weak forms of words, Introduction to Vocabulary, All Types of Vocabulary – Exercises on it.	
Module-4	(04 hours)
Basic English Communicative Grammar and Vocabulary PART - II:Words formation - Prefixes and Suffixes, Contractions and Abbreviations. Word Pairs (Minimal Pairs) – Exercises, Tense and Types of tenses, The Sequence of Tenses (Rules in use of Tenses) and Exercises on it. Communication Skills for Employment :Information Transfer:Oral Presentation and its Practice. Difference between Extempore/Public Speaking, Communication Guidelines. Mother Tongue Influence (MTI), Various Techniques for Neutralization of Mother Tongue Influence. Reading and Listening Comprehensions – Exercises	
Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18	

marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation(CIE):

Two Unit Tests each of 30 Marks (duration 01 hour)

- First test after the completion of 30-40 % of the syllabus
- Second test after completion of 80-90% of the syllabus

One Improvement test before the closing of the academic term may be conducted if necessary. However, best two tests out of three shall be taken into consideration

Two assignments each of 20 Marks

The teacher has to plan the assignments and get them completed by the students well before the closing of the term so that marks entry in the examination portal shall be done in time. Formative (Successive) Assessments include Assignments/Quizzes/Seminars/ Course projects/Field surveys/ Case studies/ Hands-on practice (experiments)/Group Discussions/ others.. The Teachers shall choose the types of assignments depending on the requirement of the course and plan to attain the Cos and POs. (to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). CIE methods /test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The sum of two tests, two assignments, will be out of 100 marks and will be scaled down to 50 marks

Semester End Examinations (SEE)

SEE paper shall be set for **50 questions, each of the 01 mark**. The pattern of the **question paper is MCQ** (multiple choice questions). The time allotted for SEE is **01 hour**. The student must secure a minimum of 35% of the maximum marks for SEE.

Suggested Learning Resources:

Textbook:

- 1) **Communication Skills** by Sanjay Kumar & Pushp Lata, Oxford University Press India Pvt Ltd -2019.
- 2) **A Textbook of English Language Communication Skills**, (ISBN-978-81-955465-2-7), Published by Infinite Learning Solutions, Bengaluru -2022.

Reference Books:

1. **Technical Communication** by Gajendra Singh Chauhan and Et al, (ISBN-978-93-5350-050-4), Cengage Learning India Pvt Limited [Latest Revised Edition] -2019.
2. **English for Engineers** by N.P.Sudharshana and C.Savitha, Cambridge University Press – 2018.
3. **English Language Communication Skills – Lab Manual cum Workbook**, Cengage Learning India Pvt Limited [Latest Revised Edition] – (ISBN-978-93-86668-45-5), 2019.
4. **A Course in Technical English – D Praveen Sam, KN Shoba**, Cambridge University Press –2020.
5. **Practical English Usage** by Michael Swan, Oxford University Press –2016.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Contents related activities (Activity-based discussions)
- For active participation of students instruct the students to prepare Flowcharts and Handouts
- Organising Group wise discussions Connecting to placement activities
- Quizzes and Discussions, Seminars and assignments

INDIAN CONSTITUTION

Course Title:	Indian Constitution		
Course Code:	22ICO17 / 27	CIE Marks	50
		SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	3 hours
Total Hours of Pedagogy	15 hours	Credits	01

Course objectives :

The course **INDIAN CONSTITUTION (22ICO17 / 27)** will enable the students,

1. To know about the basic structure of Indian Constitution.
2. To know the Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's) of our constitution.
3. To know about our Union Government, political structure & codes, procedures.
4. To know the State Executive & Elections system of India.
5. To learn the Amendments and Emergency Provisions, other important provisions given by the constitution.

Course outcome (Course Skill Set)

At the end of the course 22ICO17/27 the student will be able to:

CO1	Analyse the basic structure of Indian Constitution.
CO2	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.
CO3	know about our Union Government, political structure & codes, procedures.
CO4	Understand our State Executive & Elections system of India.
CO5	Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective: Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools.

- (i) Direct instructional method (Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools),
- (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation based learning, (v) Personalized learning, (vi) Problems based learning through discussion.
- (ii)** Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills.

Module-1	(04 hours)
Indian Constitution: Necessity of the Constitution, Societies before and after the Constitution adoption. Introduction to the Indian constitution, Making of the Constitution, Role of the Constituent Assembly.	
Module-2	(04 hours)
Salient features of India Constitution. Preamble of Indian Constitution & Key concepts of the Preamble. Fundamental Rights (FR's) and its Restriction and limitations in different Complex Situations. building.	
Module-3	(04 hours)
Directive Principles of State Policy (DPSP's) and its present relevance in Indian society. Fundamental Duties and its Scope and significance in Nation, Union Executive : Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet.	
Module-4	(04 hours)
Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Judicial System of India, Supreme Court of India and other Courts, Judicial Reviews and Judicial Activism. State Executive and Governor, CM, State Cabinet, Legislature - VS & VP, Election Commission, Elections & Electoral Process. Amendment to Constitution, and Important Constitutional Amendments till today. Emergency Provisions.	
Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together. Continuous Internal Evaluation(CIE): Two Unit Tests each of 30 Marks (duration 01 hour) • First test after the completion of 30-40 % of the syllabus • Second test after completion of 80-90% of the syllabus One Improvement test before the closing of the academic term may be conducted if necessary. However, best two tests out of three shall be taken into consideration Two assignments each of 20 Marks The teacher has to plan the assignments and get them completed by the students well before the closing of the term so that marks entry in the examination portal shall be done in time. Formative (Successive) Assessments include Assignments/Quizzes/Seminars/ Course projects/Field surveys/ Case studies/ Hands-on practice (experiments)/Group Discussions/ others.. The Teachers shall choose the types of assignments depending on the requirement of the course and plan to attain the Cos and POs. (to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). CIE methods /test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for	

thecourse.

The sum of two tests, two assignments, will be out of 100 marks and will be scaled down to 50 marks

Semester End Examinations (SEE)

SEE paper shall be set for **50 questions, each of the 01 mark**. The pattern of the **question paper is MCQ** (multiple choice questions). The time allotted for SEE is **01 hour**. The student must secure a minimum of 35% of the maximum marks for SEE.

Suggested Learning Resources:

Textbook:

1. **“Constitution of India” (for Competitive Exams)** - Published by NaidhruvaEdutech Learning Solutions, Bengaluru. –2022.
2. **“Introduction to the Constitution of India”,** (Students Edition.) by Durga Das Basu (**DD Basu**): Prentice –Hall,2008.

Reference Books:

1. **“Constitution of India, Professional Ethics and Human Rights”** by Shubham Singles, Charles E. Haries, and et al: published by Cengage Learning India, Latest Edition – 2019.
2. **“The Constitution of India”** by Merunandan K B: published by Merugu Publication, Second Edition, Bengaluru.
3. **“Samvidhana Odu” - for Students & Youths by Justice HN Nagamohan Dhas, Sahayana, kerekon.**

M.Govindarajan, S.Natarajan, V.S.Senthilkumar, **“Engineering Ethics”,** Prentice –Hall,2004.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- ☐ Contents related activities (Activity-based discussions)
- ☐ For active participation of students instruct the students to prepare Flowcharts and Handouts
- ☐ Organising Group wise discussions Connecting to placement activities
- ☐ Quizzes and Discussions

Seminars and assignments

SAMSKRUTHIKA KANNADA

Course Code:22KSK17/2727 (L-T-P)C: (1-0-0)1

Total Hours: 30

CIE :50

Hours/Week: 1

SEE: 50

At the end of course, student will be able to

#	Course outcomes	Mapping to PO's	Mapping to PSO's
1.	Understand Government order letters	P10	-
2.	Write Government order letters	P10	-

Chapter No.	Contents
1.	Kannada bashe – samkshipthavivarane (Brief Description of Kannada Language)
2.	Basha prayogadallaguvalopadoshagalumattuavugulanivaarane (Imperfections in language usage and their remedies)
3.	Lekhanachinhegalumattuavugalaupayoga (Punctuation marks and their use)
4.	Patra vyavahaara (Letter correspondences)
5.	Aadalithapatragalu (Letters of Administration)
6.	Sarakaradaaadeshapatragalu (Government order letters)
7.	Samkshipthaprabhandarachane, prabhandamattubashaantra (precise writing, essays and translation)
8.	Kannada shabdhasanghrraha (Kannada vocabulary)
9.	Computer haagumaahithitantrajana (Computer and Information Technology)
10.	Paaribhashikaaadalithakannadapadagalumattutaantrika/computer paaribhashikapadagalu (Kannada words for administration and computer technology)

BALAKE KANNADA (KANNADA FOR CONVERSATION)

Course Code: 22KBK17/27 (L-T-P)C: (1-0-0)1

Total Hours: 30

CIE :100

Hours/Week: 2

SEE: 50

Course Learning Objectives:

At the end of course student will be able to

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Understand Kannada language	P10	-
2.	Communicate (converse) in Kannada language	P10	-

Chapter No.	Contents
1.	Vyavaharika Kannada – Parichaya (Introduction to Vyavaharika Kannada)
2.	Kannada Aksharamalehaaguuchcharane (Kannada Alphabets and Pronunciation)
3.	Sambhashanegaagi Kannada Padagalu (Kannada Vocabulary for Communication)
4.	Kannada in Conversations (Sambhashaneyalli Kannada)
5.	Activities in Kannada. (Kannada SambhashanegaagiChatuvatikegalu)

University Guidelines for CIE Procedure:

- CIE Marks in Vyavaharika Kannada and Aadalita Kannada shall be the sum of marks prescribed for tests and assignments. Marks prescribed for tests shall be 75 and that for the assessments be 25.
- The CIE marks awarded for the tests shall be based on three tests generally conducted at the end of fifth, tenth and fifteenth week of each semester. Each test shall be conducted for a maximum of 25 marks and the final CIE marks shall be the sum of the marks of all the three tests.
- The remaining 25 marks shall be awarded based on the evaluation of assignments/unit tests/written quizzes that supports to communication skills as per Bloom's Revised Taxonomy and Course/programme outcomes.
- Final marks awarded shall be the sum of (ii) and (iii) for a maximum of 100 marks.
- The candidates shall write the test in Blue Books and also assignments/unit-tests/written quizzes in Blue Books/Notes which shall be preserved by the Principal/Head of the Department for at least six months after the announcement of University results and shall be made available for verification at the direction of the Registrar (Evaluation).

INNOVATION AND DESIGN THINKING

CourseTitle	INNOVATION AND DESIGN THINKING		
CourseCode	22IDT18/28	(L-T-P)C	(0-0-2)3
SEE duration	3hour	Class Hours/Week	02
CIE (Theory) marks	20	Activity marks	30
SEE marks	50	Total class hours	20
CourseObjective: The objective of this Course is to provide the new ways of creative thinking and learn the innovation cycle of Design Thinking process for developing innovative products and services which useful for a student in preparing for an engineering career. CourseOutcomes(COs): Upon completion of the course, students shall be able to			

Sl. No.	Courseoutcomes	Mapping to POs
1.	Analyze emotional experience and expressions to better understand stakeholders while designing innovative products through group brainstorming sessions.	PO6 & PO9
2.	Develop new ways of creative thinking and learn the innovation cycle of Design Thinking process for developing any innovative products	PO9 & PO12
CourseContents:		
Syllabus / Course Contents		20Hrs.
Basics of Design Thinking: Definition of Design Thinking, Need for Design Thinking, history of Design Thinking, Concepts & Brainstorming, Stages of Design Thinking Process (explain with examples) – Empathize, Define, Ideate, Prototype, Test. Prototyping & Testing in AICTE IDEA LAB: What is Prototype? Why Prototype? Rapid Prototype Development process; 3D printing, Laser Cutter, CNC wood router, PCB Prototyping machine. Testing; Sample Example, advanced CNC facilities for prototyping. Integrating 17 Sustainable development goals (SDG) during design a product or service.		
Course Contents 1. Empathize with a given situation and develop a customer journey map to identify real world problems. 2. Analyze the problem using Customer journey map. 3. Brainstorming to define the result of analysis of the problem using the above steps. 4. Ideate the result of a customer journey map. 5. Prototype the given idea in the AICTE IDEA LAB. 6. Test the developed prototype using the available methods in AICTE IDEA LAB. 7. Open ended activity/experiment.		
<u>Text Books:</u> Karmin Design Thinking by Dr. BalaRamadurai, Mudranik Technology Private Ltd. ISBN 978-93-5419-010-0.		

SCIENTIFIC FOUNDATIONS OF HEALTH & PHYSICAL EDUCATION

CourseTitle:	SCIENTIFIC FOUNDATIONS OF HEALTH & PHYSICAL EDUCATION		
CourseCode:	22SFH18/28	CIEMarks	50
CourseType(Practical)	Practical	SEEMarks	50
		TotalMarks	100
TeachingHours/Week(L:T:P:S)	0:0:1:0	ExamHours	02 hours Practical
TotalHoursofPedagogy/physical activity	30 hours	Credits	01

Courseobjectives-

To improve the student's physical and mental health

Course out come

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

1. Describe Health, wellness&itsbalanceforpositive mindset.(PO1)
2. Adopt healthylifestylesfor goodhealth and betterfuture.(PO1)
3. Demonstrate physical activity (PO1, PO9)

Module-1

(3hoursofPedagogy)

GoodHealth&It'sbalanceforpositivemindset:Health-

ImportanceofHealth,InfluencingfactorsofHealth,Healthbeliefs,Advantagesofgoodhealth,Health&Behavior,Health&Society,Health&family,Health&Personality,Psychologicaldisorders-Methodsto improve good psychologicalhealth,Changinghealthhabits forgood health.

Module-2

(3hoursofPedagogy)

Buildingofhealthylifestylesforbetterfuture: Developinghealthydietforgoodhealth,Food&health,Nutritional guidelinesforgoodhealth,Obesity&overweightdisordersanditsmanagement,Eatingdisorders,Fitnesscomponentsfor health,Wellnessandphysicalfunction, Howtoavoidexerciseinjuries.

Physical Education Practical classe(24hours of Practical)		
Sl. No	Name of the Game	Name of the Skills
1.	Shuttle badminton	Service
		Smash
		Receive
		Drop Shot
		Foot work
2.	Basket ball	Dribbling
		Shooting
		Ten ley shoot
		Defensive slide
		Passing
3.	Foot Ball	Dribbling
		Chest drop
		Ball control
		Thigh drop
		Shooting

Physical Education Practical classe(24hours of Practical)		
Sl. No	Name of the Game	Name of the Skills
4.	Table tennis	Service
		Fore hand receive
		Back hand receive
		Smash
		Rally
5.	Volley ball	Attack
		Block
		Service
		Upper hand pass
		Under hand pass
6.	Ball badminton	Service
		Fore hand receive
		Back hand receive
		Spin Smash
		Striate Smash
7.	Throw ball	Spin Pass
		Jump Throw
		Service
		Receive
		Simple pass
8.	Kho- Kho	Giving Kho
		Single chain
		Pole dive
		Pole turning
		3 – 6 Up
9.	Kabaddi	Hand Touch
		Chain Hold

Physical Education Practical class(24hours of Practical)		
Sl. No	Name of the Game	Name of the Skills
		Ankle Hold
		Thigh Hold
		Bonus
10.	Hand ball	Step with ball
		Shoot
		Pass
		Block
		Dribbling

AssessmentDetails(bothCIEandSEE):

CIE Theory -20 Marks (Multiply Choice Questions - 20 marks)

CIE Practical -30 Marks (Physical activity, Performance and Attendance)

SEE Practical -50 Marks (Skill test-20 marks, Game performance-20 marks, and Event viva -10 marks)

Evaluation method	Assessment Tool	Maximum Marks	Minimum marks to be obtained
CIE	Multiple Choice Questions	20	8
	Performance and Attendance Criteria	30	12
SEE	Skill Examination	20	20
	Game Performance Examination	20	
	Viva -Voce	10	
Total Marks		100	40

ENGINEERING SCIENCE COURSES (ESC)

1.INTRODUCTION TO CIVIL ENGINEERING

Course Title	INTRODUCTION TO CIVIL ENGINEERING		
Course Code	22CIV141/241	(L-T-P)C	(2-1-0)1
SEE duration	3 hour	Hours / Week	04
CIE (Theory) marks	30	CIE (Practicals)/Activity marks	20
SEE marks	50	Total contact hours	50
Course Objective: • To make students learn the scope of various specializations of civil engineering. • To make students learn the concepts of sustainable infrastructure • To develop students’ ability to analyze the problems involving forces, moments with their applications. • To develop the student’s ability to find out the center of gravity and their applications. • To make the students learn about kinematics. • To make students learn the scope of Transportation Engineering in Civil Engineering			
Course Outcomes (COs): Upon completion of the course, students shall be able to			
Sl. No.	Course outcomes		Mapping to POs
1.	Compute the resultant of a force system and resolution of a force		1,2
2.	Comprehend the action for forces, moments, and other types of loads on rigid bodies and compute the reactive forces		1,2
3.	Analyse the frictional resistance offered by different planes and locate the centroid.		1,2
4.	Comprehend the importance of Transportation Engineering		1,2
Course Contents:			
MODULE –1			12 Hrs.

Civil Engineering Disciplines and Building Science Introduction to Civil Engineering: Surveying, Structural Engineering, Geotechnical Engineering, Hydraulics & Water Resources, Environmental Engineering, Construction planning & Project management. Basic Materials of Construction: Bricks, Cement & mortars, Plain, Reinforced & Pre-stressed Concrete, Structural steel, Construction Chemicals. Precast construction, Glass Fiber Reinforced Polymer. Structural elements of a building: foundation, plinth, lintel, chejja, Masonry wall, column, beam, slab and staircase	
MODULE –2	12 Hrs.
Societal and Global Impact of Infrastructure Infrastructure: Introduction to sustainable development goals, Smart city concept, clean city concept, Safe city concept Environment: Water Supply and Sanitary systems, urban air pollution management, Solid waste management, identification of Landfill sites, urban flood control Built-environment: Energy efficient buildings, recycling, Temperature and Sound control in buildings, Security systems; Smart buildings.	
MODULE –3	12 Hrs.
Analysis of force systems: Concept of idealization, system of forces, principles of superposition 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 Centroid: Importance of centroid and centre of gravity, methods of determining the centroid, locating the centroid of plane laminae from first principles, centroid of built-up sections. Numerical examples	
MODULE – 4	14 hrs.
Transportation Engineering: Importance of Transportation: Modes of transportation, Comparison with other modes, Different road patterns-Planning surveys. Importance-Controlling factors- Surface Characteristics-Cross Sectional elements, Camber, Sight distances, Horizontal and vertical alignment. Pavement Materials: Introduction, Soil, Road Aggregates and Bitumen.	

Concept of Green Construction, Carbon credits, recycled materials, Sustainable Construction.

Text Books :

4. I B Prasad, “A Textbook of Applied Mechanics Dynamics and Statics”, Khanna Publishers. New Delhi. ISBN No. 978-81-7409-068-1, 19th Edition, Eleventh Reprint 2016.
5. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 2015, Laxmi Publications.
6. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB

Reference Books:

8. Beer F.P. and Johnston E. R., Mechanics for Engineers, Statics and Dynamics, 1987, McGraw Hill.
9. Irving H. Shames, Engineering Mechanics, 2019, Prentice-Hall.
10. Hibbeler R.C., Engineering Mechanics: Principles of Statics and Dynamics, 2017, Pearson Press.
11. Timoshenko S, Young D. H., Rao J. V., Engineering Mechanics, 5th Edition, 2017, Pearson Press.
12. Bhavikatti S S, Engineering Mechanics, 2019, New Age International
13. Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, 2011, BS publication

2. INTRODUCTION TO ELECTRICAL ENGINEERING

Course Title	INTRODUCTION TO ELECTRICAL ENGINEERING		
Course Code	22ESC142	(L-T-P) C	(3-0-0) 3
SEE duration	3 Hours	Hours / Week	03
CIE (Theory) marks	30	Activity marks	20
SEE marks	50	Total Contact Hours	40

Course Objective: The student will acquire basic knowledge of electrical power systems, protective devices, electric circuits, measuring systems and machines.

Course Outcomes (COs): Upon completion of the course, students shall be able to

Sl. No.	Course outcomes	Mapping to POs
1.	Explain the basic concepts of electrical generation, transmission, distribution and basic electrical protection devices.	1, 2
2.	Describe the basic principle and construction of analog and digital measuring instruments.	1, 2
3.	Apply the basic concepts of electrical machines.	1, 2
4.	Analyze the fundamentals of single phase and three phase AC circuits and perform related calculations.	1, 2

Course Contents:

MODULE –1	8 Hrs.
Electric Energy systems: Significance of electrical energy, sources of energy (Conventional/renewable), Single line/block diagram representation of a typical power system. Brief introduction to the electrical generation, transmission and distribution subsystems indicating typical voltage levels. General concept of earthing, types of earthing, introduction to protective devices- Fuses, MCB, ELCB, MCCB, General types of wires and cables and selection, Electrical Tariff, Elementary calculation of energy consumption. Self-learning topics: General safety precautions in handling electrical appliances.	
MODULE –2	12 Hrs.
AC systems: Generation of single/three phase voltages, Instantaneous/average/rms values. Definition of impedance, admittance, real power, reactive power, apparent power and power factor. Analysis of series R-L, R-C, R-L-C circuits, phasor diagrams. Illustrative examples involving series and parallel circuits. Three phase systems: Star-Delta connection – calculation of voltage, current and power in a balanced three phase Star-Delta system. Self-learning topics: Measurement of Voltage, current, power and power factor in single phase and three phase AC system.	
MODULE –3	10 Hrs.

Electromechanical / Digital Instruments: Construction, working and principle of operation of Dynamometer type wattmeter. Digital meters, Merits and demerits of digital meters over analog meters, digital multimeter and digital voltmeter. Electrical Machines: Specifications of machines, classification of machines, DC machines - Constructional features, working principle of generator, EMF equation, Working principle of motor, Torque equation, Types of motors and their Voltage & Current relations, applications, Illustrative examples. Self-learning topics: Digital/smart energy meter, Brushless DC Motors and their application			
MODULE – 4			10 hrs.
Transformers: Classification of transformers, applications of each type, construction of core and shell type transformers, principle of operation, EMF Equation, Transformation ratio, Power losses and efficiency, Illustrative examples on EMF equation and efficiency Induction machines: Induction Motors-Concept of rotating magnetic field, classification (Squirrel cage and Slip ring motors) Principle of operation and Constructional features, Slip and its significance, Single-phase induction motors, working principle, classification and applications. Self-Learning topics: Applications of transformers and induction motors, types of electric motors used in Electric Vehicles.			
<u>Text Books :</u> 2. Rajendra Prasad, Fundamentals of Electrical Engineering, Prentice-Hall of India Pvt. Ltd., ISBN: 81-203-2729-2, 2005.			
<u>Reference Books:</u> 4. D. C. Kulshreshtha, <i>Basic Electrical Engineering</i>, McGraw Hill, 2nd edition, 2019 5. E. Hughes, <i>Electrical and Electronics Technology</i>, Pearson 2010 6. D.P. Kothari, I.J. Nagrath, <i>Basic Electrical Engineering</i>, McGraw Hill Education, 4th Ed., 2019			

3.INTRODUCTION TO ELECTRONICS ENGINEERING

Course Title	INTRODUCTION TO ELECTRONICS ENGINEERING		
Course Code	22ESC143/243	(L-T-P) C	(3-0-0)3
SEE duration	3 hours	Hours / Week	03

CIE (Theory) marks	30	Activity marks	20
SEE marks	50	Total contact hours	40
Course Objective:			
The objective of the course is to equip students with a basic foundation in electronic engineering required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communication systems.			
Course Outcomes (COs): Upon completion of the course, students shall be able to			
Sl. No.	Course outcomes	Mapping to POs	
1.	Develop the basic knowledge on construction, operation and characteristics of semiconductor devices.	1,2	
2.	Apply the acquired knowledge to construct small scale circuits consisting of semiconductor devices.	1,2, 5, 9	
3.	Develop competence knowledge to construct basic digital circuit by make use of basic gate and its function.	1, 5, 9	
4.	Apply the knowledge of Embedded system and basic communication system.	1,2	
Course Contents:			
MODULE –1			10 Hrs.
Power Supplies –Block diagram, Half-wave rectifier, Full-wave rectifiers and filters, Voltage regulators, Output resistance and voltage regulation, Voltage multipliers.			
Amplifiers – CE amplifier with and without feedback, multi-stage amplifier; BJT as a switch: Cut-off and saturation modes, BJT Biasing: Introduction, DC Load line and Bias point -Self bias, fixed bias. (Text 1)			
MODULE –2			10 Hrs.

Oscillators – Barkhausen criterion, sinusoidal and non-sinusoidal oscillators, Colpitt's and Hartley oscillator, Multivibrators, Single-stage astable oscillator, Crystal controlled oscillators (Only Concepts, working, and waveforms. No mathematical derivations) Operational amplifiers - Ideal op-amp; characteristics of ideal and practical op-amp; Practical op- amp circuits: Inverting and non-inverting amplifiers, voltage follower, summer, subtractor, integrator, differentiator. (Text 1)			
MODULE –3			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 (Text 2: 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7). Combinational logic: Introduction, Design procedure, Adders/subtractors-Half adder/Subtractor, Full adder/subtractor. (Text 2: 4.1, 4.2, 4.3).			
MODULE – 4			10 hrs.
Embedded Systems–Definition, Embedded systems vs general computing systems, Classification of Embedded Systems, Major application areas of Embedded Systems, Elements of an Embedded System, Core of the Embedded System, Microprocessor vs Microcontroller, RISC vs CISC. (Text 1). Analog Communication Schemes–Modern communication system scheme, Information source, and input transducer, Transmitter, Channel – Hardwired and Soft wired, Noise, Receiver, Multiplexing, Types of communication systems. Types of modulation (only concepts)– AM, FM, Concept of Radio wave propagation (Ground, space, sky). Digital Modulation Schemes: Advantages of digital communication over analog communication, ASK, FSK, PSK. (Text 3).			
List of Activities			
Activity Number	Activity Name	Description	Marks
1	Analog Circuit design and implementation using open source Simulator	• Use Multisim Live Circuit Simulator (Online Simulation) • A group of 3 students should solve assigned experiment • Demonstration of the circuit with results	10

2	Digital Circuit design and implementation using open-source Simulator	• Use Multisim Live Circuit Simulator (Online Simulation) • A group of 3 students should solve assigned experiment • Demonstration of the circuit with results	10
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Activity 1 Details:

Following are the experiments list of analog circuit design and implementation using open-source simulator.

9. For a mobile charger design a zener voltage regulator that takes ripple DC voltage produced by bridge rectifier circuit and delivers a DC regulated supply of 5 V, 5 mA across load resistor.
10. Construct an audio amplifier which takes 20 mV audio signal and delivers 2 V output signal to a loudspeaker inside a radio system.
11. Construct a sinusoidal wave generator circuit using crystal oscillator to generate an audio signal frequency of 2 kHz.
12. Design an inverting amplifier to have a voltage gain of 50 and the output voltage amplitude is to be 2.5 V.
13. A direct-coupled noninverting amplifier with a ± 25 mV input is to produce a ± 5 V output. Design the circuit with suitable resistance values.
14. Design a bridge full wave rectifier circuit to produce 12 V unregulated DC voltage using a capacitor filter used in an electric vehicle charger circuit.
15. The difference of two input signals is to be amplified by a factor of 20. Design the circuit with suitable resistance values.
16. Design a three-input inverting summing amplifier circuit and show how it can be converted into an averaging circuit.

Activity 2 Details:

Following are the experiments list of circuit design and implementation using open source simulator.

9. Realization of Boolean expressions using basic gates.
10. Realization of half adder circuit.
11. Realization of full adder circuit.
12. Realization of 4-bit parallel adder.
13. Realization of half subtractor circuit.
14. Realization of full subtractor circuit.
15. Realization of Integrator.
16. Realization of Differentiator.

Suggested Learning Resources:**Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

1. Mike Tooley, 'Electronic Circuits, Fundamentals & Applications', 4th Edition, Elsevier, 2015. DOI <https://doi.org/10.4324/9781315737980>. eBook ISBN 9781315737980.
2. Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203-0417-84.
3. D P Kothari, I J Nagrath, 'Basic Electronics', 2nd edition, McGraw Hill Education (India), Private Limited, 2018.

4. INTRODUCTION TO MECHANICAL ENGINEERING

Course Title		INTRODUCTION TO MECHANICAL ENGINEERING	
Course Code	22ESC144/244	(L-T-P)C	(3-0-0)3
SEE duration	3 hour	Hours / Week	03
CIE (Theory) marks	30	CIE (Practicals)/Activity marks	20
SEE marks	50	Total contact hours	39
Course Objective: To introduce fresh entrants of engineering courses to the principles and fundamentals of Mechanical Engineering Course Outcomes (COs) {with mapping shown against the Program Outcomes (POs)} Upon completion of the course, students shall be able to:			
Sl. No.	Course outcomes		Mapping to POs
1.	explain the concepts of mechanical engineering, energy sources, and engineering materials		1, 10
2.	explain the working principle of IC engines, electric and hybrid vehicles		1, 10
3.	describe non-traditional and modern manufacturing techniques and illustrate manufacturing components using CNC, additive manufacturing, and joining processes		1, 10
4.	understand the basic principles of automation, mechatronics and robotics		1, 10

Course Contents:	
MODULE –1	10 Hrs.
Introduction to Mechanical Engineering Role of Mechanical Engineers in Industries and Society - Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, Automation, Industry 4.0 and applications in Artificial Intelligence (AI) and Machine Learning (ML). Energy Sources: Introduction and applications of Energy sources like Fossil fuels, nuclear fuels, Hydroelectric, Solar, wind, and biofuels. Engineering Materials: Classification of Engineering Materials, Types and applications of Ferrous & Nonferrous Metals, silica, ceramics, glass, graphite, diamond and polymer, composite materials.	
Activity: 4. Visit to any manufacturing/ aero/ auto industry or any power plant 5. Demonstration on Tensile testing using UTM	
MODULE –2	10 Hrs.
Introduction to IC Engines: Introduction, classification, Components and working principles, 4-stroke petrol and diesel engines, Applications of IC engines, Heat sinks in electronic devices. Electric and Hybrid Vehicles: Introduction, Working principle, Components of hybrid and electric vehicles, Advantages, and disadvantages of EVs and Hybrid vehicles.	
Activity: 4. Demonstration of working of IC engine 5. Various pollutants from the IC Engine Emission and Effect on the environment 6. Demonstration of power transmission devices	
MODULE -3	10 Hrs.
Non-conventional machining processes: Introduction, Difference between conventional and non-conventional machining processes. Working principle, advantages, disadvantages and applications of AJM, ECM, EDM and LBM. Joining Processes: Soldering and Brazing - principles and applications, Welding - Definition, applications, working principle of electric arc welding, gas welding and flames.	
Activity: 4. Demonstration of welding, soldering and brazing	
MODULE – 4	10 hrs.

Introduction to Advanced Manufacturing Processes: Introduction, Components of CNC, advantages and applications of CNC, Additive Manufacturing.

Introduction to Mechatronics and Robotics: Open loop and closed loop mechatronic systems, Programmable logic controllers, Sensors, Actuators, Nomenclature of an Industrial Robot: Polar Cylindrical, Cartesian coordinate and Spherical robot, Advantages, disadvantages, and applications. Automation, Types - Fixed, programmable, and flexible automation, merits and demerits of automation, Applications.

Activity:

3. Demonstration of CNC operations and 3D Printing
4. Demonstration of pneumatic system and robot configuration in robotics lab.

TEXTBOOK:

3. Elements of Mechanical Engineering, K R Gopala Krishna, Subhash Publications, 2008
4. Elements of Workshop Technology (Vol. 1 and 2), Hazra Choudhry and Nirzar Roy, Media Promoters and Publishers Pvt. Ltd., 2010.

REFERENCES:

5. An Introduction to Mechanical Engineering, Jonathan Wickert, 2nd edition, Cengage Learning 2006, ISBN-10: 1-111-57682
6. Elements of Mechanical Engineering - K P Roy, S K H Choudhry, A K H Choudhry, Roy Media promoters and publishers, Mumbai, 7th edition, ISBN: 4567145216, 1234567145210.
7. Electric and Hybrid vehicles by A. K. Babu Khanna Publications
8. Robotics, AppuuKuttan K K. International Pvt. Ltd, volume 1
9. Introduction to Mechatronics, AppuuKuttan K K, Oxford University Press, 2007.

5. INTRODUCTION TO C PROGRAMMING

INTRODUCTION TO C PROGRAMMING				
Course Code	:	22ECS145/245	L-T-P-C	: 2-0-2-3
SEE Hours	:	03	Hours / Week	: 04
CIE(Theory) Marks	:	30	CIE (Practicals) Marks	: 20
SEE	:	50 Marks	Total hours	: 40
Course Objective :	To provide fundamental programming concepts which are essential to develop program for a given problem.			
Course Outcomes (COs) :	Upon Completion of the course, students shall be able to:			
COs	Statement			POs
1.	Describe the concepts of C programming			PO1
2.	Apply C programming constructs to solve a given problem			PO1, PO2
3.	Analyze the given program to determine the output and its correctness			PO1, PO2
4.	Develop programs to find a solution for the given real world problems			PO1, PO2, PO9, PO10
Course Contents:				
MODULE – 1				10 Hrs
Introduction:ImportanceofC,BasicstructureofCprogram,executingaCprogram,Characters set,Ctokens,Variables,Datatypes,Operators,Expressions,Evaluationofexpressions,Operator precedence and associativity, Type conversion, Managing Input and OutputOperations.				
MODULE – 2				10 Hrs
Decision making and Branching: Simple if, if..else, nested if and else if...ladder statements. Switch statement, The ?: operator. Decision making and Looping: Jumps in Loops, programming examples, Nested loops.				
MODULE – 3				10 Hrs
Arrays: One-dimensional Arrays, Two-dimensional Arrays, Character Arrays, Arithmetic operation on characters, String handling functions.				
MODULE – 4				10 Hrs
User-defined Functions: Elements of User defined function, Category of functions, Parameters passing in functions: call by value and call by reference, Passing arrays to functions, Passing strings to functions. Structures: Defining a structure, Declaring a structure variable, Accessing structure members, Structure initialization, Operations on individual members, Arrays of structure Pointers: Understanding pointers, Accessing the address of a variable, Declaring pointer variables, Initialization of pointer variables, Accessing a variable through its pointers.				
Text Book:				
1.	Balagurusamy E, Programming in ANSI C, 8 th Edition, Tata Mc Graw Hill, 2013.			
Reference Books:				

1.	Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, PHI, 2012.
2.	Programming Techniques through C, M. G. Venkatesh Murthy, Pearson Education, 2014

Practice Programs											
1.	a. Write a C program to read length of the sides of a triangle and find its area. b. Write a C program to read radius of a circle and find its area and circumference										
2.	An employee gets DA 90% of basic salary; HRA 15% of basic salary, CA 5% of basic salary. And also employee has to pay income tax of 10% of gross salary (Gross salary = Basic Salary + DA + HRA + CA). Write a C program to read the basic salary of an employee and find the take home salary of the employee. (Take home salary = gross salary – income tax)										
3.	Heights of three students in a class are h1, h2 and h3. Write a C program to find the tallest among three students using nested if else statement.										
4.	Read first name, middle name and last name of a person. Write a C program to concatenate first name with middle name without using built-in function. And concatenate the resultant string with last name using built-in function.										
Guided Laboratory Experiments											
1.	Quadratic equation is given by $ax^2+bx+c=0$, where a, b and c are the coefficients provided where $a \neq 0$. The formula to find roots of quadratic equation is $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$. Write a C program to find all the roots and test it for all three cases (based on discriminant value)										
2.	A shop keeper requires performing simple calculations like addition, subtraction, multiplication and modulo division for his daily business. Write a C program to design a simple calculator for shop keeper.										
3.	An electric power distribution company charges its domestic consumers as follows: <table border="0"> <tr> <td>Consumption Units</td><td>Rate of Charge</td></tr> <tr> <td>0-200</td><td>Rs. 0.50 per unit</td></tr> <tr> <td>201-400</td><td>Rs. 100 plus Rs. 0.65 per unit excess of 200</td></tr> <tr> <td>401-600</td><td>Rs. 230 plus Rs. 0.80 per unit excess of 400</td></tr> <tr> <td>601 and above</td><td>Rs. 390 plus Rs. 1.00 per unit excess of 600</td></tr> </table> Write a C program to read the customer number, power consumed and display the amount to be paid by the customer.	Consumption Units	Rate of Charge	0-200	Rs. 0.50 per unit	201-400	Rs. 100 plus Rs. 0.65 per unit excess of 200	401-600	Rs. 230 plus Rs. 0.80 per unit excess of 400	601 and above	Rs. 390 plus Rs. 1.00 per unit excess of 600
Consumption Units	Rate of Charge										
0-200	Rs. 0.50 per unit										
201-400	Rs. 100 plus Rs. 0.65 per unit excess of 200										
401-600	Rs. 230 plus Rs. 0.80 per unit excess of 400										
601 and above	Rs. 390 plus Rs. 1.00 per unit excess of 600										
4.	Sine series is given by $x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots$ upto n terms, where x is an angle in radian. Write a C program to find sine value for a given angle. Also verify calculated sine value using built-in function.										
5.	A person wants to register his newly purchased car. He is passionate to have a palindrome number for car registration. Write a C program to check whether the number allotted is palindrome or not.										
6.	Given a list of n student's weight, write a C program to find a student with given weight. If found, display the position of the student in the list else display suitable message.										

7.	Given two matrices, write a C program to check whether the matrices are multipliable, if so find the product matrix, otherwise display suitable message.
8.	Given a matrix, write a C program to find its transpose. Also find sum of upper triangle elements and sum of lower triangle elements of the transposed matrix.
9.	Write a C program to read a string, find number of vowels and consonants in it.
10.	Develop a function to find the factorial of a given number. Using the above function write a C program to find nCr and nPr where $nCr = \frac{n!}{r!(n-r)!}$ and $nPr = \frac{n!}{(n-r)!}$
11.	Develop a C function to swap two numbers using pointers. Write a C program using the above function to swap two numbers.
12.	Define a structure data type called student containing members: Name, USN, Marks of CIE1, CIE2, CIE3, activity1 and activity2. Write a C program that would assign values to individual members and display them along with the total internal marks of all students where total internal marks is sum of best of two CIE marks, activity1 and activity2.

EMERGING TECHNOLOGY COURSES (ETC)

1. SMART MATERIALS AND SYSTEMS

Exam hours: 03	Hours/week: 03
SEE: 50 Marks	Total hours: 40

Course Objective:

To know the fundamentals of various smart materials, the process of their synthesis and their applications.

Upon successful completion of this course, the student shall be able to:

COs	Statement	POs
1.	learn the fundamentals of emerging materials	1, 7, 12
2.	define the properties of prefabricated materials and optic fibers	1, 2
3.	demonstrate the use of smart materials in engineering applications	1, 3
4.	analyze BIM fundamentals and develop a 3-D model	1, 6, 7

Module – 1 (10 Hours)

Emerging Materials: Honey comb structure (Carbon composites), Nano-materials, engineering polymers, emerging sustainable by products (Fly ash and GGBS), Composite materials, types, synthesis methods, properties and applications.

Module – 2 (10 Hours)

Engineering Components: Definition, types of prefabricated/ manufactured components

for engineering applications, desirable properties and manufacturing techniques, fundamentals of Shape Memory Alloys, Characteristics and Applications, Fiber Optics, Twisted and Braided Fibre Optics, Applications of Fiber Optics
Module – 3 (10 Hours) Smart Materials and MEMS: Definition, Principles of Piezo-electricity, Materials (Polymers and Ceramics), Sensors (Piezo-electric sensor, strain gauge, shear sensor, in-plane and out of plane sensor, accelerometer), MEMS: History of MEMS, Intrinsic Characteristics, Devices: Sensors and Actuators, Microfabrication: Photolithography, Thermal oxidation, Thin film deposition, etching types, Doping, Dicing, Bonding.
Module – 4 (10 Hours) BIM and 3D Printing: BIM, Definition, Characteristics, Necessity, Advantages, 3D Printing, Importance, Historic development, advantages, common terminologies, classification, process chain, 3D printing procedure, Applications, Case Studies on application of 3D printing.

Textbooks:

1. Donald R. Askeland and Pradeep P. Fulay, Essentials of Materials Science and Engineering, 2009, Cengage Learning
2. Ian Gibson, David Rosen, Brent Stucker, Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, 2015, Springer Nature, 2nd Edition, ISBN-10: 1493921126.
3. Stefan Mordue, Paul Swaddle, David Philp, Building Information Modeling, 2015, For Dummies, 1st Edition, ISBN-10: 9781119060055.

2. INTRODUCTION TO NANOTECHNOLOGY

CourseTitle	INTRODUCTION TO NANOTECHNOLOGY		
CourseCode	22ETC15C	(L-T-P)C	(3-0-0)3
SEE duration	3hour	Class Hours/Week	03
CIE (Theory) marks	30	Activity marks	20
SEE marks	50	Total class hours	40
CourseObjective: Objective of the course is to make the students learn basic principles of nanoscience and application of as derived understanding in advanced nanotechnology. CourseOutcomes(COs): Upon completion of the course, students shall be able to			
Sl. No.	Courseoutcomes		Mapping to POs

1.	Interpret the basic interdisciplinary nature of nanotechnology.	1
2.	Illustrate the synthesis and characterization methods of nanomaterial.	1
3.	Discuss the properties and applications of nanotechnology.	1
CourseContents:		
MODULE–1		10Hrs.
Introduction Origin of nanotechnology, types of nanomaterials (including free stand and substrate supported), properties of nanomaterials, nanoparticles and quantum confinement – 0D, 1D & 2D. Influence of size on properties and their characterization of materials.		
MODULE–2		8 Hrs.
Synthesis of Nanomaterials Synthesis approaches; Bottom-up and top-down. Physical methods: vacuum evaporation, sputtering techniques (DC, RF, thermal evaporation). Chemical methods: Electroplating, spray pyrolysis, chemical vapour deposition (CVD), sol-gel process: screen printing, solution based techniques, hydrothermal method.		
MODULE–3		10 Hrs.
Characterizations UV-Visible spectroscopy, Fourier Transform infrared spectroscopy (FTIR), X-Ray Diffraction (XRD). Microscopy: Scanning Electron Microscopy (SEM), Atomic Force Microscopy (AFM), Transmission Electron Microscopy (TEM).		
MODULE– 4		10 hrs.
Applications of nanomaterials and nanotechnology Advantage of nanotechnology, application of nanomaterials and nanotechnology in LED, Solar cell, Transistors, quantum computing, medical devices, MEMS, NEMS, etc.		
<u>Text Books:</u> 1. Nano: The Essentials: Understanding Nanoscience and Nanotechnology , T. Pradeep, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008. 2. Nanoscale Science and Technology , Robert W. Kelsall, Ian W. Hamley and Mark Geoghegan, John Wiley & Sons, Ltd., UK, 2005.		

ReferenceBooks:

- 1 **Introduction to Nanotechnology**, Charles P. Poole Jr and Frank J. Owens, Wiley Interscience, 2003.
2. **Principles of Nanotechnology**, Phanikumar (Scitech Publications, Chennai).

3.Introduction to Sustainable Engineering

Course Title		INTRODUCTION TO SUSTAINABLE ENGINEERING	
Course Code	22ETC15D	(L-T-P)C	(3-0-0)3
SEE duration	3 hour	Hours / Week	03
CIE (Theory) marks	30	CIE (Practicals)/Activity marks	20
SEE marks	50	Total contact hours	40
Course Objective: To introduce students to the ideas of sustainability and provide knowledge of the guiding principles and framework for sustainable engineering Course Outcomes (COs) {with mapping shown against the Program Outcomes (POs)} Upon completion of the course, students shall be able to:			
Sl. No	Course outcomes		Mapping to POs
1.	Elucidate the foundations of sustainable development and its application to engineering.		1,7
2.	Application of Sustainable Engineering Concepts and Principles in Engineering		1,7
3.	Apply the principles and procedures of the Life Cycle Assessment Tool to the design of engineering systems.		3,7
4.	Recognize ways to include sustainability into Engineering Design		3,7
Course Contents:			
MODULE –1			10 Hrs.

Sustainable Development and Role of Engineers: Introduction, The SDGs, Paris Agreement, and Role of Engineering, Sustainable Development and the Engineering Profession. Concepts for Sustainable Engineering: The Goals of sustainability, Systems Thinking, Life Cycle thinking, The Circular Economy, Industrial Ecology, Green Economy and Low-Carbon Economy, The Natural Step, Resources Efficiency and Decoupling, Eco-efficiency, Triple Bottom line.	
Self-study: Case Study on Adapting cooking technology powered by recycled materials Activity: Search the internet for an example of a major collapse of a culture in the past due to unsustainable behavior.	
MODULE –2	10 Hrs.
Sustainable Engineering Principles and Frameworks: Guiding Principles for Sustainable Engineering, Sustainability framework for engineering, Sustainable Consumption and Production (SCP) framework, Lifecycle Engineering framework. Tools for Sustainability Assessment and Introduction to Life Cycle Assessment (LCA):Introduction, Environmental Management system, Environmental Auditing, Cleaner Production Assessment, Environmental Impact Assessment, Strategic Environmental Assessment, Life Cycle Management, Design for Sustainability, LCA Goal and Scope definition, Life cycle Inventory, Strengths and Limitations of LCA.	
Self-study: Case study on Conserving Materials for the next mobility revolution, JG Afrika’s operational Materials management plan for Hotel Verde, South Africa. Activity: Choose a common household appliance such as a refrigerator, TV set, an air conditioner, or a washing machine and describe its life stages, including who is primarily responsible for the environmental concerns at each stage.	
MODULE –3	10 Hrs.
Life Cycle Assessment Applications in Engineering: Environment Product Declaration and Product Category Rules, Carbon and Water Foot printing, Energy systems, Buildings and Build Environment, Drinking Water Supply and Wastewater Treatment, Solid Waste Management, Chemicals and Chemical Production, Automotive Industry, Food and Agriculture, Electronics and Information and Communication Technologies(ICT).	

Self-study: Case study for LCA for Planning of disposal of Pet Bottles in Mauritius and Sustainable product redesign at MAKSS Packaging Industries in Kampala, Uganda. Activity: Recognize the ways the establish a new paper mill closer to a river bank.	
MODULE – 4	10 hrs.
Integrating Sustainability in Engineering Design: Problems Solving in Engineering, Conventional to Sustainable Engineering Design Process, Design for Life Guidelines and Strategies, Measuring Sustainability, Sustainable Design through sustainable procurement criteria, Case studies on sustainable Engineering Design Process in Building Design, Mechanical Engineering, Electronic Engineering and Electrical Engineering.	
Self-study: Case study of Sustainable product redesign at MAKSS Packaging Industries in Kampala, Uganda. Activity: Provide examples of engineering designs or products from these designs that caused unintended damage to ecosystems.	
TEXTBOOK: Introduction to Sustainability for Engineers, ToolseeramRamjeawon, CRC Press, 1stEdition., 2020, ISBN – 13: 978-0-367-25445-2 REFERENCES: . Sustainability Engineering: Concepts, Design and Case studies, Prentice Hall, 1stEdn, 2015 . System Analysis for sustainable Engineering: Theory and applications, Ni bin Chang, McGraw Hill Publications, 1stEdn., 2010 . Engineering for Sustainable development: Delivery a sustainable development goals, UNESCO, International Centre for Engineering Education, France, First Edition, 2021 . Introduction to Sustainable Engineering, Rag. R.L. and Ramesh Lakshmi Dinachandran, PHI Learning Pvt. Ltd., Second Edition, 2016	

4. RENEWABLE ENERGY SOURCES

Course Title		RENEWABLE ENERGY SOURCES	
Course Code	22ETC15E	(L-T-P) C	(3-0-0) 3
SEE duration	3 Hours	Hours / Week	03
CIE (Theory) marks	30	Activity marks	20
SEE marks	50	Total Contact Hours	40
Course Objective: The objective of this course is to impart knowledge of various renewable energy resources and its applications.			
Course Outcomes (COs): Upon completion of the course, students shall be able to			
Sl. No.	Course outcomes		Mapping to POs
1.	Explain basic concept of renewable energy resources		1, 2
2.	Describe the operation of solar thermal systems		1,6, 7
3.	Explain the concept of wind energy system.		1, 6, 7
4.	Explain hydrogen energy, biomass, tidal and ocean energy systems		1, 6, 7
Course Contents:			
MODULE –1			10 Hrs.
Energy Sources: Energy sources–renewable and non-renewable. Energy Resources and Classification, Renewable Energy – Worldwide Renewable Energy Availability, Renewable Energy in India.			
Energy from Sun: Measurement of solar radiation, schematic diagrams, and principle of working. Solar Radiation Geometry: latitude, declination angle, hour angle etc.			
MODULE –2			10 Hrs.
Solar Thermal Energy Systems and Applications: Solar thermal energy storage and collection devices-Concentrating and non-concentrating collectors. Solar thermal applications - Solar Water Heating Systems, Solar Air Heating, Solar Pond.			
Solar Cells: Components of Solar Cell System, Elements of Silicon Solar Cell, Solar Cell materials. Photovoltaic Conversion: Principle of working and characteristics, applications - Photovoltaic Panels, Applications of Solar Cell Systems			

MODULE –3	10 Hrs.
Hydrogen Energy: Properties of Hydrogen with respect its utilization, sources of hydrogen, production of hydrogen, storage and transportation methods, introduction to green hydrogen technology. Wind Energy Systems: Availability of wind energy in India, Wind flow-motion of wind, wind speed characteristics, basic components of a wind energy conversion system (Block diagram of WECS), classification of WEC systems, Advantages, and disadvantages of WECS, site selection consideration.	
MODULE – 4	10 hrs.
Biomass Energy: Energy plantation and description of biogas plant (Batch type Floating & Fixed type), advantages and disadvantages. Tidal Energy: Fundamental characteristics of tidal power, classification of tidal power plants, Advantages and Disadvantages of Tidal Power. Ocean Thermal Energy: Fundamental characteristics of ocean thermal power, Open Cycle and Closed Cycle OTEC power plant. Advantages and limitations of OTEC. Introduction to sea wave energy.	
Self Study: 1. Prepare a report on the world energy and energy scenario in India. 2. Prepare a report on methods to improve the harnessing of alternate energy resources.	
<u>Text Books :</u> 3. G.D. Rai, Non-conventional energy sources, Khana Publishers, 4th edition, 2009, ISBN: 8174090738, 9788174090737 4. S. P. Sukhatme, Solar Energy Principle of Thermal Collection and Storage, Tata McGraw Hill, 1990, ISBN 10: 0074624539	
<u>Reference Books:</u> 7. P.K. Nag, Solar power Engineering, TMH, 2003, ISBN: 0-07-043599-5. 8. Domkundwar, Power Plant Engineering, Dhanpath Rai& Sons, 3rd Edition, 2003, ISBN: 6700000000330 9. B.H. Khan, Nonconventional energy resources by, TMH, 3rd edition, 2015, ISBN: 13: 978-0070142763	

5. WASTE MANAGEMENT

Course Title	WASTE MANAGEMENT
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Course Code	22ETC15F	(L-T-P)C	(3-0-0)3
CIE marks	50	Hours / Week	03
SEE marks	50	Total contact hours	40
Total marks	100	SEE duration	3 hours
Course Objective: To learn broader understandings on various aspects of solid waste management practice			
Course Outcomes (COs): Upon completion of the course, students shall be able to			
Sl. No.	Course outcomes	Mapping to POs	
1.	Comprehend the sources, classification, characteristics and system of collection of solidwaste	PO1, PO2, PO4,	
2.	Learn different methods of transportation and treatment of solid waste	PO2, PO3, PO5	
3.	Comprehend the various methods of air pollution control techniques and types of composting	PO3, PO4	
4.	Learn different disposal methods of solid waste and hazardous waste	PO2, PO4, PO5	
Course Contents:			
MODULE –1			10 Hrs.
Introduction: Land Pollution – Definition, causes, health and environmental effects of waste. Scope and importance of solid waste management – Classification, source and characteristics. Estimation of energy content. Material flow and Functional elements of solid waste management.			
Collection: segregation at source, Types of collection service. Systems of collection – hauled container and stationary container system. Estimation of solid waste quantities. Collection equipment – Garbage chutes. Bailing and compacting			
MODULE –2			10 Hrs.

Transportation and Processing Techniques: Transport methods, Transfer station and route optimization techniques. Mechanical volume reduction, Chemical volume reduction, Mechanical size reduction, Component separation, Drying and dewatering. Waste Disposal: key issues in waste disposal, disposal options and selection criteria. Incineration - Process, Design and Performance Considerations, 3T's of incineration process and problems associated with incineration operation	
MODULE –3	10 Hrs.
Air Pollution Control Technologies: Gravitational settling chambers, Cyclone separator, Fabric filters, Electrostatic precipitators and Scrubbers Composting: Objectives, Aerobic and anaerobic composting – process and design consideration. Bangalore process of composting and Indore process of composting. Factors affecting composting. Vermicomposting	
MODULE – 4	10 hrs.
Sanitary Land Filling: Different types – Trench, area and Ramp Method. advantages and disadvantages, landfill gas emission, leachate formation Hazardous waste: classification, exposure pathways and effects Biomedical waste: classification, potential implication and steps in biomedical waste management	
<u>Text Books :</u> 1. Integrated Solid Waste Management : Tchobanoglous : Mc. Graw Hill, 1970, I Edition 2. SasiKumar.K, SanoopGopikrishna “Solid Waste Management” PHI Learning Pvt.ltd, 2009	
<u>Reference Books:</u> 1. Pavoni J.L “Hand book on Solid Waste Disposal” - 1973 2. Peavy and Tchobanoglous “Environmental Engineering” 1985	

6. Introduction to Internet of Things (IOT)

INTRODUCTION TO INTERNET OF THINGS

Course Code: 22ETC15H	LTPC: 3-0-0-3
Exam Hours : 3	Hours / Week : 3
SEE : 50Marks	Lecture hours : 40 hours

Course Objective:

Understand about the fundamentals of networking, things in IoT and connecting things with the internet and IoT usage domains in everyday life.

Course Outcomes (COs){with mapping shown against the Program Outcomes (POs)}

Upon completion of the course, students shall be able to:

Course Contents:

COs	Statement	POs
1.	Describe the evolution of IoT, IoT networking components, and addressing strategies in IoT.	PO1
2.	Classify various sensing devices and actuator types.	PO1
3.	Explain the processing in IoT and associated IOT technology-cloud computing	PO1
4.	Illustrate architecture of IOT Applications	PO1,PO5

<u>Module-1</u>	<u>Teaching Hours</u>
Basics of Networking: Introduction, Network Types, Layered network models Emergence of IoT: Introduction, Evolution of IoT, Enabling IoT and the Complex Interdependence of Technologies, IoT Networking Components Textbook 1: Chapter 1- 1.1 to 1.3 Chapter 4 – 4.1 to 4.4	10 Hours
<u>Module-2</u>	
IoT Sensing and Actuation: Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensor examples,Sensing Considerations, Actuators, Actuator Types, Actuator Characteristics. Case study- Sensors and actuators in a smart phone Textbook 1: Chapter 5 – 5.1 to 5.9 Textbook-2 Chapter3- Tables 3.1 and 3.2	10 Hours
<u>Module-3</u>	
IoT Processing Topologies and Types: Data Format, Importance of Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations, Processing Offloading. ASSOCIATED IOT TECHNOLOGIES Cloud Computing: Introduction, Virtualization, Cloud Models Textbook 1: Chapter 6 – 6.1 to 6.5 Chapter 10– 10.1 to 10.3	10 Hours
<u>Module-4</u>	
IOT CASE STUDIES Agricultural IoT – Introduction and Case Studies Vehicular IoT – Introduction Healthcare IoT – Introduction, Case Studies IoT Analytics – Introduction Textbook 1 Chapter 12- 12.1-12.2; Chapter 13– 13.1; Chapter 14- 14.1-14.2; Chapter 17- 17.1	10 Hours

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Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation(CIE):

Three Unit Tests each of 20 Marks then reduced to 10 Marks (duration 01 hour)

- First test after the completion of 30 % of the syllabus
- Second test after completion of 60% of the syllabus
- Third test after completion of 90% of the syllabus

ACTIVITIES

Activity Number	Activity Name	Description	Marks
1	Demonstrating the usage of general IoT sensors and actuators	• Demonstration using online simulation platform wokwiin group of 5-6 students. • Student can select any sensor or actuator for the simulation. For example sensors like DHT11, Ultrasonic sensor, IR sensor, Soil Moisture sensor, gas sensor, Current sensor, barometer etc and actuators like servo motor, LED, buzzer, DC motors etc. • Presentation with two pages report about the characteristics of sensors and actuators used.	15
2	Group Discussion	• Groups discussion about IoT case studies like Greenhouse automation, Vehicular IoT, IoT in smart cities, IoT in health and lifestyle etc.	05

Text Book:

1. Sudip Misra, Anandarup Mukherjee, Arijit Roy, “Introduction to IoT”, Cambridge University Press 2021.
2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry- IoT Fundamentals- Networking Technologies, Protocols and Use Cases for the Internet of Things, Cisco Press-2017

Reference:

1. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.
2. Vijay Madiseti and ArshdeepBahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.
3. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013.

7. INTRODUCTION TO CYBER SECURITY

Course Title		INTRODUCTION TO CYBER SECURITY		
Course Code	22ETC15I	(L-T-P)C	(3-0-0)3	
SEE duration	3 hour	Hours / Week	03	
CIE (Theory) marks	30	Activity marks	20	
SEE marks	50	Total contact hours	40	
Course Objective: Students will be able to gain knowledge on Cyber security and laws. Course Outcomes (COs): Upon completion of the course, students shall be able to				
Sl. No.	Course outcomes			Mapping to POs
1.	Comprehend knowledge on cybercrime terminologies			1
2.	Describe Cyber offenses and Botnets			1,8
3.	Gain insight on Modern Tools and Methods used on Cybercrime			1,5
4.	Identify Phishing, Identity Theft and need of computer forensics			1,6

Course Contents:	
MODULE –1	10 Hrs.
Introduction to Cybercrime: Cybercrime: Definition and Origins of the Word, Cybercrime, and Information Security, who are Cybercriminals? Classifications of Cybercrimes, An Indian Perspective, Hacking, and Indian Laws., Global Perspectives Cyber Offenses: How Criminals Plan Them: Introduction, how criminals plan the attacks.	
MODULE –2	10 Hrs.
Social Engineering, Cyber Stalking, Cybercafé & cybercrimes. Botnets: The fuel for cybercrime, Attack Vector. Tools and Methods used in Cybercrime: Introduction, Proxy Servers, Anonymizers,	
MODULE –3	10 Hrs.
Phishing, Password Cracking, Key Loggers and Spyware, Virus, and Worms, Trozen Horses and Backdoors, Steganography, DoS and DDOS Attacks, Attacks on Wireless networks. Phishing and Identity Theft: Introduction, methods of phishing, phishing, phishing techniques, spear phishing	
MODULE – 4	10 hrs.
Types of phishing scams, phishing toolkits and spy phishing, counter measures, Identity Theft 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.	
<u>Text Books :</u> 1. SunitBelapure and Nina Godbole, “Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives”, Wiley India Pvt Ltd, ISBN: 978-81- 265-21791, 2011, First Edition (Reprinted 2018)	
MOOCs	
1. https://www.youtube.com/watch?v=yC_hFm0BX28&list=PLxApjaSnQGi6Jm7LLSxvmNQjS_rt9swsu	

2. https://www.youtube.com/watch?v=nzZkKoREEGo&list=PL9ooVrP1hQOGPQVeapGsJCktzIO4DtI4_
3. https://www.youtube.com/watch?v=6wi5DI6du4&list=PL_uaekrhGzJlB8XQBxU3z__hDwT95xllk
4. <https://www.youtube.com/watch?v=KqSqyKwVuA8>

8. INTRODUCTION TO ELECTRIC VEHICLE TECHNOLOGY

Course Title	INTRODUCTION TO ELECTRIC VEHICLE TECHNOLOGY																						
Course Code	22ETC15J	(L-T-P) C	(3-0-0) 3																				
SEE Duration	3 Hrs.	Hours/Week	3																				
CIE (Theory) Marks	30	Activity marks	20																				
SEE Marks	50	Total Hours	40																				
Course objective: To enlighten students with various aspects of Electric Vehicles and Hybrid Electric Vehicles Course outcomes: The student will be able to: <table border="1"> <thead> <tr> <th>#</th><th>Course Outcomes</th><th>Mapping to POs</th><th>Mapping to PSO's</th></tr> </thead> <tbody> <tr> <td>1</td><td>Recognise and recall the history, necessity, and evolution of different type of electric vehicles</td><td>1,7</td><td>-</td></tr> <tr> <td>2</td><td>Explain EV and EHV configurations and the electric propulsion systems used in them.</td><td>1</td><td>-</td></tr> <tr> <td>3</td><td>Identify various type of sources that can be used in EV and EHV</td><td>1</td><td>-</td></tr> <tr> <td>4</td><td>Compare the electric power supply and infrastructure used with EV and EHV, distinguish different types of fuel cells used in this industry and verify their suitability.</td><td>1,7</td><td>-</td></tr> </tbody> </table>				#	Course Outcomes	Mapping to POs	Mapping to PSO's	1	Recognise and recall the history, necessity, and evolution of different type of electric vehicles	1,7	-	2	Explain EV and EHV configurations and the electric propulsion systems used in them.	1	-	3	Identify various type of sources that can be used in EV and EHV	1	-	4	Compare the electric power supply and infrastructure used with EV and EHV, distinguish different types of fuel cells used in this industry and verify their suitability.	1,7	-
#	Course Outcomes	Mapping to POs	Mapping to PSO's																				
1	Recognise and recall the history, necessity, and evolution of different type of electric vehicles	1,7	-																				
2	Explain EV and EHV configurations and the electric propulsion systems used in them.	1	-																				
3	Identify various type of sources that can be used in EV and EHV	1	-																				
4	Compare the electric power supply and infrastructure used with EV and EHV, distinguish different types of fuel cells used in this industry and verify their suitability.	1,7	-																				
MODULE-1			10 Hrs																				
Introduction to Electric Vehicles: History of Electric Vehicles (EV), Hybrid Electric Vehicles (EHV) and Fuel Cell Vehicles. Social and environmental importance of electric and hybrid electric vehicles – air pollution, global warming, impact of modern drive-trains on energy supplies.																							

Types of Electric Vehicles: Battery Electric Vehicles, IC Engine/Electric Hybrid Vehicle, Fuelled EVs, EVs using Supply Lines, EVs which use Flywheels or Supercapacitors, Solar-Powered Vehicles, Vehicles using Linear Motors, EVs for the Future			
MODULE-2			10 Hrs
Configuration of EV's and EHV's: Configurations of EVs, Concept of Hybrid Electric Drive Trains, Architectures of Hybrid Electric Drive Trains - Series Hybrid Electric Drive Trains, Parallel Hybrid Electric Drive Trains and series-parallel Hybrid Electric Drive Trains Electric Propulsion Systems: DC Motor Drives, Induction Motor Drives, Permanent Magnetic BLDC Motor Drives, PMSM Drives, SRM Drives			
MODULE-3			10 Hrs
Sources: Batteries, Battery Parameters, Lead Acid Batteries, Nickel-Based Batteries, Sodium-Based Batteries, Lithium Batteries, Battery Charging, Battery Management System.			
MODULE-4			10 Hrs
Electric Supply: Normal Existing Domestic and Industrial Electricity Supply, Infrastructure needed for charging Electric Vehicles, Electricity supply Rails, Battery swapping Fuel Cells: Operating principles of fuel cells, Fuel cell technologies, fuel supply, non-Hydrogen fuel cells			
Reference Books: 1. James Larminie, John Lowry, <i>Electric Vehicle Technology Explained</i>, John Wiley & Sons Ltd, 2nd ed., 2012. 2. John G. Hayes, G. Abas Goodarzi, <i>Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid</i>, 3. <i>Electric and Fuel Cell Vehicles</i>, John Wiley & Sons Ltd, 2018 4. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, <i>Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design</i>, CRC Press Taylor & Francis Group, 2004.			

9. INTRODUCTION TO EMBEDDED SYSTEM

Title	INTRODUCTION TO EMBEDDED SYSTEM		
Course Code	22ETC15K	(L-T-P)C	(3-0-0)3
SEE duration	3 hour	Hours / Week	03

CIE (Theory) marks	30	CIE (Practicals)/Activity marks	20
SEE marks	50	Total contact hours	40
Course Objective: To make students familiar with the basic concepts and terminology of the Embedded systems design flow, architecture, and applications.			
Course Outcomes (COs): Upon completion of the course, students shall be able to			
Sl. No.	Course outcomes	Mapping to POs	
1.	Discuss the requirements for designing embedded systems using microprocessor/microcontrollers, and the fundamentals of ARM processor and its architecture.	1	
2.	Illustrate how the memory, peripheral components and buses interact in an embedded system	1	
3.	Analyse the selection of microcontroller for different domain specific applications of embedded systems	1,2	
4.	Apply the basic knowledge to demonstrate microcontroller based applications.	1,5,9	
Course Contents:			
MODULE –1			10 Hrs.
Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems. Characteristics and Quality Attributes of Embedded Systems.			
MODULE –2			10 Hrs.
The Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, Commercial Off-The-Shelf Components (COTS) Memory: ROM, RAM, Memory according to the type of Interface, Memory shadowing, Memory selection for Embedded Systems.			
MODULE –3			10 Hrs.
Typical Embedded System: Sensors and Actuators, Designing Embedded Systems with 8-bit Microcontrollers-8051: Factors to be Considered in Selecting a Controller, Why 8051 Microcontroller, The 8051 Architecture.			
MODULE – 4			10 hrs.

ARM Embedded Systems: Microcontrollers, Microprocessors v/s Microcontrollers, RISC v/s CISC, Harvard v/s Von-Neumann processor, Big-endian v/s Little-endian processors, Load store operation, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software.
ARM Processor Fundamentals: Registers, Current Program Status Register.

List of experiments/Activities

1. To display numbers from 0 to 9 using Seven Segment Display
2. To rotate Stepper Motor clockwise and anticlockwise.
3. Blinking LEDs

TEXT BOOKS:

1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.
2. ARM system developers guide, Andrew Sloss, Dominic Symes and Chris Wright, Elsevier, Morgan Kaufman publishers, 2008.

Reference Books:

1. Embedded Systems - Raj Kamal, TMH.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley

PROGRAMMING LANGUAGE COURSES (PLC)

1. INTRODUCTION TO WEB PROGRAMMING

Course Title	INTRODUCTION TO WEB PROGRAMMING		
Course Code	22PLC15A	(L-T-P)C	(2-0-2)3
SEE duration	3 hour	Hours / Week	04
CIE (Theory) marks	30	CIE (Practicals)/Activity marks	20
SEE marks	50	Total contact hours	40

Course Objective: Create web pages with client-side scripting. Course Outcomes (COs): Upon completion of the course, students shall be able to		
Sl. No.	Course outcomes	Mapping to POs
1.	Apply the knowledge of XHTML in designing webpages.	1,3
2.	Design webpages by applying CSS.	3
3.	Develop client-side script to design webpage.	1,3,5
Course Contents:		
MODULE –1		10 Hrs.
Fundamentals of Web, XHTML: Internet, WWW, Web Browsers, and Web Servers; URLs; MIME; HTTP; the Web Programmers Toolbox. XHTML: Basic syntax; Standard structure; basic text markup; Images; Hypertext Links; Lists; Tables; Forms; the audio element, the video element, Syntactic Differences between HTML and XHTML.		
MODULE –2		10 Hrs.
CSS: Introduction; Levels of style sheets; Selector forms; Property value forms; Font properties. List properties; Color; Alignment of text; The box model; Background images; The and <div> tags.		
MODULE –3		10 Hrs.
JavaScript: Overview of JavaScript; Syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input; Control statements; Arrays; Functions; Pattern matching using regular expressions.		
MODULE – 4		10 hrs.
JavaScript and HTML Documents: Element access in JavaScript; Events and event handling; Handling events from the Body elements, Button elements, Text box and Password elements; The navigator object. Dynamic Documents with JavaScript: Element positioning; Moving elements; Element visibility; Changing colors and fonts; Dynamic content; Stacking elements.		

Programming Assignments:

1. Create an XHTML page using tags to accomplish the following:

- (i) A paragraph containing text “Malnad College of Engineering”. Bold face and italicize this text
- (ii) Create equation: $x = 1/3(y_1^2 + z_1^2)$
- (iii) Put a background image to a page
- (iv) Create unordered list of 5 fruits and ordered list of 3 flowers

2. Create following web page using XHTML and CSS.

CAR MANUFACTURERES

1. Maruti Suzuki

- A. Swift AMT
- B. Brezza- ZXI

2. TATA Motors

- A. Nexon EV
- B. TATA Harrier

3. Hyundai India

- A. Creta
- B. Aura

3. Write an XHTML document to display 3 paragraphs and apply the style using CSS as below.

Paragraph-1:

- Set the border style to dotted, set left margin and right margin to 1 centimeter.

Paragraph-2:

- Set the background color to yellow, set margin to 25 pixels.

Paragraph-3:

- Set color of the text to green, set padding to 10 pixels.

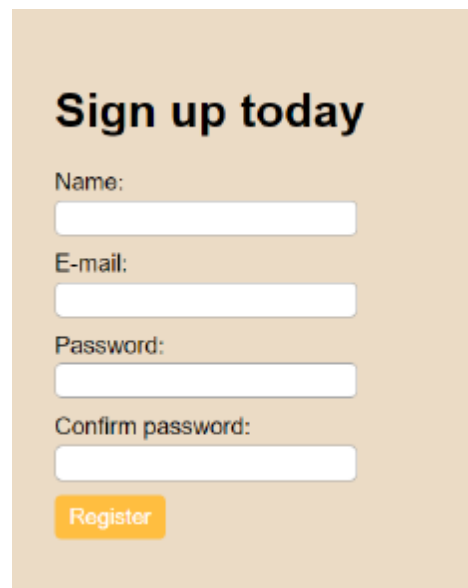
4. Create following web page using XHTML and CSS.

	TV sales in units		
	2021-20	2020-19	2019-18
Sony	3000	5000	6000

Samsung	2000	3000	4000
LG India	5000	8000	7000

5. Write an HTML document to create a form for online submission of RESUME. The following information must be provided. Name, Gender (use radio buttons), Address, Qualifications (use check boxes), University (use select element) and other information (use textarea element)

6. Create following web page using XHTML and CSS.



Sign up today

Name:

E-mail:

Password:

Confirm password:

7. Write a JavaScript program to compute and print sum and average of given N numbers.

8. Write a JavaScript program to check whether a given number is prime number or not.

9. Develop a web page, using JavaScript and XHTML, that collects X-coordinate and Y-coordinate values, to move an image to position on click of a button.

10. Create a webpage containing 3 overlapping paragraphs using XHTML, CSS, and JS. Further when the mouse is over any paragraph, it should be on the top and fully displayed.

Text Books :

Robert W. Sebesta: Programming the World Wide Web, 8th Edition, Pearson Education, 2014.

Reference Books:

1. Deitel H.M. and Deitel P.J., “Internet and World Wide Web How to program”, Pearson International, 2012, 4th Edition.
2. Randy Connolly, Ricardo Hoar, “Fundamentals of Web Development”, Pearson, 2015.

2. INTRODUCTION TO PYTHON PROGRAMMING

Course Title		INTRODUCTION TO PYTHON PROGRAMMING	
Course Code	22PLC15B	(L-T-P)C	(2-0-2) 3
SEE duration	3 hours	Hours / Week	4
CIE (Theory) marks	30	CIE (Practicals)/Activity marks	20
SEE marks	50	Total contact hours	40
Course Objective: Student’s will be able to write a python program to solve the given problem			
Course Outcomes (COs): Upon completion of the course, students shall be able to			
Sl. No.	Course outcomes		Mapping to POs
1.	Elucidate the basic constructs and OOPS concepts of python language		-
2.	Apply python language construct and OOPS concepts to write a program for the given problem		1
3.	Analyze the code snippet for its correctness		2
4.	Design a GUI/python program to solve a real-world problem		3, 5
Course Contents:			
MODULE –1			10 Hrs.

Python Basics: The way of Programming, Variables, Expression and Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Your First Program, Dissecting Your Program, Flow control: Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys.exit(). Loops for iteration.	
MODULE –2	10 Hrs.
Manipulating Strings: Working with Strings, Useful String Methods. Lists: The List Data Type, Working with Lists, Augmented Assignment Operators, Methods, Example Program: Magic 8 Ball with a List, List-like Types: Strings and Tuples, References Tuples and Dictionaries and Structuring Data: The Dictionary Data Type, Pretty Printing, Using Data Structures to Model Real-World Things Functions: def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Arguments and print (), Local and Global Scope, The global Statement, Exception Handling, A Short Program: Guess the Number	
MODULE –3	10 Hrs.
Classes and objects: Programmer-defined types, Attributes, Rectangles, Instances as return values, Objects are mutable, Copying Classes and functions: Time, Pure functions, Modifiers, Prototyping versus planning Classes and methods: Object-oriented features, Printing objects, Another example, A more complicated example, The init method, The __str__ method, Operator overloading, Type-based dispatch, Polymorphism, Interface and implementation	
MODULE – 4	10 hrs.
Debugging: Raising Exceptions, Getting the Traceback as a String, Assertions, Logging, IDLE's Debugger. GUI Programming: Tkinter Introduction, Tkinter and python programming, Widgets: Label, Button, Entry, Scaling, Menu, Check Box, Radio button. Tkinter examples	
Programming Exercises: a. 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.	

- b. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.
2.
 - a. Develop a program to generate Fibonacci sequence of length (N). Read N from the console.
 - b. Write a function to calculate factorial of a number. Develop a program to compute binomial coefficient (Given N and R).
3. Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages.
4.
 - a. Write a program to search an element using linear search.
 - b. Write a program to search an element using binary search.
5. Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with suitable message.
6. Write a Python Event driven Program for file operations Press 1: to open file in read mode 2: open the file in write mode 3: current position of the file pointer #4: Reposition the pointer at the beginning 5: exit.
7. Write an Object oriented Python program to create two Time objects: currentTime, which contains the current time; and breadTime, which contains the amount of time it takes for a bread maker to make bread. Then we'll use addTimeto figure out when the bread will be done. Write the printTime function to display the time when the bread will be done by the bread maker.
8. Define a function which takes TWO objects representing complex numbers and returns new complex number with an addition of two complex numbers. Define a suitable class 'Complex' to represent the complex number. Develop a program to read N ($N \geq 2$) complex numbers and to compute the addition of N complex numbers.
9. Develop a program that uses class Student which prompts the user to enter marks in three subjects and calculates total marks, percentage and displays the score card details. [Hint: Use list to store the marks in three subjects and total marks. Use __init__() method to initialize name, USN and the lists to store marks and total, Use getMarks() method to read marks into the list, and display() method to display the score card details.]
10. Design a simple calculator using GUI.

Text Books

1. Al Sweigart, "Automate the Boring Stuff with Python", 1st Edition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at <https://automateheboringsstuff.com/>) for lambda functions use this link: <https://www.learnbyexample.org/python-lambda-function/>
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015. (Available under CC-BY-NC license at <http://greenteapress.com/thinkpython2/thinkpython2.pdf> (Download pdf/html files from the above link))
3. Core Python Application Programming, Wesley J Chun, 3rd Edition, Pearson Publication, 2016.

Reference Books:

1. R. Nageswara Rao, "Core Python Programming" 3 Edition, Dreamtech Press

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Chalk and talk, use modern tools and projector.
2. Demonstrate and visualize basic data types (list, tuple, dictionary).
3. Use <https://pythontutor.com/visualize.html#mode=edit> in order to visualize the python code
4. Online Videos

Web links and Video Lectures (e-Resources):

- <https://www.learnbyexample.org/python/>
- <https://www.learnpython.org/>
- <https://pythontutor.com/visualize.html#mode=edit>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes for list, tuple, string dictionary slicing operations using below link:
https://github.com/sushantkhara/Data-Structures-And-Algorithms-with-Python/raw/main/Python%203%20_%20400%20exercises%20and%20solutions%20for%20beginners.pdf

3.BASICS OF JAVA PROGRAMMING

CourseTitle		BASICS TO JAVA PROGRAMMING	
CourseCode	: 22PLC15C	L-T-P-C	(2-0-2)3
SEEHours	:03	Hours/ Week	:04
CIE(Theory) Marks	: 30	CIE (Practicals) Marks	: 20
SEE	: 50Marks	TotalHours	: 40
CourseObjective: Implement object-oriented concepts using Java.			
CourseOutcomes(COs): Upon Completion of the course, student shall be able to:			
#	CourseOutcomes		Mapping to POs
1.	Explain the features and object-oriented concepts in Java programming		PO1

2.	Analyze/Debug the given program to get proper output	PO2
3.	Develop a java program(s) for simple real-world problem(s)	PO3
CourseContents:		
MODULE-1		10Hrs
Java programming fundamentals – The Java Language, The key attributes of Object Oriented programming, Java Development Kit (JDK), JVM, A first Simple program, handling syntax errors, The Java Keywords, Identifies in Java. Introducing Data Types Java's Primitive Types, Literals, A Closer Look at Variables, The Scope and Lifetime of Variables, operators, Shorthand Assignments, Type conversion in Assignments, Using Cast, Operator Precedence, Expressions. Program Control Statements: Input characters from the Keyboard, if statement, Nested ifs, if-else-if Ladder, Switch Statement, Nested switch statements, for Loop, Enhanced for Loop, While Loop, do-while Loop, Use break, Use continue, Nested Loops.		
MODULE-2		10Hrs
Introducing Classes, Objects and Methods: Class Fundamentals, How Objects are Created, Reference Variables and Assignment, Methods, Returning from a Method, Returning Value, Using Parameters, Constructors, Parameterized Constructors, The new operator Revisited, Garbage Collection. The this Keyword. More Data Types and Operators: Arrays, Multidimensional Arrays, Alternative Array Declaration Syntax, Assigning Array References, Using the Length Member, The For- each Style for Loop, Strings, The Bitwise operators.		
MODULE-3		10Hrs
A Closer Look at Methods and Classes: Controlling Access to Class Members, Pass Objects to Methods, How Arguments are passed, Returning Objects, Method Overloading, Overloading Constructors, Recursion, Understanding Static, Introducing Nested and Inner Classes, Varargs: Variable- Length Arguments. Inheritance: Inheritance Basics, Member Access and Inheritance, Constructors and inheritance, Using super to Call Superclass constructors, Using super to Access Superclass Members, Creating a Multilevel Hierarchy, When are Constructors Executed, Superclass References and Subclass Objects, Method Overriding, Overridden Methods support polymorphism,		
MODULE-4		10Hrs
Interfaces: Interface Fundamentals, Creating an Interface, Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Constants in Interfaces, Interfaces can be extended, Nested Interfaces Packages: Package Fundamentals, Packages and Member Access, Importing Packages, Static import. Exception Handling: The Exception Hierarchy, Exception Handling Fundamentals, The Consequences of an Uncaught Exception, using Multiple catch clauses, Catching subclass Exceptions, try blocks can be nested, Throwing an Exception, A Closer look at Throwable, using finally, using throws, Java's Built-in Exceptions.		
TextBook: 1. Java Fundamentals, A comprehensive Introduction by Herbert Schildt, Dale Skrien. Tata McGraw Hill Edition 2013 2. Java –The complete Reference, by Herbert Schildt Eight Edition Tata McGraw Hill Education		

MOOC:

1. <http://nptel.ac.in/courses/106106147/>
2. http://www.nptelvideos.com/java/java_video_lectures_tutorials.php
3. https://www.youtube.com/watch?v=0KL_zftem4g
4. <https://www.coursera.org/specializations/object-oriented-programming>

Practical Programs :

1. Develop a JAVA program to provide all real solutions to the quadratic equation $ax^2+bx+c=0$. Read a, b, c and use the quadratic formula.
2. Develop a JAVA program for multiplication of two arrays.
3. Demonstrate the following operations and sign extension with Java programs (i) << (ii) >> (iii) >>>
4. Develop a JAVA program to sort list of elements in ascending and descending order.
5. Create a JAVA class called Student with the following details as variables within it.

USN, NAME, BRANCH, PHONE and PERCENTAGE

Develop a JAVA program to create n Student objects and print the USN, Name, Branch, Phone, and percentage of these objects with suitable headings.

6. Develop a JAVA program to demonstrate Method overloading and Constructor overloading.
7. Create a super class called Staff with details as StaffId, Name, Phone, Salary. Extend this class by three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Develop a JAVA program to read and display at least 3 staff objects of all three categories.
8. Demonstrate dynamic dispatch using abstract class in JAVA.
9. Create two packages P1 and P2. In package P1, create class A, class B inherited from A, class C. In package P2, create class D inherited from class A in package P1 and class E. Demonstrate working of access modifiers (private, public, protected, default) in all these classes using JAVA.
10. Develop a JAVA program to read two integers a and b. Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero. Also demonstrate working of ArrayIndexOutOfBoundsException.

4. INTRODUCTION TO C++ PROGRAMMING

Course Title	INTRODUCTION TO C++ PROGRAMMING		
Course Code	22PLC152/22PLC252	L-T-P-C	2-0-2-3
Exam Hrs.	3 Hrs.	Hours / Week	3

SEE	50 Marks	Total hours	40
Course Objective : Students will understand Object oriented concepts and will be able to solve real world problems.			
Course Outcomes (COs) : Upon completion of the course, students shall be able to			
#	Course outcomes	Mappingto POs	
1.	Elucidate the object oriented programming concepts.	PO1	
2.	Apply Object Oriented Programming concepts to solve a given problem.	PO1, PO2	
3.	Design the solution to a real world problem using Object Oriented programming concepts.	PO1, PO2, PO3, PO9, PO10	
Course Contents:			
MODULE – 1			10 Hrs.
Introduction to Object Oriented Programming: Computer programming background- C++ overview. First C++ Program -Basic C++ syntax, Object Oriented Programming: What is an object, Classes, methods and messages, abstraction and encapsulation, inheritance, abstract classes, polymorphism.			
Textbook 1: Chapter 1(1.1 to 1.8)			
MODULE – 2			10 Hrs.
Functions in C++: Tokens – Keywords – Identifiers and constants – Operators in C++ – Scope resolution operator – Expressions and their types – Special assignment expressions – Function prototyping – Call by reference – Return by reference – Inline functions -Default arguments – Function overloading, I/O Streams - cin, cout objects.			
Textbook 2: Chapter 3(3.2,3.3,3.4,3.13,3.14,3.19, 3.20) , chapter 4(4.3,4.4,4.5,4.6,4.7,4.9)Chapter 12(12.5)			
MODULE – 3			10 Hrs.
Inheritance & Polymorphism: Derived class Constructors, destructors-Types of Inheritance- Defining Derived classes, Single Inheritance, Multiple, Hierarchical Inheritance, HybridInheritance.			
Textbook 2: Chapter 6 (6.2,6.11) chapter 8 (8.1 to,8.8)			
MODULE –4			10 Hrs.
Exception Handling: Introduction to Exception - Benefits of Exception handling- Try and catch block Throw statement- Pre-defined exceptions inC++.			
Textbook 2: Chapter 13 (13.2 to13.6)			

Text Books:

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

Reference Books:

1. **Herbert Schildt: The Complete Reference C++, 4th Edition, Tata McGraw Hill, 2003.**
2. **K.R. Venugopal, Raj kumar Buyya, T Ravishankar : Mastering C++, Tata McGraw Hill, 1999.**

MOOCs:

1. https://onlinecourses.nptel.ac.in/noc22_cs103/preview
2. <https://archive.nptel.ac.in/courses/106/105/106105151/>
3. <https://archive.nptel.ac.in/courses/106/105/106105234/>

Programming Assignments:

1.	Write a C++ program to sort the elements in ascending and descending order.
2.	Write a C++ program to find the sum of all the natural numbers from 1 to n.
3.	Write a C++ program to swap 2 values by writing a function that uses call by reference technique.
4.	Write a C++ program to demonstrate function overloading for the following prototypes. add(int a, int b) add(double a, double b)
5.	Create a class named Shape with a function that prints "This is a shape". Create another class named Polygon inheriting the Shape class with the same function that prints "Polygon is a shape". Create two other classes named Rectangle and Triangle having the same function which prints "Rectangle is a polygon" and "Triangle is a polygon" respectively. Again, make another class named Square having the same function which prints "Square is a rectangle". Now, try calling the function by the object of each of these classes.

6.	Suppose we have three classes Vehicle, FourWheeler, and Car. The class Vehicle is the base class, the class FourWheeler is derived from it and the class Car is derived from the class FourWheeler. Class Vehicle has a method 'vehicle' that prints 'I am a vehicle', class FourWheeler has a method 'fourWheeler' that prints 'I have four wheels', and class Car has a method 'car' that prints 'I am a car'. So, as this is a multi-level inheritance; we can have access to all the other classes methods from the object of the class Car. We invoke all the methods from a Car object and print the corresponding outputs of the methods. So, if we invoke the methods in this order, car(), fourWheeler(), and vehicle(), then the output will be I am a car I have four wheels I am a vehicle Write a C++ program to demonstrate multilevel inheritance using this.
7.	Write a function which throws a division by zero exception and catch it in catch block. Write a C++ program to demonstrate usage of try, catch and throw to handle exception.
8.	Write a C++ program function which handles array of bounds exception using C++.

MATHEMATICS FOR SECOND SEMESTER B. E.

Course Title	MATHEMATICS FOR CIVIL ENGINEERING-2		
Course Code	22MATC21	L-T-P-C	(3-1-2-4)
SEE duration	3 hours	Hours / Week	06
CIE (Theory) marks	30	CIE (Practicals)/Activity marks	20
SEE marks	50	Total contact hours	70
Course Objective: To train the students to acquire knowledge in Differential equations and vector calculus so as to solve basic engineering application problems. Course Outcomes (COs): At the end of course, student will be able to			
COs	Outcomes	PO1	PO2
CO1	Apply suitable methods to solve the simple problems of ordinary differential equations/partial differential equations and vector calculus, analytically/numerically.	3	-
CO2	Examine the higher order problems (more difficult problems) that are connected with differential equations/partial differential equations and solve.	3	2
CO3	Introspect the geometry of the region to compute the vector integration problems of gauss divergence theorem, stokes theorem, greens theorem.	3	2
CO4	Model the real-life problems/ Engineering application problems and hence solve the same.	3	2
Course Contents:			
MODULE –1			10 Hrs.

Differential Equations of First order First Degree (DE): Solution of exact differential equations, Higher Order Differential Equations , Linear differential equation with constant coefficients - Solutions of homogeneous equations. Particular solution of non- homogenous differential equations by inverse differential operator method for the following standard forms, exponential, polynomial, trigonometric and their product. Self – study: Linear differential equations, Bernoulli’s differential equations. Method of variation of parameters to solve linear differential equation with constant coefficients. Matrix method to solve homogeneous differential equations of order 2, degree 1. Orthogonal trajectories in Cartesian form, illustrative examples.	
MODULE –2	10 Hrs.
Numerical solution of first order, first degree ODE: Taylor’s series method, Runge-Kutta (RK) method of fourth order, Milne’s predictor corrector methods. Partial Differential Equations: Solving PDE by variable separable method, To find all possible solutions of one-dimensional wave equation, solution of system of equations by Gauss -Seidel iteration method. Numerical solution of a Laplace equation, Poisson equation by finite difference approximation method using standard five point formula, diagonal formula and iterative formulas. Self-study: To find all possible solutions of one-dimensional heat equation, two-dimensional Laplace equation. Numerical solution of Simultaneous differential equations, numerical solution of second order differential equations by RK method.	
MODULE –3	10 Hrs.
Vector Calculus: Velocity & acceleration of a vector point function, moment of a force, velocity of a rotating body, rotation of rigid body, Gradient, divergence & curl. Physical & Geometrical Interpretation of dot product, Gradient, divergence & curl, irrotational vectors, illustrative examples from engineering field.	

Line integrals, surface integrals and volume integrals, Statement of Green's theorem, Stoke's theorem and Illustrative examples from engineering field.

Self – study: Gauss divergence theorem, Illustrative examples from engineering field.

MODULE – 4

10 hrs.

Applications in civil engineering:

Mathematical modelling through differential equations of first order first degree and solution-modelling of population growth, finding initial velocity of the space vehicle so that it has to escape from earth. Modelling of inflected diseases, carbon dating half-life period, mixing problem involving one tank, two tank.

Applications of second order, first degree Differential equations -Applications of second order, first degree Differential equations –Mechanical Vibrations-A Spring mass system $mu''(t) + ku'(t) + gu(t) = f(t)$ -Undamped free vibrations, damped free vibrations, forced vibrations with damping, --forced vibrations without damping,

Applications to find the orthogonal trajectories -streamlines of flow in the channel, curves of constant temperature in a body. equi-potential lines in an electric field between two concentric cylinders.

Self-study- Application of first order differential equation- Autonomous equation and population dynamics-Application- Logistic model- Natural growth of halibut population in certain areas of Pacific Ocean, Harvesting a renewable resource. motion of a simple pendulum, Deflection of beams.

Modelling projectile motion(vector approach),

List of Programmes:

1. Solution of first order ordinary differential equation using Taylor series & RK method.
2. Solution of partial differential equation (Laplace&Poisson equations)
3. Finding gradient , divergence and curl.
4. Computation of area, volume and center of gravity.
5. Verification of Green's theorem in vector integration.

6. Solution of system of equations by Gauss elimination method.
7. Solution of 2nd order differential equations (by variation of parameter method).
8. Numerical solution of simultaneous differential equations by RK method.
9. Solution of system of linear equations using Gauss-Seidal iteration method.
10. Product of a matrices & finding Inverse of a matrix.

Text Books :

1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 44th edition, 2016.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India Pvt. Ltd. 8th Edition (Wiley student edition) 2004.

Reference Books:

1. Calculus by Thomas Finney, 9th edition, Pearson education, 2002.
2. R K. Jain and S. R. K. Jain & S. R. K. Iyengar, Numerical methods, New age international pvt. Publishers, 6th edition, 2014.
3. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010

Course Title	MATHEMATICS FOR MECHANICAL ENGINEERING -2		
Course Code	22MATM21	(L-T-P)C	(3-1-2-4)
SEE duration	3 hours	Hours / Week	06
CIE (Theory) marks	30	CIE (Practicals)/Activity marks	20
SEE marks	50	Total contact hours	70

Course Objective: To train the students to acquire knowledge in differential equations and vector calculus so as to solve basic engineering application problems.

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

COs	Outcomes	PO1	PO2
CO1	Apply suitable methods to solve the simple problems of ordinary differential equations/partial differential equations and vector calculus, analytically/numerically.	3	-
CO2	Examine the higher order problems (more difficult problems) that are connected with differential equations/partial differential equations and solve.	3	2
CO3	Introspect the geometry of the region to compute the vector integration problems of gauss divergence theorem, stokes theorem, greens theorem.	3	2
CO4	Model the real-life problems/ Engineering application problems and hence solve the same.	3	2

Course Contents:

MODULE –1	10 Hrs.
Differential Equations of First order First Degree (DE): Solution of exact differential equations. Higher Order Differential Equations Linear differential equation with constant coefficients - Solutions of homogeneous equations. Particular solution of non - homogenous differential equations by inverse differential operator method for the following standard forms; exponential, polynomial, trigonometric and their product. Self-study: Linear differential equations, Bernoulli's differential equations. Method of variation	

of parameters to solve linear differential equation with constant coefficients. Matrix method to solve homogeneous differential equations of order 2, degree 1. Orthogonal trajectories in Cartesian form, illustrative examples	
MODULE –2	10 Hrs.
Numerical solution of first order, first degree ODE: Taylor series method, Runge-Kutta (RK) method of fourth order, Milne's predictor corrector methods. Partial Differential Equations: Solving PDE by variable separable method, To find all possible solutions of one-dimensional wave equation, solution of system of equations by Gauss Seidel iteration method. Numerical solution of a Laplace equation, Poisson equation by finite difference approximation method--using standard five point formula, diagonal formula and iterative formulas. Self – study: To find all possible solutions of one-dimensional heat equation, two-dimensional Laplace's equation. Numerical solution of Simultaneous differential equations, numerical solution of second order differential equations by RK method.	
MODULE –3	10 Hrs.
Vector Calculus: Velocity & acceleration of a vector point function, moment of a force, velocity of a rotating body, rotation of rigid body, Gradient, divergence & curl. Physical & Geometrical Interpretation of dot product, Gradient, divergence & curl, irrotational vectors, illustrative examples from engineering field. Line integrals, surface integrals and volume integrals, Statement of Green's theorem, Stokes theorem and Illustrative examples from engineering field. Self -study: Gauss divergence theorem, Illustrative examples from engineering field.	
MODULE – 4	10 hrs.
Applications in Mechanical Engineering: Mathematical modelling through differential equations of first order first degree and solution-modelling of population growth, Modelling of inflected diseases, carbon dating-half-life period, mixing problem involving one tank, two tank. Newton's law of cooling, to compute the time	

required to drain the tank, resistance force opposing the motion, growth and decay-radioactivity.

Applications of second order, first degree Differential equations -Applications of second order, first degree Differential equations –Mechanical Vibrations-A Spring mass system $mu''(t) + ku'(t) + gu(t) = f(t)$ -Undamped free vibrations, damped free vibrations, forced vibrations with damping, --forced vibrations without damping, Applications to find the orthogonal trajectories - streamlines of flow in the channel, curves of constant temperature in a body. equi-potential lines in an electric field between two concentric cylinders.

Self-study- Application of first order differential equation- Autonomous equation and population dynamics-Application- Logistic model- Natural growth of halibut population in certain areas of pacific ocean, Harvesting a renewable resources. Application of eigen values of 2×2 matrices.

Modelling projectile motion(vector approach).

List of Programmes:

1. Solution of first order ordinary differential equation using Taylor series & RK method.
2. Solution of partial differential equation (Laplace&Poisson equations)
3. Finding gradient , divergence and curl.
4. Computation of area, volume and center of gravity.
5. Verification of Green's theorem in vector integration.
6. Solution of system of equations by Guass elimination method.
7. Solution of 2^{nd} order differential equations(by variation of parameter method).
8. Numerical solution of simultaneous differential equations by RK method.
9. Solution of system of linear equations using Guass-Seidal iteration method.
10. Product of a matrices & finding Inverse of a matrix.

Text Books :

- 1.Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 44th edition, 2016.
- 2.Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India Pvt. Ltd. 8th Edition (Wiley student edition) 2004.

Reference Books:

1. Calculus by Thomas Finney, 9th edition, Pearson education, 2002.

2. R. K. Jain and S. R. K. Jain & S. R. K. Iyengar, Numerical methods, New age international pvt. Publishers, 6th edition, 2014.

3. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010

Course Title	MATHEMATICS FOR ELECTRICAL AND ELECTRONICS ENGINEERING STREAM-2		
Course Code	22MATE21	(L-T-P)C	(3-1-2-4)
SEE duration	3 hours	Hours / Week	06
CIE (Theory) marks	30	CIE (Practicals)/Activity marks	20
SEE marks	50	Total contact hours	70

Course Objective: To train the students to acquire knowledge in differential equations and vector calculus so as to solve basic engineering application problems.

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

COs	Outcomes	PO1	PO2	
CO1	Apply suitable methods to solve the simple problems of ordinary differential equations/partial differential equations and vector calculus, analytically/numerically.	3	-	
CO2	Examine the higher order problems (more difficult problems) that are connected with differential equations/partial differential equations and solve.	3	2	

CO3	Introspect the geometry of the region to compute the vector integration problems of gauss divergence theorem, stokes theorem, greens theorem.	3	2
CO4	Model the real-life problems/ Engineering application problems and hence solve the same.	3	2
Course Contents:			
MODULE –1			10 Hrs.
Differential Equations of First order First Degree (DE): Solution of exact differential equations. Higher Order Differential Equations , Linear differential equation with constant coefficients - Solutions of homogeneous equations. Particular solution of non - homogenous differential equations by inverse differential operator method for the following standard forms; exponential, polynomial, trigonometric and their product. Self-study: Linear differential equations, Bernoulli's differential equations. Method of variation of parameters to solve linear differential equation with constant coefficients. Matrix method to solve homogeneous differential equations of order 2, degree 1. Orthogonal trajectories in Cartesian form, illustrative examples.			
MODULE –2			10 Hrs.
Numerical solution of first order, first degree ODE: Taylor series method, Runge-Kutta (RK) method of fourth order, Milne's predictor corrector methods. Partial Differential Equations: Solving PDE by variable separable method, To find all possible solutions of one-dimensional wave equation, solution of system of equations by Gauss Seidel iteration method. Numerical solution of a Laplace equation, Poisson equation by finite difference approximation method--using standard five point formula, diagonal formula and iterative formulas. Self – study: To find all possible solutions of one-dimensional heat equation, two-dimensional Laplace's equation. Numerical solution of Simultaneous differential equations, numerical solution			

of second order differential equations by RK method.	
MODULE –3	10 Hrs.
Vector Calculus: Velocity & acceleration of a vector point function, moment of a force, velocity of a rotating body, rotation of rigid body, Gradient, divergence & curl. Physical & Geometrical Interpretation of dot product, Gradient, divergence & curl, irrotational vectors, illustrative examples from engineering field. Line integrals, surface integrals and volume integrals, Statement of Green's theorem, Stokes theorem and Illustrative examples from engineering field. Self – study: Gauss divergence theorem, Illustrative examples from engineering field.	
MODULE – 4	10 hrs.
Applications in Electrical Engineering: Mathematical modelling through differential equations of first order first degree and solution-modelling of population growth, carbon dating half-life period, mixing problem involving one tank, two tank. voltage in a discharging capacitor. Modelling using difference equations- Growth of a Yeast Culture, spread of a Contagious Disease, Decay of Digoxin in the Blood stream, Solutions to Dynamical system .Linear dynamical system $a_{n+1} = ra_n$, $a_{n+1} = ra_n + b_n$, Sewage Treatment, Prescription for Digoxin.Applications of second-order differential equations $lQ''(t) + RQ'(t) + \frac{1}{C}Q(t) = E(t)$.-transient analysis of electrical net works, Modelling projectile motion(vector approach). Self Study-Introduction to graph theory, types of graphs, subgraphs, trees, spanning subgraphs, shortest path algorithms. List of Programmes: 1. Solution of first order ordinary differential equation using Taylor series & RK method. 2. Solution of partial differential equation (Laplace&Poisson equations)	

3. Finding gradient , divergence and curl.
4. Computation of area, volume and center of gravity.
5. Verification of Green's theorem in vector integration.
6. Solution of system of equations by Guass elimination method.
7. Solution of 2nd order differential equations(by variation of parameter method).
8. Numerical solution of simultaneous differential equations by RK method.
9. Solution of system of linear equations using Guass-Seidal iteration method.
10. Product of a matrices & finding Inverse of a matrix.

Text Books :

1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 44th edition, 2016.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India Pvt. Ltd. 8th Edition (Wiley student edition) 2004.

Reference Books:

1. Calculus by Thomas Finney, 9th edition, Pearson education, 2002.
2. R K. Jain and S. R. K. Jain & S. R. K. Iyengar, Numerical methods, New age international pvt. Publishers, 6th edition, 2014.
3. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010

Course Title	MATHEMATICS FOR COMPUTER SCIENCE ENGINEERING STREAM -2		
Course Code	22MATS21	(L-T-P)C	(3-1-2-4)
SEE duration	3 hour	Hours / Week	06
CIE (Theory) marks	30	CIE (Practicals)/Activity marks	20
SEE marks	50	Total contact hours	70

Course Objective: To train the students to acquire knowledge in differential equations and vector calculus, so as to solve basic engineering application problems.

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

COs	Outcomes	PO1	PO2
CO1	Apply suitable methods to solve the simple problems of ordinary differential equations/partial differential equations and vector calculus, number theory, analytically/numerically.	3	-
CO2	Examine the higher order problems (more difficult problems) that are connected with differential equations/partial differential equations and solve.	3	2
CO3	Introspect the geometry of the region to compute the vector integration problems of gauss divergence theorem, stokes theorem, greens theorem.	3	2
CO4	Model the real-life problems/ Engineering application problems and hence solve the same.	3	2

Course Contents:

MODULE –1	10 Hrs.
Differential Equations of First order First Degree (DE): Solution of exact differential equations. Higher Order Differential Equations Linear differential equation with constant coefficients - Solutions of homogeneous equations. Particular solution of non - homogenous differential equations by inverse differential operator method for the following standard forms; exponential, polynomial, trigonometric and their product. Self – study: Linear differential equations, Bernoulli’s differential equations. Method of variation	

of parameters to solve linear differential equation with constant coefficients. Matrix method to solve homogeneous differential equations of order 2, degree 1. Orthogonal trajectories in Cartesian form, illustrative examples.	
MODULE –2	10 Hrs.
Numerical solution of first order, first degree ODE: Taylor series method, Runge-Kutta (RK) method of fourth order, Milne's predictor corrector methods. Partial Differential Equations: Solving PDE by variable separable method, To find all possible solutions of one-dimensional wave equation, solution of system of equations by Gauss Seidel iteration method. Numerical solution of a Laplace equation, Poisson equation by finite difference approximation method using standard five point formula, diagonal formula and iterative formulas. Self–study: To find all possible solutions of one-dimensional heat equation, two-dimensional Laplace's equation. Numerical solution of Simultaneous differential equations, numerical solution of second order differential equations by RK method.	
MODULE –3	10 Hrs.
Vector Calculus: Velocity & acceleration of a vector point function, moment of a force, velocity of a rotating body, rotation of rigid body, Gradient, divergence & curl. Physical & Geometrical Interpretation of dot product, Gradient, divergence & curl, irrotational vectors, illustrative examples from engineering field. Line integrals, surface integrals and volume integrals, Statement of Green's theorem, Stokes theorem and Illustrative examples from engineering field. Self – study: Gauss divergence theorem, Illustrative examples from engineering field.	
MODULE – 4	10 hrs.
Applications in computer science engineering: Mathematical modelling through differential equations of first order first degree and solution-modelling of population growth, carbon dating-half-life period, mixing problem involving one tank, two tank.	

To measure the change over all concentration of glucose in blood when glucose is fed. continuous compounding.

Number theory -Properties of integers- division algorithm, GCD and LCM, Congruence relations, residue classes, congruence equations, applications of congruences on cryptography.

Self study- Application of line integral- finding projectile height from its acceleration, initial velocity, initial position. Applications connected with Differential equations and vector calculus.

List of Programmes:

1. Solution of first order ordinary differential equation using Taylor series & RK method.
2. Solution of partial differential equation (Laplace&Poisson equations)
3. Finding gradient, divergence and curl.
4. Computation of area, volume and center of gravity.
5. Verification of Green's theorem in vector integration.
6. Solution of system of equations by Gauss elimination method.
7. Solution of 2nd order differential equations(by variation of parameter method).
8. Numerical solution of simultaneous differential equations by RK method.
9. Solution of system of linear equations using Gauss-Seidal iteration method.
10. Product of a matrices & finding Inverse of a matrix.

Text Books :

- 1.Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 44th edition, 2016.
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Reference Books:

- 1.Calculus by Thomas Finney, 9th edition, Pearson education, 2002.
- 2.R K. Jain and S. R. K. Jain & S. R. K. Iyengar, Numerical methods, New age international pvt. Publishers, 6th edition, 2014.
- 3.N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications,

PROFESSIONAL WRITING SKILLS IN ENGLISH

Course Title:	PROFESSIONAL WRITING SKILLS IN ENGLISH		
Course Code:	22PWS26	CIE Marks	50
Teaching Hours/Week (L:T:P: C)	1:0:0:0	SEE Marks	50
		Total Marks	100
		Exam Hours	03 hours
		Credits	01
Total Hours of Pedagogy	15 hours		
Course objectives: The course Professional Writing Skills in English (22PWS26) will enable the students, 1. To Identify the Common Errors in Writing and Speaking of English. 2. To Achieve better Technical writing and Presentation skills foremployment. 3. To read Technical proposals properly and make them to write good technicalreports. 4. To Acquire Employment and Workplace communicationskills. 5. To learn about Techniques of Information Transfer through presentation in differentlevel.			
Course Outcomes			
CO1	To understand and identify the Common Errors in Writing and Speaking.		
CO2	To Achieve better Technical writing and Presentation skills.		
CO3	To read Technical proposals properly and make them to Write good technical reports.		
CO4	Acquire Employment and Workplace communication skills.		
CO5	To learn about Techniques of Information Transfer through presentation in different level.		
Teaching-Learning Process These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective: Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools and software’s to meet the present requirements of the Global employment market. (i) Direct instructional method (Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation based learning, (v) Personalized learning, (vi) Problems based learning through discussion, (vii) Following the method of expeditionary learning Tools and techniques, (viii) Use of audio visual methods through language Labs in teaching of of LSRW skills. Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills in teaching of communicative skills in general.			

Language Lab : To augment LSRW, grammar and Vocabulary skills (Listening, Speaking, Reading, Writing and Grammar, Vocabulary) through tests, activities, exercises etc., comprehensive web-based learning and assessment systems can be referred as per the AICTE / VTU guidelines.	
Module-1	(04 hours)
Identifying Common Errors in Writing and Speaking English : Common errors identification in parts of speech, Use of verbs and phrasal verbs, Auxiliary verbs and their forms, Subject Verb Agreement (Concord Rules), Common errors in Subject-verb agreement, Sequence of Tenses and errors identification in Tenses. Words Confused/Misused.	
Module-2	(04 hours)
Nature and Style of sensible writing: Organizing Principles of Paragraphs in Documents, Writing Introduction and Conclusion, Importance of Proper Punctuation, Precise writing and Techniques in Essay writing, Sentence arrangements and Corrections activities. Misplaced modifiers, Contractions, Collocations, Word Order, Errors due to the Confusion of words.	
Module-3	(04 hours)
Technical Reading and Writing Practices: Technical writing process, Introduction to Technical Reports writing, Significance of Reports, Types of Reports. Introduction to Technical Proposals Writing, Types of Technical Proposals, Characteristics of Technical Proposals. Scientific Writing Process. Grammar – Voices and Reported Speech, Spotting Error & Sentence Improvement, Cloze Test and Theme Detection Exercises.	
Module-4	(04 hours)
Professional Communication for Employment: Listening Comprehension, Types of Listening, Listening Barriers, Improving Listening Skills. Reading Comprehension, Tips for effective reading. Job Applications, Types of official/employment/business Letters, Resume vs. Bio Data, Profile, CV. Writing effective resume for employment, Emails, Blog Writing and Memos. Professional Communication at Workplace: Group Discussion and Professional Interviews, Characteristics and Strategies of a GD and PI's, Intra and Interpersonal Communication Skills at workplace, Non-Verbal Communication Skills and its importance in GD and Interview. Presentation skills and Formal Presentations by Students, Strategies of Presentation Skills.	

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation(CIE):**Two Unit Tests each of 30 Marks (duration 01 hour)**

First test after the completion of 30-40 % of the syllabus

Second test after completion of 80-90% of the syllabus

One

Improvement test before the closing of the academic term may be conducted if necessary. However best two tests out of three shall be taken into consideration

Two assignments each of 20 Marks

The teacher has to plan the assignments and get them completed by the students well before the closing of the term so that marks entry in the examination portal shall be done in time. Formative (Successive) Assessments include Assignments/Quizzes/Seminars/ Course projects/Field surveys/ Case studies/ Hands-on practice (experiments)/Group Discussions/ others. The Teachers shall choose the types of assignments depending on the requirement of the course and plan to attain the Cos and POs.(To have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE.Each method of CIE should have a different syllabus portion of the course). CIE methods /test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The sum of two tests, two assignments, will be out of 100 marks and will be scaled down to 50 marks

Semester End Examinations (SEE)

SEE paper shall be set for **50 questions, each of the 01 mark**. The pattern of the **question paper is MCQ** (multiple choice questions). The time allotted for SEE is **01 hour**. The student must secure a minimum of 35% of the maximum marks for SEE.

Suggested Learning Resources:**Textbook:**

“Professional Writing Skills in English” published by Fillip Learning – Education (ILS), Bangalore –2022.

“Functional English” (As per AICTE 2018 Model Curriculum) (ISBN-978-93-5350-047-4) Cengage learning India Pvt Limited [Latest Edition2019].

Reference Books:

English for Engineers by N.P.Sudharshana and C.Savitha, Cambridge University Press –2018.

Technical Communication by Gajendra Singh Chauhan and Et al, (ISBN-978-93-5350-050-4), Cengagelearning India Pvt Limited [Latest Revised Edition] -2019.

Technical Communication – Principles and Practice, Third Edition by Meenakshi Raman and SangeethaSharma, Oxford University Press2017.

High School English Grammar & Composition by Wren and Martin, S Chandh& Company Ltd –2015.

Effective Technical Communication – Second Edition by M Ashraf Rizvi, McGraw-Hill Education (India)Private

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Contents related activities (Activity-baseddiscussions)

For active participation of students instruct the students to prepare Flowcharts andHandouts

Organising Group wise discussions Connecting to placementactivities

Quizzes and Discussions, Seminars andassignments

PROGRAMMING USING C				
Course Code	: 22PPC13/23		L-T-P-C	: 2-0-2-3
Exam. Hours	: 03		Hours / Week	: 04
SEE	: 50 Marks		Total hours	: 40
Course Objective :	To provide fundamental programming concepts which are essential to develop program for a given problem.			
Course Outcomes (COs) :	Upon Completion of the course, students shall be able to:			
COs	Statement			POs
1.	Describe the concepts of C programming			PO1
2.	Apply C programming constructs to solve a given problem			PO1, PO2
3.	Analyze the given program to determine the output and its correctness			PO1, PO2
4.	Develop programs to find a solution for the given real world problems			PO1, PO2, PO9, PO10
Course Contents:				
MODULE – 1				10 Hrs
Introduction:Importance of C,Basic structure of C program,executing a C program,Characters set,C tokens,Variables,Data types,Operators,Expressions,Evaluation of expressions,Operator precedence and associativity, Type conversion, Managing Input and Output Operations.				
MODULE – 2				10 Hrs
Decision making and Branching: Simple if, if..else, nested if and else if...ladder statements. Switch statement, The ?: operator. Decision making and Looping: Jumps in Loops, programming examples, Nested loops.				
MODULE – 3				10 Hrs
Arrays: One-dimensional Arrays, Two-dimensional Arrays, Character Arrays, Arithmetic operation on characters, String handling functions. User-defined Functions: Elements of User defined function, Category of functions.				
MODULE – 4				10 Hrs
Parameters passing in functions: call by value and call by reference, Passing arrays to functions, Passing strings to functions. Structures: Defining a structure, Declaring a structure variable, Accessing structure members, Structure initialization, Operations on individual members, Arrays of structure Pointers: Understanding pointers, Accessing the address of a variable, Declaring pointer variables, Initialization of pointer variables, Accessing a variable through its pointers, Pointer expressions, Pointers increments and scale factor, Pointers and arrays, Pointers as function Arguments. Files: Introduction to files, Using files in C, Reading and Writing data files.				
Text Book:				

	Balagurusamy E, Programming in ANSI C, 8 th Edition, Tata Mc Graw Hill, 2013.
Reference Books:	
1.	Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, 2 nd Edition, PHI, 2012.
2.	Programming Techniques through C, M. G. Venkatesh Murthy, Pearson Education, 2014

Practice Programs											
1.	a. Write a C program to read length of the sides of a triangle and find its area. b. Write a C program to read radius of a circle and find its area and circumference										
2.	An employee gets DA 90% of basic salary; HRA 15% of basic salary, CA 5% of basic salary. And also employee has to pay income tax of 10% of gross salary (Gross salary = Basic Salary + DA + HRA + CA). Write a C program to read the basic salary of an employee and find the take home salary of the employee. (Take home salary = gross salary – income tax)										
3.	Heights of three students in a class are h1, h2 and h3. Write a C program to find the tallest among three students using nested if else statement.										
4.	Read first name, middle name and last name of a person. Write a C program to concatenate first name with middle name without using built-in function. And concatenate the resultant string with last name using built-in function.										
Guided Laboratory Experiments											
1.	Quadratic equation is given by $ax^2+bx+c=0$, where a, b and c are the coefficients, provided where $a \neq 0$. The formula to find roots of quadratic equation is $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ Write a C program to find all the roots and test it for all three cases (based on discriminant value)										
2.	A shop keeper requires performing simple calculations like addition, subtraction, multiplication and modulo division for his daily business. Write a C program to design a simple calculator for shop keeper.										
3.	An electric power distribution company charges its domestic consumers as follows: <table border="0"> <tr> <td>Consumption Units</td><td>Rate of Charge</td></tr> <tr> <td>0-200</td><td>Rs. 0.50 per unit</td></tr> <tr> <td>201-400</td><td>Rs. 100 plus Rs. 0.65 per unit excess of 200</td></tr> <tr> <td>401-600</td><td>Rs. 230 plus Rs. 0.80 per unit excess of 400</td></tr> <tr> <td>601 and above</td><td>Rs. 390 plus Rs. 1.00 per unit excess of 600</td></tr> </table> Write a C program to read the customer number, power consumed and display the amount to be paid by the customer.	Consumption Units	Rate of Charge	0-200	Rs. 0.50 per unit	201-400	Rs. 100 plus Rs. 0.65 per unit excess of 200	401-600	Rs. 230 plus Rs. 0.80 per unit excess of 400	601 and above	Rs. 390 plus Rs. 1.00 per unit excess of 600
Consumption Units	Rate of Charge										
0-200	Rs. 0.50 per unit										
201-400	Rs. 100 plus Rs. 0.65 per unit excess of 200										
401-600	Rs. 230 plus Rs. 0.80 per unit excess of 400										
601 and above	Rs. 390 plus Rs. 1.00 per unit excess of 600										
4.	Sine series is given by $x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots$ upto n terms, where x is an angle in radian. Write a C program to find sine value for a given angle. Also verify calculated sine value using built-in function.										
5.	A person wants to register his newly purchased car. He is passionate to have a palindromic number for car registration. Write a C program to check whether the number allotted is palindrome or not.										

6.	Given a list of n student's weight, write a C program to find a student with given weight. If found, display the position of the student in the list else displaysuitable message.
7.	Given twomatrices, write a C program to check whether the matricesare multipliable, if so find the product matrix, otherwise display suitable message.
8.	Given a matrix, write a C program to find its transpose. Also find sum of upper triangle elements and sum of lower triangle elements of the transposed matrix.
9.	Write a C program to read a string, find number of vowels and consonants in it.
10.	Develop a function to find the factorial of a given number. Using the above function writeaCprogramtofindnCr and nPr where $nCr = \frac{n!}{r!(n-r)!}$ and $nPr = \frac{n!}{(n-r)!}$
11.	Develop a C function to swap two numbers using pointers. Write a C program using the above function to swap two numbers.
12.	Defineastructuredatatypecalledstudentcontainingmembers:name,usn,marksof CIE1, CIE2, CIE3, activity1 and activity2. Write a C program that would assign values to individual members and display them along with the total internal marks of all students where total internal marks is sum of best of two CIE marks, acitvity1 and activity2.
Open ended problems	
1.	Solve a puzzle/game like tic-tac-toe
2.	Read two strings and check whether they are anagram or not
3.	Generate bill in a grocery store
4.	Generate magic square.
5.	Design a car/hut/rainbow using graphics in C.

CourseCode:22CVXXX

L –T-P -C -2- 0-2-3

Exams: 3 Hours

Hours/week -4

CIE: 50 Marks

Total hours=40

SEE: 50Marks

Engineering Drawing

COs	At the end of the course the students will be able to	Mapping to POs
CO1	Understand the basic principles and conventions of engineering drawing	PO1,PO2
CO2	Use drawing as a communication mode	PO2,PO3
CO3	Generate pictorial views using Auto-CAD software	PO2,PO3

CO4	Understand the development of surfaces	PO2,PO3,
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MODULE-1

Introduction:

Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Free hand sketching of engineering drawing, Scales., Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment.

Orthographic Projections of Points, Lines and Planes:

Orthographic projections: Orthographic projections of points in 1st and 3rd quadrants.

Orthographic projections of lines (Placed in First quadrant only).

Orthographic projections of plane triangle, square, rectangle, pentagon, hexagon, and circular lamina (Placed in First quadrant only using change of position method).

10 Hrs

Self-Study Component : Drawings using drafter and also use of different pencils, sizes of drawing sheets.

MODULE-2

Orthographic Projection of Solids:

Orthographic projection of right regular solids (**Solids Resting on HP only**): Prisms & Pyramids (triangle, square, rectangular, pentagonal, hexagonal), Cylinders, and Cones.

10 Hrs

Self-Study Component – Projections of Frustums of cone and pyramid

MODULE-3

Isometric Projections:

Isometric scale, Isometric projection of right regular prisms, pyramids, cylinders, cones and spheres.

Isometric projection of combination of two simple solids.

Perspective Views of Simple Objects and Buildings.

10 Hrs

Self-Study Component – Sign Conventions and Symbols.

MODULE-4

Development of Lateral Surfaces of Solids:

Development of lateral surfaces of right regular prisms, cylinders, pyramids and cones resting

with base on HP only. Development of lateral surfaces of their frustums and truncations.
Problems on applications of development of lateral surfaces like funnels and trays. 10 Hrs

Self-Study Component:- Learn to draw the elevation and plan of buildings.

Text Books

- *S.N. Lal, & T Madhusudhan*., Engineering Visulisation, 1st Edition, Cengage, Publication
- *Parthasarathy N. S., Vela Murali*, Engineering Drawing, Oxford University Press, 2015.

Reference Books

- *Bhatt, N.D.*, *Engineering Drawing: Plane and Solid Geometry*, 53rd edition, Charotar Publishing House Pvt. Limited, 2019.
- *K. R. Gopalakrishna, & Sudhir Gopalakrishna*: Textbook Of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2017

Course Title	MATHEMATICS FOR COMPUTER SCIENCE		
Course Code	22MAC301	L-T-P-C	(2-2-0)3
Exam Hrs.	3	Hours / Week	4
SEE	50 Marks	Total Hours	40
Course Objective: To introduce linear algebra and transform calculus which may be employed as tools in solving engineering application problems. Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Utilize the concept of consistency of system of equations to solve the engineering application problems and compute the number of linearly independent vectors.	1, 2	-
2.	Examine for the existence of diagonalization of matrix, find the suitable matrix of transformations so as to get the required image and analyze the system of equations to compute the number of linearly independent Eigen vectors.	1, 2	-
3.	Apply Laplace transform on simple functions and compute Fourier series of periodic functions.	1	-
4.	Examine for adopting different techniques of integration so as to compute Fourier series, Laplace transform of a given function.	1, 2	-
5.	Model the real life problems/engineering application problems and solve the same.	1, 2	-
Course Contents:			
MODULE – 1			10 Hrs
Linear Algebra: Importance of Matrices in engineering. Rank of a matrix. Consistency of nonhomogeneous and homogeneous system of equations, Solution of the system of linear equations by Gauss elimination method and Gauss – Seidel iterative method. Special matrices-matrix of rotation, reflection, translation. To find the matrix of transformation when the image of some points is given. Applications of solution of system of equations to balance the chemical equations. Self Study-- Traffic flow problem, To find the suitable combination of food stuff so as to get the desired nutrients as prescribed by a dietician.			
MODULE – 2			10 Hrs
Linear Algebra: Eigen values and Eigen vectors, properties, Illustrative examples, applications- Stretching of an elastic membrane, to determine the growth of a population model. Role of eigenvalues, eigenvectors in determining natural frequency, mode shapes of equations of motions (Spring mass system). Diagonalization and powers of 3X3 matrices when Eigen values are already given. <i>Self Study-- Stability analysis of differential equations which governs the dynamical systems using the concept of eigen value, eigen vectors.</i>			
MODULE – 3			10 Hrs
Fourier Series: Periodic functions and their graphical representation, to find Fourier series by change of interval method, To represent the experimental data as a Fourier series using the method - Practical harmonic analysis. application of Fourier series in engineering-To represent the signal (wave form) in terms of Fourier series, Fourier series representation for the excitation described by the wave form, graphs of Fourier series approximating the given function. <i>Self Study-- Half range series method.</i>			

MODULE – 4	10 Hrs
Laplace Transforms: Introduction, Definition, Importance of Laplace transform in engineering applications, properties, Laplace transform of standard functions, Laplace transform of derivatives, Laplace transform of periodic functions, unit-step functions. Inverse Laplace Transforms: Definition and general properties, Convolution theorem – illustrative examples, Initial value problems. To solve Applications of initial value problems in engineering using Laplace transform <i>Self Study-- Unit impulse functions (Dirac – delta function). Application of Fourier series to Laplace equation, heat conduction.</i>	
Note - Theorems and properties without proof. Applicable to all the Modules.	
Text Book : 1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 44th edition, 2016. 2. Linear algebra by David c lay, 3rd edition, Pearson education, 2002.	
Reference Books: 1. R K Jain and S R K Iyengar, Advanced Engineering mathematics by Narosa publishers, 2nd edition, 2005. 2. Calculus by Thomas Finney, 9th edition, Pearson education, 2002. 3. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India Pvt. Ltd. 8th Edition (Wiley student edition) 2004.	
Activities: 1. To represent Sawtooth periodic motion of a follower operated by a Cam which rotates uniformly, in the form of Fourier series. 2. Application of Fourier series to Laplace equation, heat conduction. 3. Fourier series representation for the excitation described by the wave form, 4. Role of eigenvalues, eigenvectors in determining natural frequency, mode shapes of equations of motions (Spring mass system).	

Course Title	DIGITAL DESIGN AND COMPUTER ORGANIZATION		
Course Code	22CS302	L-T-P-C	(3-0-2)4
Exam Hrs.	3	Hours / Week	5
SEE	50 Marks	Total Hours	40
Course Objective: To quantitatively evaluate different designs and organizations of a computer system.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Explain system architecture and functioning of a digital computer, interrupts, bus structures, memory organization, arithmetic unit operations	1	-
2.	Apply arithmetic operations and cache mapping methods on a given problem	1,2	-
3.	Apply various techniques to design combinational logic circuits	1	
4.	Analyze a given logic circuit	1,2	-
5.	Design combinational and sequential logic circuits	1,2,3	-
Course Contents:			
MODULE – 1			10 Hrs
Basic Structures of Computers: Functional units; Basic Operational Concepts: Bus Structures, Performance, Data Organization: Numbers, Arithmetic operations and characters, Memory Locations and Addresses: Byte addressability, Big-endian & Little-endian assignments, Word Alignment, Accessing Numbers, Characters & Character strings, Addressing Modes. Input/ Output Organization: Accessing I/O devices, Interrupts: Interrupt Hardware, Enabling & Disabling Interrupt, Handling Multiple devices, Controlling Device Requests, Exceptions Self Study: Computer types , <i>Generation of Computers</i>			
MODULE – 2			10 Hrs
Direct Memory Access: Bus Arbitration. The Memory System: Basic Concepts, Cache Memories: Mapping functions, Performance considerations: Interleaving, Hit Rate & Miss Penalty. Arithmetic: Multiplication of Positive numbers: Signed-Operand Multiplication: Booth Algorithm; Fast Multiplication; Bit-pair Recoding of Multipliers; Integer division: Floating-Point Numbers & Operations: IEEE Standard for Floating-Point Numbers, Arithmetic Operations on Floating-Point Numbers.			
MODULE – 3			10 Hrs
Combinational Logic Circuits: Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs Quads, and Octets, Karnaugh Simplifications - Overlapping, Eliminating Redundant Groups. Data-Processing Circuits: Multiplexers, Decoders Flip-Flops: RS flip flop, Gated Flip Flop, Edge triggered flipflop, D FLIP-FLOP, Edge-triggered D FLIP-FLOP, Edge-triggered FLIP-FLOP, JK Master-slave FLIP-FLOP.			
MODULE – 4			10 Hrs
Flip-Flops (continued): Various Representation of FLIP-FLOPs. Analysis of sequential Circuits, Conversion of flipflops. Registers: Types of Registers, Serial In - Serial Out, Serial In - Parallel out, Parallel In - Serial Out, Parallel In - Parallel Out, Applications of Shift Registers. Counters: Asynchronous Counters, Synchronous Counters, Counter Design as a Synthesis problem. Design of Synchronous Sequential Circuits: Model Selection, State Transition Diagram, State Synthesis Table, Design equation and circuit diagram.			
Text Book :			
1. Carl Hamacher, Z. Vranesic & S. Zaky, Computer Organization , 5 th Edition, McGraw Hill, 2012			

2. Donald P Leach, Albert Paul Malvino & Goutam Saha: Digital Principles and Applications, 8th Edition, Tata McGraw Hill, 2015.

Reference Books:

1. David A. Patterson and John L. Hennessey, Computer Organization and Design, Morgan Kaufmann, Elsevier, Fifth edition, 2014.
2. William Stallings, Computer Organization and Architecture, 9th Edition, Pearson India, 2013
3. Kai Hwang: Advanced Computer Architecture Parallelism, Scalability, Programmability, 2nd Edition, Tata McGraw Hill, 2011.
4. Stephen Brown, Zvonko Vranesic: Fundamentals of Digital Logic Design with VHDL, 2nd Edition, Tata McGraw Hill, 2014.
5. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss: Digital Systems Principles and Applications, 10th Edition, Pearson Education, 2013.
6. M Morris Mano: Digital Logic and Computer Design, 1st Edition, Pearson, 2013.

MOOC:

1. <http://www.nptelvideos.in/2012/11/computer-organization.html>

Course Title	OPERATING SYSTEMS		
Course Code	: 22CS303	Course Code	(3-0-0)3
Exam. Hours	: 3	Hours / Week	3
SEE	: 50 Marks	Total hours	40
Course Objective : Students should recognize critical resources of operating system and schedule the resources appropriately.			
Course Outcomes (COs) : Upon completion of the course, students shall be able to :			
COs	Statement	Mapping to POs	Mapping to PSOs
1.	Identify fundamental concepts in designing the operating system	1	-
2.	Apply resource management strategies in designing operating system	1, 3	-
3.	Compare various resource scheduling techniques	2, 3	-
4.	Analyse synchronization and deadlock handling mechanisms	2	-
Course Contents:			
MODULE – 1			10 Hrs
Introduction to Operating Systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and security; Distributed system. Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating System design and implementation; Operating System structure; Virtual machines.			
MODULE – 2			10 Hrs
Process Management: Process concept; Process scheduling; Operations on processes; Inter-process communication, Threads: Overview; Multithreading models; Threading issues. Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms; Multiple-Processor scheduling; Process Synchronization: Synchronization: The Critical section problem; Peterson's solution; Semaphores; Classical problems of synchronization.			
MODULE – 3			10 Hrs
Deadlocks: Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. Memory Management: Main Memory: Background; Swapping; Contiguous memory allocation; Paging; Segmentation. Virtual Memory Management: Background; Demand paging; Page replacement			
MODULE – 4			10 Hrs
File System Interface: File System: File concept; Access methods; Directory and Disk structure; Mass-Storage Structures: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management, Protection and Security: Access matrix implementation.			
Text Books:			
1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: Operating System Principles, 8 th			

edition, Wiley-India, 2012.	
Reference Books:	
1. D.M Dhamdhere: Operating systems - A concept based Approach, 2nd Edition, Tata McGraw- Hill, 2002. 2. P.C.P. Bhatt: Operating Systems, 2nd Edition, PHI, 2006. 3. Harvey M Deital: Operating systems, 3rd Edition, Pearson Education, 1990.	
MOOCs	
1.	http://nptel.ac.in/courses/106108101/
Activity:	
1	Consider the banking service and use the appropriate scheduling algorithm for the below scenarios. ➤ Physically handicap ➤ Senior citizen ➤ Lapsed token ➤ Based on token ➤ Different services offered by the bank
2	In an online shopping you wish to purchase an item which is out of stock. Apply producer consumer problem technique to address the given scenario
3	Simulate the concept of Dining-Philosophers problem.
4	Assume that your wardrobe is full and you want to replace with new ones. Make use of the available replacement technique and solve

Course Title	DATA STRUCTURES AND ITS APPLICATIONS		
Course Code	22CS304	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: To be able to use the appropriate data structures for designing programs. Course Outcomes (COs) : Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe the basic concept of linear and non-linear data structures.	1	-
2.	Identify the data structures required to solve a given problem.	1	-
3.	Implement operations of linear and non-linear data structures.	2,3	-
4.	Develop a program using linear and non-linear data structures for a given scenario.	2,3	2
Course Contents:			
MODULE – 1			10 Hrs
Introduction: Structures and pointers revisited. Introduction to data structures - Basic terminology, Classification, Operations. The Stack - Definition, Operations, Array Representation of stacks in C Applications of stack: Infix, postfix and prefix, Basic definitions and examples, evaluating a postfix expression, Program to evaluate a postfix expression, converting an expression from infix to postfix, Program in C to convert an expression from infix to postfix.			
MODULE – 2			10 Hrs
Recursion - finding GCD, Fibonacci Series, Recursion Types, Tower of Hanoi, and Recursion versus iteration. Queues - Definition, Array representation of Queues, Operations on Queues, Types of Queues- Circular Queue and its implementation in C, Applications of Queues. Linked List: Introduction to linked list, linked list versus arrays, Singly linked list operations - Insert, Delete, Display, Search and Traverse.			
MODULE – 3			10 Hrs
Other Lists structures: Circular Lists - C Implementation by adding and deleting nodes, Doubly Linked List - C implementation by adding and deleting nodes, Circular doubly linked list, Linked list Applications: Linked Implementation of stacks and Queues, Polynomial Representation.			
MODULE – 4			10 Hrs
Trees: Basic Terminology, Types, Representation using array and Linked List. Creating a binary tree from a general tree, Traversing a binary tree- In-order, Pre-order, Post order, Level order, Constructing a binary tree from traversal results. Efficient Binary Trees: Binary Search trees - definition, Operations- Create, Insert, delete, display, Finding height, Finding number of nodes. AVL trees - Definition, Rotations, Constructing an AVL tree.			
Text Book: 1. Data Structures Using C, Second edition, Reema Thereja, Oxford Press, 2017.			

Reference Books:

1. Yedidyah, Augenstein, Tannenbaum: Data Structures Using C and C++, 2nd Edition, Pearson Education, 2003.
2. Richard F. Gilberg and Behrouz A. Forouzan: Data Structures A Pseudocode Approach with C, Cengage Learning, 2005.
3. Debasis Samanta: Classic Data Structures, 2nd Edition, PHI, 2009.
4. Balagurusamy E, Programming in ANSI C, 7th Edition, Tata McGraw Hill, 2017.

MOOC:

http://nptel.ac.in/keyword_search_result.php?word=data+structures

Course Title		DATA STRUCTURES LABORATORY	
Course Code	22CS305	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	Total Hours	28
Course Objective: Design and implement various data structures.			
Course Outcomes (COs): Upon the completion of the course the students will be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Develop, design and document C programs to implement structures and pointers.	1,2,3	-
2.	Illustrate the concepts of data structures: stack, queue, linked list and trees in C using static or dynamic memory allocation and document them.	1,2,3	2
3.	Demonstrate the concept of recursion by developing recursive C programs and document them.	1,2,3	2
Course Contents:			
Practice Programs			
1.	Write a C program to find the maximum and minimum element in an array of n integers. Use only pointers for referencing the array.		
2.	Write a C program for Dynamic Memory allocation of 10 elements and find the largest element.		
3.	Write a C program to represent a complex number using structure variable. Write user defined functions that accept two complex numbers and finds their sum and difference.		
4.	Define a structure Author name with fields: First name, Middle name and Last name. Using the above structure, design another structure Book: ISBN, Author name, Book Title, Price, Publisher, and Edition. Write a function to search a book given the Author name. Using the above function write a C Program to store N books information and display the details of a book given the author name.		
Exercise Programs			
1.	Files are placed one over another in my study room. The file which is at the top is the first one to be removed, i.e. the file which has been placed at the bottom most position remains in the pile of files for the longest period of time. Help me out to add a file and remove the bottom most file from the pile of files.		
2.	Consider an algebraic expression which needs to be evaluated by a computer system. Operating System (OS) consumes less time to evaluate if it is in postfix form of the expression. Thus, help your OS to evaluate by converting the expression into its postfix form.		
3.	Assume you have converted an algebraic expression into its postfix form to process the expression fast.This expression need to be evaluated for a given set of values. Implement the above.		
4.	Assume you come across a toll gate while you are on your way to home town. Illustrate the working of the toll gate using suitable data structure		
5.	a) Suppose you want to search a text book in a huge library where books are arranged in alphabetical order. Optimize your search by using recursion. b) Implement Tower of Hanoi problem using recursion.		

6.	Consider a traffic signal controlled by a computer system. Traffic signal has three colors: Red, yellow and Green. All these glows in a circular fashion based on the traffic. Implement the above using suitable data structure.
7.	The parking lot has a fixed number of parking spaces. Cars can enter the parking lot and occupy an available space, and they can also exit the parking lot, freeing up the space for other cars. Designing a parking lot management system using a circular queue.
8.	Consider a treasure hunt task where a series of clues are given. Clue1 gives hint to clue2, clue2 Provides hint for clue3 and so on until you can get a hint to the final treasure. Develop an illustration to demonstrate the above scenario.
9.	Consider a list of numbers. Find i. Maximum number ii. Minimum number iii. Sum of all the numbers
10.	The phonebook will contain a list of contacts sorted in ascending order based on their names. Each contact will have a name and a phone number. Developing a phonebook management system using an ordered linked list.
11.	Assume you have an iPod, where in you have stored plenty of songs so that you get engaged during a long journey. If you want to hear a particular song, you need to use forward button to reach that song and can also traverse back using backward button. Implement the following using relevant data structure.
12.	Your text book contains chapters, sections, subsections, subdivisions, etc. Illustrate this scenario of text book using tree structure.

Course Title	UNIX AND SHELL PROGRAMMING LABORATORY		
Course Code	22CS306	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	Total Hours	24
Course Objective: To provide the skills needed to develop and customize Unix shell programs and to make effective use of a wide range of UNIX commands. Course Outcomes (COs) : Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Execute and document the commands related to Shell basics, vi editor and regular expression.	1,5,9,10	-
2.	Design the solutions for a given problem using the concepts of shell concepts and document.	1,5,9,10	-
Course Contents:			
Practice Programs			
Execute basic UNIX commands, VI editor commands. File comparing commands.			
Exercise Programs			
1. a) Write a shell script to read a message “Good Morning” and display it 10 times at regular intervals of 60 seconds. b) Write a shell script that accepts a string as a command line argument and reverse it. 2. a) Write a shell script to generate multiplication table. b) Write a shell script to print sum of individual digits of a number. 3. a) Write a shell script to search a given pattern in file, if found display the message “Found” or else display “Not found”. Accept the pattern and input file as command line arguments. b) Write a shell script to accept the pattern and file to be used. If the pattern is not entered display a message ”String not entered”. If file name is not mentioned display appropriate message. 4. Write a shell script to check whether the given file as read and write and execute permission. 5. Write a shell script that searches a given string in a given file and prints the number of times it repeats, else display proper error message. The script should accept the file has command line argument. 6. Write a shell script to display all the process running in the system every 30 seconds for 5 times using a) while b) for. 7. Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else. 8. Write a shell script that accepts one or more file name as arguments and converts all of them to uppercase, provided they exist in the current directory. 9. Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it 10. Write a shell script that computes the gross salary of an employee according to the following rules: i) If basic salary is < 1500 then HRA =10% of the basic and DA =90% of the basic. ii) If basic salary is >=1500 then HRA =Rs500 and DA=98% of the basic the basic salary is entered interactively through the key board. 11. Write a shell script that accepts two integers as its arguments and computes the value of first number raised to the power of the second number.			

12. Write an interactive file-handling shell program. Let it offer the user the choice of copying, removing, renaming, or linking files. Once the user has made a choice, have the program ask the User for the necessary information, such as the file name, new name and so on.
13. Write shell script that takes a login name as command – line argument and reports when that Person logs in.
14. Write a shell script which receives two file names as arguments. It should check whether the two file contents are same or not. If they are same then second file should be deleted.
15. Write a shell script to perform the following string operations:
 - i. To extract a sub-string from a given string.
 - ii. To find the length of a given string.
16. Write a menu driven shell script to perform the following:
 - i) List of users who are logged in
 - ii) List of files in the current directory
 - iii) List of processes of users
 - iv) Today's date
 - v) Quit to Unix

Course Title	OBJECT ORIENTED PROGRAMMING WITH JAVA		
Course Code	22CS307A	L-T-P-C	(2-0-2)3
Exam Hrs.	3	Hours / Week	4
SEE	50 Marks	Total Hours	40
Course Objective: Design and develop java application programs using object-oriented concepts.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply Java constructs for the development of object oriented programs.	1	2
2.	Analyze the given java program to make suitable changes.	2	-
3.	Design a java program for the given problem.	3	2
4.	Conduct practical experiments for demonstrating object oriented concepts through java using IDE.	1, 2, 5	1
Course Contents:			
MODULE – 1			10 Hrs
Java Programming Fundamentals – The Java Language, The key attributes of Object-Oriented programming, Java Development Kit (JDK), JVM, A first Simple program, Introducing Data Types and Operators: Java's Primitive Types, A Closer Look at Variables, The Scope and Lifetime of Variables, operators, Type conversion in Assignments, Using Cast. Program Control Statements: Input characters from the Keyboard, if statement, Nested ifs, if-else-if Ladder, Switch statements, for Loop, While Loop, do-while Loop, Use break, Use continue. Introducing Classes, Objects and Methods: Class Fundamentals, How Objects are Created, Reference Variables and Assignment, Methods, Returning from a Method, Returning Value, Using Parameters, Constructors, Parameterized Constructors, The new operator Revisited, Garbage Collection. The this Keyword. More Data Types and Operators: Arrays, Multidimensional Arrays, Alternative Array Declaration Syntax, Assigning Array References, Using the Length Member, The For-each Style for Loop, Strings.			
MODULE – 2			10 Hrs
A Closer Look at Methods and Classes: Controlling Access to Class Members, Pass Objects to Methods, How Arguments are passed, Method Overloading, Overloading Constructors, Recursion, Understanding Static, Introducing Nested and Inner Classes, Varargs: Variable- Length Arguments. Inheritance: Inheritance Basics, Member Access and Inheritance, Constructors and inheritance, Using super to call Superclass constructors, Using super to Access Superclass Members, Creating a Multilevel Hierarchy, When are Constructors Executed, Superclass References and Subclass Objects, Method Overriding, Overridden Methods support polymorphism, Using Abstract Classes, Using final, The object class.			
MODULE – 3			10 Hrs
Interfaces: Interface Fundamentals, Creating an Interface, Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Constants in Interfaces, Interfaces can be extended, Nested Interfaces. Packages: Package Fundamentals, Packages and Member Access, Importing Packages, Static import. Exception Handling: The Exception Hierarchy, Exception Handling Fundamentals, The Consequences of an Uncaught Exception, using Multiple catch clauses, catching subclass Exceptions, try blocks can be nested, Throwing an Exception, A Closer look at Throwable, using finally, using throws, Java's Built-in Exceptions.			
MODULE – 4			10 Hrs

Multithreaded Programming: Multithreading fundamentals, The Thread Class and Runnable Interface, Creating Thread, Creating Multiple Threads, Determining When a Thread Ends, Thread Priorities, Synchronization, using Synchronization Methods, The Synchronized Statement, Thread Communication using notify(), wait() and notify All(), suspending, Resuming and stopping Threads. Exploring java.io – The I/O Classes and Interfaces, File, Auto closeable, Closeable and Flushable Interfaces, The Stream Classes, The Byte Streams, The Character Streams, The Console Class.
Text Books : 1. Java Fundamentals, A comprehensive Introduction by Herbert Schildt, Dale Skrien. Tata McGrawHill Edition 2013 (Chapters 1,2,3,4,5,6,7,8,9,10,12) 2. Java –The complete Reference, by Herbert Schildt Eight Edition Tata McGraw Hill Education (Chapter 19).
Reference Books: 1. Programming in JAVA2 by Dr K Somasundaram ,Jaico publications 2. Java Programming by Hari Mohan Pandey, Pearson Education, 2012. 3. Deitel and Deitel – "Java How to Program" – 6th Ed. – Pearson.
MOOCs: 1. http://nptel.ac.in/courses/106106147/ 2. http://www.nptelvideos.com/java/java_video_lectures_tutorials.php 3. https://www.youtube.com/watch?v=0KL_zftem4g 4. https://www.coursera.org/specializations/object-oriented-programming
Activity: Write and execute the following programs in java 1. Design Java application to model Employee of an “ABC” organization. Consider types of employees as : a) Manager b) Sales Person Perform the following: • Implement simple inheritance where Employee (employee ID, First Name, Last Name, Current salary) is super class, consider Manager (number of stock options) and SalesPerson (number of sales, commission rate) as subclasses. • Define parameterized constructors in class hierarchy. • Define methods to display status of employee (override toString()) and increase current payment (salary) as giving bonus by a small amount. 2. Create class Employee with name, Id, cellNum, designation, department, salary permanent (boolean) as members. Also create separate class for member name as EmpName, department as Department and salary as Salary. Members of EmpName are firstName, midName, lastName . Members of Salary are BASIC, DA percent, HRA , PF, insurance. Members of Department are deptName, deptCode. Create an instance of Employee and initialize all its members from user input console. Access the same instance by more than one reference of Employee. Count the number of references and objects being created. [class, reference, objects]. 3. Create a super class Bind {x,y} and subclass Bind3d {z} include • Parameterized constructor in class Bind to initialize object. • Include a method in class Bind to Print data members of object. Override the same method in sub-class and reuse the inherited method in it. • Create final static member printArr (Bind[]) which print array of objects. In this method use above method to print member of individual objects of array. • Write test class to create to array of Bind3d type. Use the above method to print all the objects of array. 4. A bank maintains two kinds of accounts – Savings account and Current account. The savings account provides simple interest, deposit and withdrawal facilities. The current account only

provides deposit and withdrawal facilities. Current account holders should also maintain minimum balance. If balance falls below minimum level a service charge is imposed. Create an abstract class Account that stores customer name, account number type of account and abstract methods. From this derive the classes Curr_Account (double balance, double min_bal, double service Charge / penalty) and Sav_Account (double balance).

Include the necessary methods in order to achieve the following:

Define parameterized constructor in a class hierarchy.

- Allow deposit and update the balance.
- Display the balance.
- Compute interest and add to balance.
- Permit withdrawal and update the balance (check for minimum balance).
- Apply polymorphism if required for methods in class hierarchy.
- Create an array of super class / object and populate with subclass objects and call the overridden /object methods.
- Write a test program to demonstrate the above said implementations.

5. Define an interface EMP Interface (void displayEMP(), void giveBonus (double amount)). Define an abstract class Employee(empID, fName, lName, salary). Define a concrete class Manager (noOfStockOptions), subclass of Employee and define interface methods.

Perform the following:

- Define appropriate constructors in a class hierarchy.
- Ensure the bonus amount should not be negative and zero using exception handling mechanism (use throws and throw clauses of exception handling)
- Create array of interface reference variables and populate with manager objects.

Write a test program to implement the above said requirements of interface implementation and exception handling.

Course Title		OBJECT ORIENTED PROGRAMMING WITH C++	
Course Code	22CS307B	L-T-P-C	(2-0-2)3
Exam Hrs.	3	Hours / Week	4
SEE	50 Marks	Total Hours	40
Course Objective: Students will understand Object oriented concepts and will be able to solve real world problems.			
Course Outcomes (COs): Upon completion of the course, students shall be able to			
#	Course outcomes	Mapping to POs	
1.	Explain the object – oriented programming concepts.	1, 2, 3	
2.	Achieve code reusability and extensibility by means of Inheritance and Polymorphism.	1, 2, 3	
3.	Develop programs with code reusability and handle exceptions inprogramming.	1, 2, 3	
4.	Design the solution to a real world problem using Object – Oriented programming concepts.	1, 2, 3	
Course Contents:			
MODULE – 1			10 Hrs.
Introduction to Object Oriented Programming: Computer programming background- C++ overview. First C++ Program -Basic C++ syntax, Object Oriented Programming: What is an object, Classes, methods and messages, abstraction and encapsulation, inheritance, abstract classes, polymorphism Textbook 1: Chapter 1(1.1 to 1.8)			
MODULE – 2			10 Hrs.
Functions in C++: Tokens – Keywords – Identifiers and constants – Operators in C++ – Scope resolution operator – Expressions and their types – Special assignment expressions – Function prototyping – Call by reference – Return by reference – Inline functions -Default arguments – Function overloading, I/O Streams - cin, cout objects. Textbook 2: Chapter 3(3.2,3.3,3.4,3.13,3.14,3.19, 3.20) , chapter 4(4.3,4.4,4.5,4.6,4.7,4.9) Chapter 12(12.5)			
MODULE – 3			10 Hrs.
Inheritance & Polymorphism: Derived class Constructors, destructors-Types of Inheritance- Defining Derived classes, Single Inheritance, Multiple, Hierarchical Inheritance, Hybrid Inheritance. Textbook 2: Chapter 6 (6.2,6.11) chapter 8 (8.1 to,8.8)			
MODULE – 4			10 Hrs.
Exception Handling: Introduction to Exception - Benefits of Exception handling- Try and catch blockThrow statement- Pre-defined exceptions in C++ Textbook 2: Chapter 13 (13.2 to13.6)			
Text Books: 1. Bhushan Trivedi, “Programming with ANSI C++”, Oxford Press, Second Edition, 2012. 2. Balagurusamy E, Object Oriented Programming with C++, Tata McGraw Hill Education Pvt.Ltd , Fourth Edition 2010.			

Course Title	SOCIAL CONNECT AND RESPONSIBILITY		
Course Code	22SCR	L-T-P	(0-2-0)1
Exam	3 Hrs.	Hours/Week	2
CIE	50 Marks	Total Hours	15
Course Objective: Provide a formal platform for students to communicate and connect with their surroundings and create a responsible connection with society			
Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Describe societal challenges and build solutions to alleviate these complex social problems through immersion, design & technology.	6	-
2	Communicate and connect with their surroundings.	7,12	-
MODULE – 1			
Plantation and adoption of a tree: Plantation of a tree that will be adopted by a group of students. They will also make an excerpt either as a documentary or a photo blog describing the plant's origin, its usage in daily life, and its appearance in folklore and literature.			
MODULE – 2			
Heritage walk and crafts corner: Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photoblog and documentary on evolution and practice of various craft forms.			
MODULE -3			
Organic farming and waste management: Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus.			
MODULE -4			
Water Conservation: knowing the present practices in the surrounding villages and implementation in the campus, documentary or photo blog presenting the current practices. Food Walk City's culinary practices, food lore, and indigenous materials of the region used in cooking.			
Course Conduction			
A total of 14-20 hrs engagement per semester is required for the course. Students will be divided into teams and each team will be handled by two faculty mentors . Faculty mentors will design the activities for evaluation.			
Guideline for Assessment Process: Continuous Internal Evaluation (CIE) After completion of, the social connect, the student shall prepare, with daily diary as reference, a comprehensive report in consultation with the mentor/s to indicate what he has observed and learned in the social connect period. The report should be signed by the mentor.			

Course Title	R Programming		
Course Code	22CS308A	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	Total Hours	15
Course Objective: To learn and Practice Programming techniques using R Programming. Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	To understand the fundamental syntax of R and demonstration through readings and writing R code	1, 2	-
2.	To apply critical programming language concepts such as data types, iteration, control structures and functions by writing R programs and through examples	2, 3,4,5	-
3.	To import a variety of data formats into R using R-Studio	1, 2	-
Course Contents:			
Practice Programs:			
1. Installation of R Studio 2. Write an R Program to take input from the user (name and age) and display the values. Also print the version of R installation. 3. Write an R Program to get the details of the objects in memory. 4. Write an R Program to create a sequence of numbers from 20 to 50 and find the mean and product of numbers from 20 to 60 and sum of numbers from 51 to 91. 5. Write an R Program to multiply two vectors of integer's type and length 3.			
Guided Laboratory Experiments			
1. Write a program to check a year (integer) entered by the user is a leap year or not. 2. A shop keeper requires performing simple calculations like addition, subtraction, multiplication and modulo division for his daily business. Develop R program to perform these operation using switch cases and functions. 3. Write a program to perform searching within a list (1 to 5). If the number is found in the list, print that the search is successful otherwise print that the number is not in the list. 4. As a data analyst, you are tasked to analyze the three CIE conducted for 40 students. Find the total marks, average, maximum marks and minimum marks of six subjects. 5. As a data scientist, you are tasked with handling various matrices for a research project. Develop an R program to create three different matrices and populate them with data. For 5x4 and 3x3 matrix, fill the data by rows, and for the 2x2 matrix, fill the data by columns. Example: Matrix 1: 2x2 matrix with labels The matrix represents data gathered from two different subjects (rows) and two measurements (columns). Each row corresponds to a subject, and each column represents a different measurement (e.g., heart rate, blood pressure).			
6. As a data analyst, you are responsible for merging data from two different departments within your organization. Each department has collected data in the form of matrices with the same number of columns but different numbers of rows. Develop an R program to concatenate these two matrices while preserving the column structure.			

7. In your role as a data analyst at the healthcare organization, you have been tasked with organizing patient data into a structured format. You have collected four sets of data, each stored as a separate vector, which includes patient details such as patient ID, name, age, and medical condition. Write an R program to create data frame from these four vectors. After creating the data frame, you must save the data frame into a file to ensure data preservation and future access.
8. As a programmer at the digital security company, you have been assigned a critical task related to number encryption. Your task is to create an R program that calculates the sum of the digits of a given number using various looping techniques.
9. Create employee .CSV file having attributes such as Eid, name, salary, start_date and department. Perform various operation such as Reading, writing and analyzing (no. of rows and columns, max salary with and without person, specific department, joined on or before specific date)
10. As a teacher at a high school, you recently conducted a quiz for your students on five different subjects: Mathematics, English, Science, History, and Geography. Write an R program to create a simple bar plot for these five subjects to present the performance of your students.

Course Title	DATA ANALYTICS WITH EXCEL		
Course Code	22CS308B	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	Total Hours	15

Course Objective: To learn and Practice various Data analytics using Excel tool

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	To understand the mathematical calculations performed in Excel	1, 2	-
2.	To apply sorting, Filtering and condition format for the various problems.	2, 3, 5	-

Course Contents:

Guided Laboratory Experiments

1. In a company, 30 employee details (name, Date of Joining, Qualification, and Salary) are stored in Microsoft Access Database and text file. Using Excel tool import the data from different sources for analysis.
2. Suppose a class of size 40 having SGPA of 8 semesters between 5 to 10. Calculate the CGPA of each student in below Grade form:

O	S	A	B	C
100 >= 9	8 - 8.9	7 - 7.9	6 - 6.9	5 - 5.9

3. Create 10 students name in the form of First name, Middle name and Last name. Concatenate all the names and store in one column and also find the length of each name.
4. Suppose your customer survey results from the east and west regions, month wise are

Month	East	West	Low (<50%)	Medium (50%-80%)	High (>80%)
Apr-15	86.4%	63.0%	50%	30%	20%
May-15	45.8%	58.9%	50%	30%	20%
Jun-15	44.1%	81.6%	50%	30%	20%
Jul-15	77.6%	86.1%	50%	30%	20%
Aug-15	80.7%	95.0%	50%	30%	20%

For the above data, display customer satisfaction survey using Band Chart.

5. A Person takes a loan of Rs. 5,00,000/- for a tenure of 30 years, find the monthly payments (EMI) for the varied interest rates (Assume interest rate start with 12% and incremented by 2% in each month). Calculate the amount of interest and Principal that is paid in the second year. (use what if Analysis tool)
6. Suppose there is a bookstore that has 100 books in storage. The original price of the book is 250 and certain number of books was sold at that price. Later, the bookstore announced a 10% discount on that book and cleared off the stock. You might want to know how many books are sold at the original price to obtain total revenue of 24,500.
7. Suppose you want to have a report displaying the following – (Explore Data using Pivot Table)
 - a. Data for five disciplines - Archery, Diving, Fencing, Figure Skating and Speed Skating.
 - b. Regions that scored more than 80 medals in these 5 disciplines.
 - c. The count of medals in each of the five disciplines in each of these regions.
 - d. Total count of medals for the five disciplines in each of these regions.

8. Consider the data of 20 employees are stored in two different tables. First table consists of name, employee ID and Second table consists of employee ID, salary. Find the employee salary using lookup table from second table to first.
9. In Olympic, 20 countries participated and won various medals by male and female in equal proportions. Display the medal count for each country with power view charts (Pie, Column, Bar, Line, Scatter, and Bubble).
10. Consider the sequence of data from 1 to 100, where Male are 48% and Female are 52% in the data. For the given data create Male vs Female Info-graphic Chart, Male vs Female Ratio Chart and Waffle chart.

Course Title	DATA VISUALIZATION WITH PYTHON		
Course Code	22CS308C	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	Total Hours	15
Course Objective: To explore principles and techniques of data visualization using Python.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Understand the importance of data visualization in extracting insights and communicating information effectively.	1	-
2.	Utilize Python libraries such as Matplotlib, Seaborn, and Plotly for creating various types of visualizations.	5	-
Course Contents:			
1. Write a Python program to read data from a CSV file and create a line plot to visualize the trend over time. Customize the plot with appropriate labels, title, and color. 2. Load a dataset containing information about students' scores in different subjects. Create a scatter plot to visualize the relationship between two variables (e.g., math score vs. science score). Use Seaborn to enhance the plot with appropriate styling and add labels. 3. Given a dataset with multiple variables, create a figure with two subplots: one displaying a line plot and the other showing a bar chart. Customize the subplots with appropriate titles, legends, and colors. 4. Load a dataset containing information about employees' salaries across different departments. Create a box plot and a violin plot to visualize the distribution of salaries by department. Customize the plots and add appropriate labels and titles. 5. Load a dataset containing stock prices over time. Create a line plot to visualize the stock prices and add appropriate labels and titles. Format the x-axis tick labels to display the dates properly. 6. Load a dataset containing temperature readings over time. Create an interactive line plot using Plotly, which displays the temperature when hovering over the data points. Add appropriate labels and customize the plot's appearance. 7. Load a dataset with information about population density by country. Create a choropleth map using GeoPandas to visualize the population density. Customize the map's appearance and add a color legend. 8. Design and implement an interactive dashboard using Dash to display various visualizations. Include at least two interactive controls (e.g., dropdowns, sliders) to update the visualizations dynamically. 9. Select a dataset related to a specific topic of interest (e.g., climate change, COVID-19). Design a series of visualizations that tell a compelling data story, highlighting key insights and trends. Present the visualizations with appropriate annotations and captions. 10. Choose a dataset related to a real-world problem (e.g., retail sales, customer behavior). Explore the dataset, identify interesting patterns, and design a set of visualizations to present the findings effectively. Present the visualizations along with a brief explanation of the insights gained.			

Course Title	VERSION CONTROLLER WITH GiT		
Course Code	22CS308D	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	Total Hours	15
Course Objective: To use GitLab and Git and utilize it for software development.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Understand the fundamental concepts of version control systems and their importance in software development	1	-
2.	Demonstrate proficiency in using basic Git commands for initializing repositories, tracking changes, and committing code	5	-
Course Contents:			
MODULE – 1			7 Hrs
1. Initializing a Repository: Initialize a new Git repository for a simple project. Add a few files to the repository and commit them. 2. Committing Changes: Make changes to the files in the repository and commit them. Practice creating meaningful commit messages 3. Creating and Switching Branches: Create a new branch in the repository, make changes in the branch, and switch between branches. 4. Merging Branches: Create a branch, make changes in both the main branch and the new branch, and merge the changes back into the main branch. 5. Resolving Merge Conflicts: Create a merge conflict by making conflicting changes in two different branches. Practice resolving the conflict using Git's conflict resolution tools. 6. Working with Remote Repositories: Clone a remote repository to your local machine. Make changes locally and push the changes back to the remote repository. 7. Collaborating with Others: Practice collaborating with others using Git. Clone a shared repository, make changes, push the changes, and pull changes made by others. 8. Reverting and Rolling Back Commits: Experiment with reverting commits and rolling back changes to a previous state in the repository using Git commands. 9. Tagging Releases: Tag a specific commit in the repository as a release version. Practice creating annotated tags and lightweight tags. 10. Ignoring Files: Create a .gitignore file to exclude certain files or directories from being tracked by Git. 11. Viewing Repository History: Use Git commands to view the commit history, explore differences between commits, and track changes made over time. 12. Branch Management: Practice creating, deleting, and renaming branches in the repository using Git commands.			

Course Title	BRIDGE COURSE MATHEMATICS - I		
Course Code	22BCM301	L-T-P-C	(3(A)-0-0)0
Exam Hrs.	3	Hours/Week	3
CIE	100 Marks	Total Hours	40
Course Objective: To introduce simple concepts of calculus and numerical methods.			
Course Outcomes: At the end of the course, student will be able:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Solve simple problems on determinants, matrix multiplication, partial differentiation, and integration.	1	-
2.	Compute the roots of transcendental equations and interpolate when the experimental data is given.	1	-
3.	Expand the given function in terms of Taylor/ McLaurin's series.	1	-
Course Contents:			
MODULE-1			10 Hrs
Basic Formulas: Partial fractions. Matrices and determinants: matrix multiplication, evaluation of determinants, finding inverse. Differentiation-I: Review of limit and Continuity, differentiation- Basic formulas, Sum rule, product rule, quotient rule, chain rule and problems. Differentiation-II: Taylor's series, and McLaurin's series of simple functions for single variable, simple problems.			
MODULE-2			10 Hrs
Partial Differentiation: Definition, Illustrative examples on Partial differentiation, Total differentiation, chain rule, Differentiation of composite and implicit functions, Jacobians, illustrative examples and problems, simple problems.			
MODULE-3			10 Hrs
Integration: Basic formulas, Illustrative examples, evaluation of definite integrals, Integration by parts, Bernoulli's rule of Integration. Integral calculus: Reduction formula for functions $\sin^n x$, $\cos^n x$ (without proof), Simple problems, Double & triple integration, simple problems with standard limits.			
MODULE-4			10 Hrs
Numerical Methods: Numerical Solution of algebraic & transcendental equations by Bisection method, Newton Raphson method, Regular Falsi method. Numerical Interpolation: Definition of forward, backward differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation formula, central difference formulas-Bessel and Stirling formulas, illustrative examples.			
Note - Theorems and properties without proof. Applicable to all the units.			
Text Books: 1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 40th edition (2007). 2. Erwin Kreyszig, Advanced Engineering Mathematics, Tata McGraw Hill, Publications, 8th edition (2007). 3. Calculus by Thomas Finney, 9th edition, Pearson education, 2002. 4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.			

Course Title	STATISTICS AND PROBABILITY		
Course Code	22MA401	L-T-P-C	(2-2-0)3
Exam Hrs.	3	Hours / Week	4
SEE	50 Marks	Total Hours	40
Course Objective: To introduce the concept of probability distribution functions, hypothesis testing, complex analysis so as to apply in engineering application problems. Course Outcomes (COs) : Upon Completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Fit a suitable curve/regression line for the given experimental data, probability and joint probability.	1	-
2.	Validate an assumption through "hypothesis testing" (that is the assumption is not simply because of chance).	1, 2	-
3.	Analyze the problems connected with probability to apply suitable probability distribution and also, predict the probability in the long run for Markov chain based problems.	1, 2	-
4.	Model real life problems/engineering application problems and solve the same.	1, 2	-
Course Contents:			
MODULE – 1			10 Hrs
Statistics: Correlation –, Karl Pearson coefficient of correlation and Spearman's rank correlation coefficient. Physical interpretation of numerical value of the rank correlation coefficient. Linear Regression analysis (when the experimental output depends on one input). Illustrative examples from engineering field, multiple regression analysis. (When the experimental output depends on two inputs). Probability: Discrete Random Variables: Definitions of PDF & CDF: Expectation and Variance: Binominal pdf- Illustrative examples. Self-study/Applications: Poisson probability distribution function- Illustrative examples.			
MODULE – 2			10 Hrs
Continuous Random Variables: Definition of PDF and CDF, Expectation and Variance, illustrative examples. Shaft conforms, Detection of signal. Probability distribution: Exponential pdf, Normal/Gaussian pdf. Discussion on the choice of PDF. Illustrative examples from engineering field. Self-study/Applications: Uniform pdf, Digital transmission channel.			
MODULE – 3			10 Hrs
Confidence intervals & Hypothesis analysis: Introduction, Testing a hypothesis, central limit theorem-statement, Level of significance, Simple sampling of attributes, confidence intervals, Test of significance for large samples, Comparison of large samples, Student's t-distribution, Chi-square distribution. Self-study/Applications: Current measurement problems, Propellant burning rate, process-capacity problem, drying time problem, Two catalyst effect on chemical reaction.			
MODULE – 4			10 Hrs

Joint Probability Distribution & Stochastic Processes: Concept of joint probability, Joint distributions of discrete random variables, Independent random variables-problems. Joint expectation, co-variance, and correlation. Markov Chains: Introduction, stochastic matrices, fixed probability vectors and regular stochastic matrices. Application of Markov chain to determine the voting tendencies. Self-study/Applications: <i>Estimating the population distribution of a city due to migration.</i>
Note - Theorems and properties without proof. Applicable to all the modules.
Text Books: 1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 44th Edition, 2016. 2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India Pvt. Ltd., 9th edition, 2014. 3. B V Ramana Higher Engineering Mathematics, Tata McGraw Hill Publications, 2nd edition, 2007.
Reference Books: 1. Scott L. Miller, Donald G. Childers: "Probability and Random Process with application to Signal Processing", Elsevier Academic Press, 2nd Edition, 2013. 2. Statistics for engineers and Scientists, William Navide, Mc-Graw hill education, India pvt. Ltd., 3rd edition 2014. 3. T. Veerarajan: "Probability, Statistics and Random Process", 3rd Edition, Tata McGraw Hill Co., 2008. 4. Theory and problems of probability, Seymour Lipschutz and Marclarslipson, Schaum out line series, 2nd edition.
Activities: 1. Negative binomial distribution: Failure of server's problems, 2. Negative binomial distribution: Contamination problem, flaws in wires. 3. Exponential distribution: lack of memory property. 4. Continuous random variable: Shaft conforms. 5. Continuous random variable: detection of signal, Digital transmission channel.

Course Title	DESIGN AND ANALYSIS OF ALGORITHMS		
Course Code	22CS402	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: To design algorithms using suitable algorithm design method and mathematically analyze it. Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe basic knowledge of algorithm analysis, algorithm design strategies, various algorithms, NP problems.	1	-
2.	Apply algorithms to solve a given computational problem.	1	2
3.	Analyze algorithms with respect to time & space complexity	2	2
4.	Design algorithm for a given problem using suitable algorithm design strategy	3	2
Course Contents:			
MODULE – 1			10 Hrs
Introduction: Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Fundamentals of the Analysis of Algorithm Efficiency: Analysis Framework, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive and Non-recursive algorithms, Examples. Brute Force: Selection Sort and Bubble Sort, Sequential Search and String Matching. <i>Self Study: Exhaustive Search.</i>			
MODULE – 2			10 Hrs
Divide-and-Conquer: Merge sort, Quick sort, Binary Search. Decrease-and-Conquer: Insertion Sort, Depth First and Breadth First Search, Topological Sorting, Algorithms for Generating Combinatorial Objects.			
MODULE – 3			10 Hrs
Transform-and—Conquer: Presorting, Heaps and Heapsort. Space and Time Tradeoffs: Input Enhancement in String Matching-Horspool algorithm, Hashing. Dynamic Programming: Computing binomial coefficient, Warshall's Algorithm, Floyd's Algorithm, The knapsack Problem <i>Self Study: Memory Functions.</i>			
MODULE – 4			10 Hrs
Greedy Technique: Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees. Limitations of Algorithm Power Lower-bound Arguments, Decision Trees, P, NP and NP-Complete Problems. Coping with the Limitations of Algorithm Power: Backtracking, Branch-and-Bound.			
Text Books : 1. Anany Levitin, Introduction to The Design and Analysis of Algorithms, 3 rd Edition, Pearson Education, 2012 2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, 2 nd Edition, Press 2014.			
Reference Books: 1. Coremen T.H., Leiserson C. E., and Rivest R. L., Introduction to Algorithms, 3rd edition, PHI, 2015. 2. R.C.T. Lee, S.S. Tseng, R.C. Chang and Y.T.Tsai, Introduction to the Design and Analysis of Algorithms A Strategic Approach, 1st Edition, Tata McGraw Hill, 2005.			

Course Title	MICROCONTROLLER AND EMBEDDED SYSTEMS		
Course Code	22CS403	L-T-P-C	(3-0-2)4
Exam Hrs.	3	Hours/Week	5
SEE	50 Marks	Total Hours	40
Course Objective: To make familiar with programming in microcontroller based embedded systems.			
Course Outcomes(COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe the concepts of ARM embedded system and its components.	2	-
2.	Design ARM based Assembly Language Programs to solve problems.	1,2,5	2
3.	Illustrate different Hardware interfacing.	1,3,5	2
4.	Develop embedded programs using IDE.	1,2	2
Course Contents:			
MODULE – 1			10 Hrs
ARM Embedded Systems: Microprocessors, Microcontrollers, Microprocessors v/s Microcontrollers, RISC v/s CISC, Harvard v/s Von-Neumann processor, Big-endian v/s Little-endian processors, The ARM Design Philosophy, Embedded System Hardware, and Embedded System Software. What is an Embedded system?, Embedded Vs General computing system, Classification of Embedded systems, Major applications of ES.			
MODULE – 2			10 Hrs
ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions-cache and tightly coupled memory. Memory-ROM, RAM. Introduction to the ARM Instruction Set: Data Processing Instructions-move, barrel shifter, arithmetic, logical, comparison, multiply.			
MODULE – 3			10 Hrs
(Continued) Branch Instructions, Load-store instructions-single register transfer, single register load-store addressing modes, multiple register transfer, stack operations, and swap instruction. Program Status Register Instructions, Loading Constants, and conditional execution.			
MODULE – 4			10 Hrs
Interfacing: Sensors, Actuators, LED interfacing, 7 segment LED display interfacing, stepper motor interfacing, LCD interfacing, Keyboard interfacing, DAC interfacing.			
Text Books:			
1. ARM system developers guide, Andrew N Sloss, Dominic Symes and Chris Wright, Elsevier, Morgan Kaufman publishers, 2008. (1.1 to 1.4, 2.1 to 2.5.1, 3.1 to 3.3, 3.5 to 3.6 (Excluding 3.5.1, 3.5.2), 3.8) 2. Hardware interfacing Manual – Module 4 (Author Shashidhara H V, Malnad College of Engineering, Hassan) 3. Raj Kamal, Embedded System, Tata McGraw-Hill Publishers, 2nd Edition, 2008			
Reference Books:			
1. The Insider's Guide to the ARM7 Based Microcontrollers, Hitex Ltd., 1st edition, 2005 2. Steve Furber, ARM System-on-Chip Architecture, Second Edition, Pearson, 2015			
MOOC:			
1. https://onlinecourses.nptel.ac.in/noc18_ec03/preview			

Course Title	DATABASE MANAGEMENT SYSTEMS		
Course Code	22CS404	L-T-P-C	(3-0-2)4
Exam Hrs.	3	Hours / Week	5
SEE	50 Marks	Total Hours	52
Course Objective: Design a database and write SQL queries.			
Course Outcomes(COs): Upon completion of the course, students shall be able to			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1	Apply knowledge of database concepts in designing database	1	-
2	Analyze a problem, in identifying appropriate computing requirements to get a solution	2	-
3	Formulate SQL queries to perform database operations	3,12	-
4	Design a database for a given scenario using appropriate techniques	3	-
Course Contents:			
MODULE – 1			10 Hrs
Introduction: Introduction; An example; Characteristics of Database approach; Actors on the screen; Advantages of using DBMS approach. Data models, schemas and instances; Three-schema architecture and data independence; Database languages and interfaces; The database system environment; Centralized and client-server architectures; Classification of Database Management systems. Entity-Relationship Model: Using High-Level Conceptual Data Models for Database Design; An sample Database Application; Entity Types, Entity Sets, Attributes and Keys. Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; ER Diagrams, Naming Conventions and Design Issues.			
MODULE – 2			10 Hrs
Relational Model and Relational Algebra: Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN-variations of JOIN, OUTER JOIN operations. SQL: SQL Data Definition and Data Types; Specifying basic constraints in SQL; Basic Retrieval queries in SQL;			
MODULE – 3			10 Hrs
Continued: Insert,Delete and Update statements in SQL; Additional features of SQL, More complex SQL Retrieval Queries; Views; Schema Change Statements in SQL. Database Design-1: Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys-1NF,2NF,3NF.			
MODULE – 4			10 Hrs
Database Design-2: Transaction management: The ACID Properties- Consistency and Isolation, Atomicity and Durability; Transactions and Schedules; Concurrent Execution of Transactions- revalorization for Concurrent Execution , Serializability , Anomalies Due to Interleaved Execution , Schedules Involving Aborted Transactions; Concurrency control- 2PL, Serializability, and Recoverability , View Serializability; Introduction to Lock Management - Implementing Lock and Unlock Requests			
Text Books:			
1. Elmasri and Navathe, Fundamentals of Database Systems, Addison-Wesley, 7th Edition, 2015. 2. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, McGraw-Hill, 3rd Edition, 2007.			

Reference Books:

1. Silberschatz, Korth and Sudharshan, Database System Concepts, 5th Edition, Mc-Graw Hill, 2006.
2. C.J. Date, A. Kannan, S. Swamynatham, An Introduction to Database Systems, Pearson education, 8th Edition, 2006.

MOOCs:

1. <http://nptel.ac.in/courses/106106093>
2. <https://www.edx.org/course/database-systems-concepts-design-gtx-cs6400x>

Course Title	ALGORITHMS LABORATORY		
Course Code	22CS405	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	Total Hours	28
Course Objective: To demonstrate various algorithmic design techniques.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Implement various algorithms	1, 3, 9	2
2.	Document the executed algorithms	10	-
Course Contents:			
Practice Programs			
1. Sort a given set of elements using Insertion sort method. 2. Obtain the topological ordering of vertices in a given digraph. 3. Write a program using Transform and Conquer technique for checking whether the digits of mobilenumbers of a person are unique. 4. Find the Binomial Co-efficient using Dynamic Programming 5. Implement computing a mode using pre-sorting method. 6. Implement 0/1 Knapsack problem using dynamic programming.			
Exercise Programs			
1. Employees in an organization need to be grouped for a tournament based on their ages. Sort the ages using Merge sort and find the time required to perform the sorting. 2. Students in a department need to be selected for a high jump competition based on their height (integer values only). Sort the heights of students using Quick sort and find the time required for the Sorting. 3. Print all the nodes reachable from a given starting node in a digraph using BFS and DFS method. 4. Sort a given set of elements using the Heap sort method. 5. Implement Horspool algorithm for String Matching. 6. Consider N cities. The shortest path between every pair of cities needs to be determined. Implement Floyd's algorithm for the All-Pairs- Shortest-Paths problem. Also find transitive closure by implementing Warshall's algorithm 7. There are N different routes from hostel to college. Each route incurs some cost. Find the minimum cost route to reach the college from hostel using Prim's algorithm. 8. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm. 9. Consider the distance between Hassan and N different cities. Every city can be reached from Hassan directly or by using intermediate cities whichever costs less. Find the shortest distance from Hassan to other cities using Dijkstra's algorithm. 10. Consider a scenario where you need to send a secret message across a network. To ensure the confidentiality of the message, encode it using Huffman coding and transmit the encoded message. 11. Consider the problem having weights and profits are: Weights: {3, 4, 6, 5} Profits: {2, 3, 1, 4} The weight of the knapsack is 8 kg. Find the optimal set of items to include in the knapsack using dynamic programming. 12. Implement N-Queens problem using back tracking.			

Course Title	OPTIMIZATION TECHNIQUES		
Course Code	22CS406A	L-T-P-C	(2-0-2)3
Exam Hrs.	3	Hours / Week	4
SEE	50 Marks	Total Hours	40
Course Objective: Solve optimization problems using various methods			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Develop mathematical model for a given problem.	1	-
2.	Apply techniques of Operations Research.	2	-
3.	Solve prediction and estimation problems.	1, 2	-
4.	Expose to the significance of various scientific tools.	5	-
Course Contents:			
MODULE – 1			10 Hrs
Introduction : Introduction: The origin, nature and impact of OR; Overview of the Operations Research Modeling Approach: Defining the Problem and Gathering Data; Formulating a Mathematical Model; Deriving Solutions from the Model; Testing the Model; Preparing to Apply the Model; Implementation Linear Programming – 1 : Prototype example; The Linear Programming (LP) Model, Assumptions of LP, Additional Examples			
MODULE – 2			10 Hrs
Simplex Method - 1 : The Essence of the Simplex Method; Setting up the Simplex Method; The Algebra of the Simplex Method; The Simplex Method in Tabular Form; Tie Breaking in the Simplex Method Simplex Method – 2 : Adapting to other Model Forms; Post Optimality Analysis, Computer implementation			
MODULE – 3			10 Hrs
Revised Simplex Methods : Foundations of the Simplex Method, The revised simplex method, A Fundamental Insight Duality Theory: The Essence of Duality Theory; Economic Interpretation of Duality. Primal-Dual Relationships , Adapting to other primal forms, The role of duality in sensitive analysis; The essence of sensitivity analysis; Applying sensitivity analysis, The dual simplex method ; Parametric linear programming; The upper bound technique.			
MODULE – 4			10 Hrs
Transportation Model : Definition of the Transportation Model, Nontraditional Transportation Models, The Transportation Algorithm. Assignment Model and Network Models : The Assignment Model, CPM and PERT			
Text Books : 1. Frederick S. Hillier and Gerald J. Lieberman, “Introduction to Operations Research”, Tata McGrawHill, 9th Edition, 2012. (Chapters: 1.1 to 1.3, 2, 3.1 to 3.3, 4.1 to 4.7, 5, 6.1 to 6.7, 7.1) 2. Hamdy A Taha, “Operations Research: An Introduction”, Prentice Hall India, 8th Edition, 2005.(Chapters: 5, 6.4)			
Reference Book: 1. Wayne L. Winston, “Operations Research Applications and Algorithms”, Thomson Course Technology, 4th Edition 2003			

Course Title	DISCRETE MATHEMATICAL STRUCTURES		
Course Code	22CS406B	L-T-P-C	(2-0-2)3
Exam Hrs.	3	Hours/Week	4
CIE	100 Marks	Total Hours	40
Course Objective: Prepare student to use discrete mathematics as a tool in developing a consistent program in Computer Science & Information Technology. Course Outcomes: At the end of the course, student will be able:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply logic and counting principles to model and analyze problems of computer science & engineering	3,2	-
2.	Apply the concepts of logic to identify methods of mathematical proofs.	3,2	-
3.	Use concepts of functions in analyzing problems on algorithms and programs.	3,2	-
4.	Model and analyze programming problems related to Graph theory and coding theory.	3,2	-
	Derive mathematical model for real life problems related to Information science and Engineering.		
MODULE-1			10 Hrs
Principles of Counting: The rule of sum and product, permutation principle, combination principle, rule of generalized Permutations and Combinations, counting technique in chess board. Fundamentals of Logic: Basic logic connectives and truth tables. Logical equivalence and Tautologies. Statement of laws of logic. Self-study: Set theory – set operations, Venn diagram, Inclusion Exclusion principle.			
MODULE-2			10 Hrs
Fundamentals of Logic contd.: Logic implication - Rules of inference theory. Application of switching network. Relations-definition and elementary properties , Partially ordered sets, Hasse diagram, Lattice . Self-study: Quantifiers, Relations, Partially ordered sets, Hasse diagram.			
MODULE-3			10 Hrs
Functions: Ceiling function, Floor function, Characteristic function, and Application of Stirling numbers of second kind. Application of functions in vending machine. Application to algorithm testing using computational complexity. Self-study: one to one and onto functions, Composition of functions			
MODULE-4			10 Hrs
Group theory: examples and elementary properties Coding theory: Elements of coding theory, the humming matrix, the parity – check and Generator matrices, Group codes: Decoding with coset leaders. Hamming matrices. Self-study: sub-groups, cosets, Matrix row operations.			
Textbooks: 3. Discrete and Combinatorial Mathematics, R C Grimaldi, Pearson's publications, 5th edition, 2007.			

Reference Books:

1. Discrete Mathematical Structures, by D. S. Malik & M. K. Sen, Thomson's Publications, First edition, 2006.

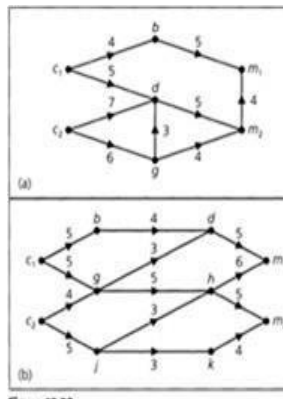
Activities List

1. Application of switching network
2. Application to algorithm testing using computational complexity.
3. Application of graph theory to study ecosystem
4. Application of graph theory in sociology and psychology
5. Computation of number of different ways n rooks can be arranged on an $n \times n$ chess board so that no two rooks can attack each other for all positive integers n .
6. Discuss ways in which the current telephone numbering plan can be extended to accommodate the rapid demand for more telephone numbers.
7. Application of functions in vending machine.
8. **Graph Theory:** Basic terminologies of a graph. Discussion of connected and disconnected graphs, Euler and Hamilton graphs, planar graphs, discuss ways in which the current telephone numbering plan can be extended to accommodate the rapid demand for more telephone numbers.
9. **Trees:** Definition, properties of a tree. Weighed trees, prefix codes. Modelling of real-life problems using graphical approach and their analysis.

Course Title	GRAPH THEORY AND COMBINATORICS		
Course Code	22CS406C	L-T-P-C	(2-0-2)3
Exam Hrs.	3	Hours / Week	4
SEE	50 Marks	Total Hours	40
Course Objective: To design and perform abstract concepts of graph theory in modeling and solving non-trivial problems. Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe the concepts of graphs and counting principles.	1	-
2.	Apply the concepts of graphs and counting principles in solving real time applications.	1, 2	-
3.	Analyze various concepts of graph and counting techniques applied in solving real time applications.	1, 2	-
4.	Design solutions for real time problems adopting the concepts of graph and counting ideas.	1, 2, 3	2
Course Contents:			
MODULE – 1			10 Hrs
An Introduction to Graph theory: Definitions and examples, Sub graphs, Complements and Graph isomorphism, Vertex degree, Euler Trails and Circuits, Planar Graphs: Planar graphs, Hamilton paths and cycles.			
MODULE – 2			10 Hrs
An Introduction to Graph theory (conti.): Graph coloring, chromatic number, and chromatic polynomials. Optimization and Matching: Transport Networks: The Max-Flow Min-Cut Theorem, Matching Theory.			
MODULE – 3			10 Hrs
The Principles of Inclusion and Exclusion: The Principle of Inclusion and Exclusion, generalizations of the principle, derangements, Rook Polynomials, Arrangements with forbidden Positions. Generating function: Introductory examples, Definition and examples; Partitions of Integers.			
MODULE – 4			10 Hrs
Generating function (conti.): The exponential generating function, the Summation Operator. Recurrence relations: First-order and second order linear recurrence relations, with constant coefficients, The non-homogeneous recurrence relation, The Method of Generating Functions.			
Text Books : 1. Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education. 2004. Chapters 8, 9, 10, 11, 12. 2. Dr. D.S. Chandrashekar: Graph Theory and Combinatorics, 4th Edition, Prism, 2012 (Chapter 4)			
Reference Books: 1. Narsing Deo, Graph Theory with applications to Engineering and Computer Science, PHI Publications. 2. V Balakrishnan, Combinatorics, Schaum Series, Tata-McGraw Hill Publications			
MOOCs: 1. http://nptel.ac.in/courses/111106050/ 2. http://nptel.ac.in/courses/106108051/			

Activity:

1. Two cases of soft drinks, 24 bottles of one type and 24 of another are distributed among five surveyors who are conducting taste tests. In how many ways can the 48 bottles be distributed so that each surveyors gets (a) at least two bottles of each type? (b) At least two bottles of one particular type and at least three of the other?
2. How can Mary split up 12 hamburgers and 16 hot dogs among her sons Richard, Peter Christopher, and James in such a way that James gets at least one hamburger and three hot dogs, and each of his brothers gets at least two hamburgers but at most five hot dogs?
3. Sergeant bueti must distribute 40bullets (20 for rifkes and 20 for handguns) among four officersso that each officer gets at least two, but no more than seven, bullets of each type. In how manyways can he do this
4. Nineteen students in a nursery school play a game each day where they hold to hands to form a circle. For how many days can they do this with no students holding hands with the same playmate twice?
5. In each of the following “transport networks” two companies c_1 and c_2 , produce a certain product that is used by two manufactures, m_1 and m_2 . For the network shown in part(a) of Fig. 13.22, company c_1 can produce 8 units and company c_2 can produce 7 units; manufacturer m_1 requires 7 units and manufacturer m_2 needs 6 units. In the network shown in Fig 13.22 (b), each company can produce 7 units and each manufacturer needs 6 units. In which situation(s) can the producers meet the manufactures demands?



6. Fritz is in charge of assigning students to part-time jobs at the college where he works. He has 25 student applications, and there are 25 different part-time jobs available on the campus. Each applicant is qualified for at least four of the jobs, but each job can be performed by at most four of the applicants. Can Fritz assign all the students to jobs for which they are qualified? Explain. Characterize the type of graph in which an Euler trail (circuit) is also a Hamilton path (cycle).

Course Title	COMPUTER ASSEMBLY AND NETWORKING		
Course Code	22CS407A	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	Total Hours	15
Course Objective: Acquire hands on experience on computer assembly and disassembly, trouble shooting and computer networking Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1	Experience on computer assembly and disassembly and troubleshooting of computer systems hardware, software and other peripheral equipment.	1	-
2	Familiar with wired and wireless communication and computer networks instruments.	2,3	-
3	Gain practical experiences in networking hardware, device configuration, testing and troubleshooting.	4	-
4	Demonstrate OPNET simulator software to virtually implement networks and analyze their performances under various traffic models	5	1
Course Contents:			
Lab 1: Computer assembly and disassembly			02 Hrs
Computer Assembly: Open the case, Install the power supply, Attach the components to the motherboard and install the motherboard, Install internal drives, Connect all internal cables, Install motherboard power connections, Connect external cables to the computer, Boot the computer for the first time. Computer Disassembly: Unplugging, Open the case, Disconnect all the connectors, Remove the fan, Remove the power supply, Removing HDD and optical drive, Remove RAM (random access memory), modules, Remove expansion cards, Remove motherboard, Reassemble the components.			
Lab 2: Troubleshooting			02 Hrs
Diagnose and troubleshooting of microcomputer/computer systems hardware and software and other peripheral equipment: Approaches to solve a PC problem, troubleshooting a failed boot before the OS is loaded, different approaches to installing and supporting I/O device, managing faulty components. Troubleshooting printer and scanner problems, troubleshooting hard drive problems.			
Lab 3: Network cables assembling and testing			01 Hrs
This lab introduces three types of cabling, i.e. twisted pairs, coaxial cable, and fiber optic. Students assemble connectors to a twisted pair cable using crimping tool, and then they test the cable to ensure properly wired connections. This is important because many of the network installation problems are related to cabling errors.			
Lab 4: Network cards installation and test			01 Hrs
This lab shows how to install and configure the network card into a PC expansion slot of a client computer. Connect the client computer to the network. Install the cable and document all network connections on a classroom LAN network.			
Lab 5: LAN configuration			02 Hrs
Once the network operating system and the physical hardware is installed and configured, shares must be set up on the workstations. The lab introduces how to locate the network configuration screen used with Windows XP and configure a workstation with a unique computer name and configure a hub with an IP address. Each workstation becomes a client for Microsoft Networks, and File and Print Sharing is enabled. The basic elements will be in place to share files between			

workstations on the LAN. In this procedure students examine the user-level access control, that is, access is granted based upon access privileges granted to a single user or a group of users. Another lab activity is the configuration of a client computer for print sharing.	
Lab 6: Wireless Networks	02 Hrs
In this lab students will install and configure the Cisco Aironet Wireless Access point, which allows laptops and other mobile computer systems wireless access to a network, and perform a link test to assess the performance of the RF link. Also students learn how to implement a strong network security by changing the Service Set Identifier (SSID), and establish a strong Wi-Fi Protected Access (WPA) pass-phrase on the router or access point. Then configure all the wireless computers and devices on the network to associate with the SSID of WPA-enabled router or access point using the same WPA pass-phrase.	
Lab 7: Router configuration	02 Hrs
This lab introduces the concepts of IP forwarding and routing between IP networks. The lab exercise show how to set up a Windows PC and a Cisco router as an IP router and reveals the similarities of IP forwarding and routing tables on a Widows PC and a Cisco router. Students learn how to interpret and manually edit routing-table entries in a network with multiple IP networks and IP routers.	
Lab 8: Client-Server Network Configuration	02 Hrs
Students are introduced to the installation of Window Server tools on a Windows Professional workstation and set up a user account on the Windows server. Also create and manage networked groups, and manage the security policies of users and the network.	
Lab 9: Routing Information Protocol	01 Hrs
The lab explores a routing protocol based on the distance-vector algorithm using OPNET. The goal of the lab is to configure and analyze the performance of the Routing Information Protocol (RIP) model. Here students study how RIP provide a distributed, dynamic way to solve the problem of finding the lowest-cost path in the presence of link and node failures and changing edge costs. A lab exercise with the routing protocol RIP explores the analysis of the routing tables generated in the routers based on distance-vector algorithm, and how RIP is affected by link failures.	
Text Book: 1. Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition, McGraw Hill, Indian Edition. 2. Computer-Networks- Andrew S. Tanenbaum and David J. Wetherall, Pearson Education, 5th-Edition. (www.pearsonhighered.com/tanenbaum). 3. Computer Networking a Top-Down Approach -James F. Kurose and Keith W. RossPearson Education 7th Edition.	
Reference Books: 1. E. Aboelela, Network Simulation Experiments Manual, Third Edition, Morgan Kaufmann 2003. 2. J. Liebeherr, M. El Zarki, “Mastering Networks, An Internet Lab Manual”, Pearson Education, 2004. 3. J. S. Beasley, Networking, Pearson Education, 2004.	

Course Title	UI/UX LABORATORY		
Course Code	22CS407B	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	Total Hours	15
Course Objective: To gain a solid understanding of fundamental UI/UX principles, including visual design, user-centered design, usability, and user experience. Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply design principles and guidelines to create visually appealing and user-friendly interfaces for websites and mobile applications.	2	-
2.	Develop wireframes and interactive prototypes using design tools to visualize and communicate interface concepts and user flows.	5	-
Course Contents:			
1. Designing a Login Form: Design a user-friendly login form for a mobile app. Consider the layout, input fields, button design, and error handling to create an intuitive and visually appealing login experience. 2. Creating a Navigation Menu: Design a navigation menu for a website that includes dropdown menus and a responsive design. Ensure the menu is easy to navigate and visually consistent across different screen sizes. 3. Redesigning a Landing Page: Redesign a landing page for a product or service. Improve the visual hierarchy, use compelling imagery, and optimize the layout to encourage user engagement and conversions. 4. Creating a Contact Form: Design a contact form for a website that captures essential user information. Consider input validation, error messages, and a confirmation message to enhance the user experience. 5. Designing a Product Card: Create a visually appealing product card for an e-commerce website. Include product images, title, price, and call-to-action buttons to entice users to learn more and make a purchase. 6. Improving Form Usability: Evaluate an existing form on a website for usability issues and propose improvements. Focus on optimizing the form's layout, labeling, and input validation to enhance user comprehension and completion rates. 7. Enhancing Mobile App Onboarding: Design an onboarding experience for a mobile app. Create a series of screens that introduce users to the app's features and guide them through the setup process in a clear and engaging manner. 8. Redesigning a Checkout Process: Redesign the checkout process for an e-commerce website. Simplify the steps, provide clear instructions, and optimize the layout and form inputs to streamline the purchasing experience. 9. Designing an Error Page: Design a visually appealing and helpful error page for a website. Consider the tone of the message, provide relevant information or suggestions, and include navigational elements to guide users back on track. 10. Creating an Interactive Prototype: Use a prototyping tool to create an interactive prototype for a mobile app or website. Design key screens and transitions to showcase the user flow and interactions within the interface.			

Course Title	TECHNICAL WRITING USING LATEX		
Course Code	22CS407C	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	Total Hours	15
Course Objective: Understand the various sections and files associated with LaTeX document processor.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1	Understood introduction of Latex tools and its installation or working with online source	1, 2	-
2	Demonstrate various packages, content formatting, inserting figures, equations and references.	1,2	-
3	Build the conference paper, journal-manuscript and thesis in LaTeX.	3, 5	1
4	Design a presentation slides using Beamer template in LaTeX.	3,5,10	1
Course Contents:			
MODULE – 1			03 Hrs
Introduction to LATEX: How to prepare a LATEX input file? How to compile a LATEX input file? LATEX syntax, Commands, Environments, Packages, Keyboard characters in LATEX. Fonts Selection: Text-mode fonts, Math-mode fonts, Colored fonts. Texts Formatting : Sectional units, Labeling and referring numbered items, Quoted texts, New lines and paragraphs, Creating and filling blank space, Producing dashes within texts, Foot notes.			
MODULE – 2			04 Hrs
Listing Texts: Numbered listing through enumerate environment, Unnumbered listing through itemize environment, Listing with user-defined labels through description environment, Nesting different listing environments. Table Preparation: Table through tabular environment, Table through tabular environment, Vertical positioning of tables, Merging rows and columns of tables, Tables in multi-column documents, Tables at the end of a document.			
MODULE – 3			04 Hrs
Figure Insertion: Commands and environment for inserting figures, Inserting simple figures, Sub-numbering a group of figures, Figures in multi-column documents, Figures at the end of a document. Equation Writing: Basic notations and delimiters, Mathematical operators, Mathematical expressions in text-mode, Simple equations, Array of equations. Bibliography with BIBTEX: Preparation of BIBTEX compatible reference database, Standard bibliographic styles of LATEX, Compiling BIBTEX based LATEX input file.			
MODULE – 4			04 Hrs
Article Preparation: List of authors, Title and abstract on separate pages, Articles in multiple columns Thesis preparation: Template of a thesis, Compilation of thesis. Slide Preparation: Frames in presentation, Sectional units in presentation, Presentation structure, Title page, Appearance of a presentation (BEAMER themes).			
Text Book:			
1. LATEX Beginner's Guide, Stefan Kottwitz.			
MOOC:			
1. https://www.my-mooc.com/en/mooc/latex-for-students-engineers-and-scientists/			

Course Title	BIOLOGY FOR ENGINEERS		
Course Code	22CS408	L-T-P-C	(2-0-0)1
Exam Hrs.	3	Hours/Week	2
CIE	100 Marks	Total Hours	14
Course Objective: Realization of relation between natural engineering and man-made engineering.			
Course Outcomes: At the end of the course, student will be able:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	To familiarize engineering students with basic biological concepts	1	-
2.	To involve students in an interdisciplinary vision of biology and engineering	2	-
3.	To gain an appreciation for how biological systems can be designed and engineered to substitute natural system	2	-
4.	To develop biological models using AI tools	3	-
MODULE-1			3 Hrs
Introduction to Human Anatomy: Overview of human anatomy, Structural organization of the human body - cardiovascular system, endocrine system, digestive system, respiratory system, excretory system, lymphatic system, nervous system, muscular system and skeletal system.			
MODULE-2			4 Hrs
Bioinspired Engineering based on human physiology: Circulatory system (artificial heart, pacemaker, stents), Nervous system (Artificial neural network).			
MODULE-3			4 Hrs
Bioinspired Algorithms and Applications: Genetic algorithm, Gene expression modelling. Parallel Genetic Programming: Methodology, History, and Application to Real-Life Problems. Dynamic Updating DNA Computing Algorithms. Beehive: New Ideas for Developing Routing Algorithms Inspired by Honey Bee Behavior.			
MODULE-4			3 Hrs
Artificial Intelligence and Biology: Applications of AI in medical imaging, neural engineering, systems biology, microbiome and data mining.			
Text Books:			
1. Jenkins, C.H. Bioinspired Engineering, NY: Momentum press, 2012 ISBN: 97816066502259			
2. A Practical Guide to Bio-inspired Design, Hashemi Farzaneh, Helena, Lindemann, Udo, Springer 2019, ISBN978-3-662-57683-0			

Course Title	UNIVERSAL HUMAN VALUES		
Course Code	22CS409	L-T-P-C	(1-0-0)1
Exam Hrs.	3	Hours / Week	1
SEE	50 Marks	Total Hours	14
Course Objective: The course aims at the development of the value education by the right understanding through the process of self-exploration (about themselves), family, society and nature/existence. Strengthening of self-reflection by development of commitment and courage to act are presented as the prime focus throughout the course towards qualitative transformation in the life of the student. Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Start exploring themselves, get comfortable with each other and with the teacher and they start appreciating the need and relevance for the course. Also they are able to note that the natural acceptance (intention) is always for living in harmony.	6, 7, 8, 9, 12	-
2.	Differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them and need to take appropriate steps to ensure right participation (in terms of nurturing, protection and right utilization) in the nature.	6, 7, 8, 9, 12	-
3.	Present sustainable solutions to the problems in society and nature. They are also able to see that these solutions are practicable and draw roadmaps to achieve them.	6, 7, 8, 9, 12	-
Course Contents:			
MODULE – 1			8 Hrs
Introduction to Value Education : Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Right Understanding, Relationship and Physical Facility, Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations.			
MODULE – 2			6 Hrs
Harmony in the Human Being : Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self Lecture, Understanding Harmony in the Self Tutorial, Harmony of the Self with the Body to ensure self-regulation and Health.			
MODULE – 3			8 Hrs
Harmony in the Family, Nature and Existence : Harmony in the Family – the Basic Unit of Human Interaction, Values in Human-to- Human Relationship, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Understanding Harmony in the Society, Vision for the Universal Human Order. Whole existence as Coexistence: Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature. Include practice sessions to discuss human being as cause of imbalance in nature (film “Home” can be used), pollution, depletion of resources and role of technology etc.			
MODULE – 4			6 Hrs
Implications of the Holistic Understanding – A Look at Professional Ethics : Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models, Typical Case Studies, Strategies for			

Transition towards Value-based Life and Profession.
Self-Learning Activities: 1. Sharing about Oneself and Exploring Natural Acceptance 2. Exploring Harmony of Self with the Body 3. Exploring the Feeling of Respect 4. Exploring the Four Orders of Nature Lecture and Exploring Co-existence in Existence 5. Exploring Humanistic Models in Education, Exploring Steps of Transition towards Universal Human Order.
Text Books: 1. The Textbook: A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019.ISBN 978-93-87034-47-1. 2. The Teacher's Manual Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2.
Reference Books: 1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999. 2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004. 3. The Story of Stuff (Book). 4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi 5. Small is Beautiful - E. F Schumacher. 6. Slow is Beautiful - Cecile Andrews 7. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj – PanditSunderlal. 9. Rediscovering India - by Dharampal 10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi. 11. India Wins Freedom - Maulana Abdul Kalam Azad 12. Vivekananda - Romain Rolland (English) 13. Gandhi - Romain Rolland (English)

Course Title	BRIDGE COURSE MATHEMATICS - II		
Course Code	22BCM401	L-T-P-C	(3(A)-0-0)0
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: To introduce simple concepts of differential equations, vector calculus and numerical integration.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Identify suitable methods to solve the differential equations analytically.	1	-
2.	Solve first order first degree D E, integration problems and simple PDE problems using numerical methods.	1	-
3.	Solve problems on Gradient, Divergence, and Curl of a vector valued function.	1	-
Course Contents:			
MODULE – 1			10 Hrs
Differential Equations: Solution of first order first degree differential equations- Variable separable methods, Homogeneous Equations, Exact differential equations, illustrative examples from engineering field. Linear & Bernoulli's differential equations, Illustrative examples from engineering field.			
MODULE – 2			10 Hrs
Differential Equations: Solution of second and higher order equations with constant coefficient by inverse differential operator method $f(D)y = e^{ax}$, $f(D)y = \cos(ax + b)/\sin(ax + b)$, $f(D) = ax^2 + bx + c$ $f(D)y = e^{ax}\cos(bx + c)/e^{ax}\sin(bx + c)$, $f(D)y = x\cos(ax + b)/x\sin(ax + b)$ (Simple problems). Illustrative examples from engineering field.			
Numerical solution of first order first degree ordinary differential equations: Taylor series method, Runge-Kutta method of fourth order, Milne's Predictor corrector methods.			
MODULE – 3			10 Hrs
Solution of Partial Differential Equations: Solving PDE by variable separable method, to find all possible solutions of one-dimensional wave equation, one dimensional Heat flow equation and two-dimensional Laplace's equation by the method of separation of variables, numerical solution of Laplace equation by finite difference approximation method using standard five point formula and diagonal five point formula. Numerical solution of poisson equation by finite difference approximation method using standard five-point formula and iterative formulas.			
MODULE – 4			10 Hrs
Numerical Integration: Computation of line integral by trapezoidal rule, Simpsons 1/3rd rule, Weddle's rule, Simpsons 3/8th rule, Illustrative examples from engineering field.			
Vector Algebra: vector addition, Multiplication (Dot and Cross product), Triple products, vector differentiation, velocity, acceleration of a vector point function, Gradient, divergence, curl.			
Note - Theorems and properties without proof. Applicable to all the units.			
Text Books:			
1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 40th edition (2007).			
2. Erwin Kreyszig, Advanced Engineering Mathematics, Tata McGraw Hill Publications, 8th edition (2007).			
Reference Books:			
1. Calculus by Thomas Finney, 9 th edition, Pearson education, 2002.			
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.			

**MALNAD COLLEGE OF ENGINEERING,
HASSAN**

(An Autonomous Institution Affiliated to VTU, Belagavi)



**Autonomous Programme
Bachelor of Engineering**

**DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING**

SYLLABUS

**V Semester & VI Semester
(2022-23 Admitted Batch)**

Academic Year 2024-2025

VISION

To become a prominent department of Computer Science & Engineering producing competent professionals with research and innovation skills, inculcating moral values and societal concerns.

MISSION

1. Impart world class engineering education to produce technically competent engineers.
2. Provide facilities and expertise in advanced computer technology to promote research.
3. Enhance Industry readiness and entrepreneurial abilities through innovative skills
4. Nurture ethical values and social responsibilities

PROGRAM EDUCATIONAL OBJECTIVES

- PEO 1 : Graduates will be efficient software developers in diverse fields and will be successful professionals and/or pursue higher studies.
- PEO 2 : Graduates will be capable to adapt to new computing technology for professional excellence and Research and will be lifelong learners.
- PEO 3 : Graduates will work productively exhibiting ethical qualities for the betterment of society.
- PEO 4 : Graduates will possess leadership qualities, work harmoniously in a team with effective communication skills.

PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Upon graduation, students with a degree B.E. in Computer Science & Engineering will be able to:

PSO – 1: To make the students industry ready by facilitating them with software tools in recent technologies

PSO – 2: To develop IT based solutions for problems in diverse domains

Course Title	TECHNOLOGY MANAGEMENT AND ENTREPRENEURSHIP		
Course Code	22CS501	L-T-P-C	(3-1-0)3
Exam Hrs.	3	Hours/Week	4
SEE	50Marks	Total Hours	40L+10T
Course Objective: To lead and manage teams, become entrepreneur and to prepare project proposal.			
Course Outcomes(COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Explore corporate culture and management principles.	1	-
2.	Build profile and project proposal	3,10,11,12	2
3.	Acquire skills for Entrepreneurship, Startups and IPR	1,12	-
4.	Document on Industry visit.	8,10	-
Course Contents:			
MODULE-1			10 Hrs
Planning, and Decision making: Planning: Preview. Nature of planning, the foundation for planning, some planning concepts. Decision Making: Preview .Nature of decision making. Types of decisions/decision making. Some human aspects of organizing: Preview. Staffing technical organizations .Authority and power .Delegation.			
MODULE-2			10 Hrs
Motivating & Leading Technical People and Controlling: Motivating and leading technical people: Preview. Motivation. Leadership. Motivating and leading technical professionals (methods). Managing the Research Functions: Preview. Product and technology life cycles .Nature of R&D. Research strategy and organization .Selecting R&D projects .Protection of ideas. Intellectual Property Rights (IPR).Creativity.			
MODULE-3			10 Hrs
Entrepreneurship: Meaning Evolution of the concept,functions of an Entrepreneur ,Characteristics of an Entrepreneur ,types of entrepreneurs , Intreprenuer. Entrepreneurship :Concept of Entrepreneurship ,Characteristics of Entrepreneurship ,Development of Entrepreneurship ,Stages in Entrepreneurial process ,Role of Entrepreneurs in economic development, Entrepreneurship in India, Entrepreneurship barriers, Women entrepreneur – Concept & steps to develop Women Entrepreneur. Small Scale Industry: Definition ,Characteristics ,Objectives ,Scope and role of SSI in economic Development, Advantages of SSI, Problems of SSI ,Steps to start an SSI.			
MODULE-4			10 Hrs
Government Policy towards SSI; Different Policies of SSI, Introduction to GATT/ WTO. Supporting Agencies of Government for SSI: Meaning, Nature of support; Objectives, functions. Ancillary Industry and Tiny Industry. Institutional Support: Different Schemes: SSIDC, SSIB, DICs/ Single Window Concept, TCOs, ICICI, NSIC, SIDO, IDBI, SIDBI, SFCS, IFCI. Preparation of Project: Meaning, Project identification ,Project selection ,Project Report Need of Project, Contents ;formulation, Network Analysis Errors of project report ,Project Appraisal ,Feasibility Study-			

MarketFeasibilityStudy,TechnicalFeasibilityStudy,FinancialFeasibilityStudy,SocialFeasibilityStudy
Text Books: 1. Daniel Babcock & Lucy C. Morse “Managing Engineering and Technology”, PHI, 6th edition, 2014. 2. Management and Entrepreneurship-N. V. RNaidu, T Krishna Rao.
Reference Books: 1. Entrepreneurship Development, Small Business Enterprises – Poornima .M. Charantimath, – Pearson Education–2006. 2. Dynamics of Entrepreneurial Development & Management-Vasant Desai, Himalaya Publishing House. 3. Management Fundamentals-Concepts, Application, Skill Development –Rober Lousier, Thomson. 4. Principles of Management–P. C .Tripathi, P .N. Reddy–Tata Mc Graw Hill.
MOOCs: 1. https://nptel.ac.in/courses/110/106/110106141 2. https://nptel.ac.in/courses/127/105/127105007
Tutorial 1. Resume building 2. Brainstorming session: Frame vision and mission statements 3. Preparing a project proposal 4. SWOC analysis exercises

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	1	-	-	-	-	-	-	2	3	2	-	1
CO3	1	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	-	-	2	-	3	-	-	-	-

Course Title	SOFTWARE ENGINEERING AND PROJECT MANAGEMENT		
Course Code	22CS502	(L-T-P)C	(3-2-0)4
Exam	3 Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	40L+10T
Course Objective: Use Software Engineering Principles for Application development Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Explore diverse software development process	1	2
2.	Construct SRS for a given scenario	1	2
3.	Design and validate a software product	3,5	2
4.	Apply appropriate project estimation and management techniques	9,11	2
MODULE – 1			10 Hrs.
Introduction: Professional Software Development, Software Engineering Ethics. Case studies: An insulin pump control system, Software Processes: Software Processes models, Process activities, coping with change, The Rational Unified Process. Agile Software Development: Agile Methods, Plan- driven and Agile Development, Extreme programming. Agile Project Management. Scaling Agile Methods. Self-Study: Case Studies- A patient information system for mental health care, A wilderness weather station			
MODULE – 2			10 Hrs.
Requirements Engineering: Functional and non-functional requirements. The software Requirements Document. Requirements Specification, Requirements Engineering Processes. Requirements Elicitation and Analysis. Requirements validation. Requirements Management. System Models: Context models. Interaction models. Structural models. Behavioural models. Model-driven engineering. Self-Study: Behavioral models as applied to case study.			
MODULE -3			10 Hrs.
Design and Implementation: Object-oriented design using the UML, Design patterns, Implementation issues, Open source development. Software Testing: Development testing, Test-driven development, Release testing, User testing. Software Evolution: Evolution processes, Program evolution dynamics. Software maintenance. Self-Study: Legacy system management			
MODULE -4			10 Hrs.
Software Project Management: Software Project Management Complexities, Responsibilities of a software project Manager, Project Planning and Metrics for project size estimation, Project estimation techniques, Empirical estimation techniques, Scheduling, Organization and Team Structures. Self-Study: COCOMO—A Heuristic Estimation Technique, Scrum tool.			
Text Books: 1. Ian Sommerville, “Software Engineering”, 9th Edition, Person Education, 2014. (Chapters:1,2,3,4,5,7,8,9) 2. Fundamentals of Software Engineering, Rajib Mall, 2015, Prentice-Hall Of India Pvt. Ltd., (Chapter 3)			

Reference Books:

1. Roger S. Pressman, “Software Engineering - A Practitioners Approach”, 7th Edition, McGraw-Hill, 2007.
2. Waman S. Jawadekar, “Software Engineering Principles and Practice”, Tata McGraw-Hill, 2004.
3. Software Engineering: A Concise introduction to Software Engineering by Pankaj Jalot, Springer.

MOOC Course:

<https://nptel.ac.in/courses/106/105/106105182/>

Tutorial:

1. Requirement specification for (functional and nonfunctional) for the specified scenario.
2. Write sequence diagram for the given case.
3. Write a SRS document for the given case study.
4. Discuss on ethical and professional issues and why they are of concern to Software Engineers.
5. Write behavioral model and interaction model for the given scenario.
6. By referring to embedded device depict requirement specification.
7. Employ software testing tool to address a given problem.
8. Practice scrum tool for the Project management.

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	-	-	3		2	-	-	-	-	-	-	-	-	2
CO4	-	-	-	-	-	-	-	-	3	-	-	2	-	2

Course Title	DATA COMMUNICATIONS		
Course Code	22CS503	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Students able to gain knowledge of TCP/IP Protocol Model and Functionalities of Data link Layer and Physical Layer Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Perceive the different types of Networks and demonstrate the responsibility each layers of TCP/IP protocol suite.	1,12	-
2.	Analyse the performance of different techniques for data/signal transmission	2	-
3.	Investigate the standard network components to utilize the available network resources	2	-
4.	Formulate and design error detection/ correction algorithms, different framing formats, and medium Access control Methods	3,4	-
Course Contents:			
MODULE-1			10 Hrs.
Data Communications; Networks; Network Types; Network Models: Protocol layer: Introduction to Physical Layer, Data and Signals; imits;			
MODULE-2			10 Hrs
Digital Transmission: Digital-to-Digital conversion: Line Coding, Line Coding Schemes, Block Coding, and Scrambling; Analog-to-Digital conversion: Pulse Code Modulation (PCM), Delta Modulation(DM); Multiplexing: FDM, WDM, TDM, Multiplexing ; Spread spectrum			
MODULE-3			10 Hrs
Transmission Media: Twisted pair cable, Coaxial cable, Fiber-Optic cable, Radio waves, Microwaves, Infrared. Switching: Introduction; Circuit-Switched Networks: Three Phases and Delay; Packet Switching; Datagram Networks: Virtual Circuit Networks; Introduction to Data-Link Layer: Link-layer Addressing: Three Types of Addresses, Address Resolution Protocol (ARP); Error Detection and Correction: Introduction; Block coding: Error Detection; Cyclic codes: CRC, Polynomials, Cyclic Code Encoder using Polynomials, Cyclic Code Analysis, Checksum: Concept, Other Approaches to the Checksum; Forward Error Correction.			
MODULE-4			10 Hrs
Data Link Control: DLC Services: Framing, Flow and Error control, Connectionless and Connection Oriented; Data Link Layer Protocols: Simple, Stop & Wait, Piggybacking; HDLC; Point to Point Protocol: Services and Framing; Media Access Control: Random Access: ALOHA, CSMA, CSMA/CD, CSMA/CA; Controlled Access: Reservation, Polling, Token Passing;			
Text Book: Behrouz A. Forouzan, “Data Communications and Networking”, Tata McGraw-Hill, 5th Edition.(Chapters 1.1,1.2,.1.3, 2, 3, 4.1,4.2, 6, 7, 8, 9, 10, 11,12, 13)			
Reference Books: 1. Alberto Leon-Garcia and Indra Widjaja, “Communication Networks–Fundamental Concepts and Keyarchitectures”, Tata McGraw- Hill, 2nd Edition. 2. William Stallings, “Data and Computer Communication”, Pearson Education, 8th Edition			
MOOC: http://nptel.ac.in/keyword_search_result.php?word=data+communication			

Course Articulation matrix

[illegible]

Course Title	COMPUTER GRAPHICS AND VISUALIZATION		
Course Code	22CS504	L-T-P-C	(3-0-2)4
Exam Hrs.	3	Hours / Week	5
SEE	50 Marks	Total Hours	40L + 12P
Course Objective: To learn the concepts of computer graphics to design a 2D and 3D scene using OpenGL.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe core concepts of computer graphics with OpenGL.	1	-
2.	Apply concepts of geometric transformations, projections, and illumination to render image.	2, 3, 4	-
3.	Analyze line clipping and polygonal clipping algorithms	2, 3	-
4.	Design a 2D/3D image using graphical concepts through OpenGL.	2, 3, 4, 5	2
Course Contents:			
MODULE – 1			12 Hrs
Introduction: Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging systems; The synthetic camera model; The programmer's interface: Pen Plotter Model; Graphics architectures; Graphics Programming: The Sierpinski gasket; Programming two - dimensional applications. The OpenGL: The OpenGL API; Primitives and attributes;			
MODULE – 2			12 Hrs
The OpenGL (Continued): Color; Viewing; Control functions; The Gasket program; Polygons and recursion; The three-dimensional gasket. Input and Interaction: Interaction; Input devices; Clients and Servers; Display lists; Display lists and modeling; Programming event-driven input; Menus, Design of Interactive programs, Animating interactive programs.			
MODULE – 3			12 Hrs
Geometric Objects and Transformations: Scalars, points, and vectors Three-dimensional primitives; Coordinate systems and frames; Modeling a colored cube; Affine transformations; Rotation, translation and scaling. Transformations in homogeneous coordinates; Concatenation of transformations; OpenGL transformation matrices			
MODULE – 4			12 Hrs
Viewing: Classical and computer viewing; Viewing with a computer; Positioning of the camera; Simple projections; Projections in OpenGL; Hidden-surface removal, Lighting and Shading: Light and matter; Light sources; The Phong lighting model; Polygonal shading; Light sources in OpenGL; Specification of materials in OpenGL Implementation: Clipping; Line- Segment Clipping; Bresenham's algorithm			
Text Book: Edward Angel, "Interactive Computer Graphics A Top-Down Approach with OpenGL", Addison-Wesley, 5thEdition, 2013. (Chapters 1, 2, 3, 4, 5, 6, 7)			

Reference Books:

1. F.S. Hill,Jr, “Computer Graphics Using OpenGL”, Pearson education,2nd Edition,2011.
2. James D Foley, Andries Van Dam, Steven K Feiner, John F Hughes, “Computer Graphics”, Addison-wesley.

Activity:

Write C program using OpenGL functions to

1. Recursively subdivide a tetrahedron to form 3D Sierpinski gasket. The number of recursive steps is to be specified by the user.
2. Draw a Rocket and allow the user to change the color.
3. Create robot face using display list.
4. Generate square for right click and to exit for left click using mouse function.
5. Draw box at each location on the screen where the mouse cursor is located.
6. Create hierarchical menus.
7. Create a house like figure and rotate it about a given fixed point using OpenGL functions.
8. Create a Rotating Square.
9. Draw a color cube and spin it using OpenGL transformation matrices.
10. Clip the line segment A(-4,2) and B(-1,7) in a window defined by left bottom corner at (-3,1) and upper right corner at (2,6). Find the visible portion of the line segment using Cohen Sutherland line clipping algorithm.

Course Articulation matrix

[illegible]

Course Title	WEB PROGRAMMING		
Course Code	22CS505	L-T-P-C	(0-0-4)2
Exam Hrs.	3	Hours / Week	4
SEE	50 Marks	Total Hours	28P
Course Objective: Create web pages with client side and server-side scripting			
Course Outcomes (COs): Upon completion of the course, students shall be able to :			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Create webpages using HTML/XHTML and CSS.	3,12	2
2.	Develop client-side script to design webpage	3,5,12	2
3.	Develop server-side script to create webpage	3,5,12	2
Course Contents:			
- Write a XHTML document to create web page with forms, links, image - Develop and demonstrate a XHTML document that illustrates the use of external style sheet (CSS), ordered list, table, borders, padding, color and the tag. - Create a JavaScript that prompts the user for a number and then counts from 1 to that number displaying only the odd numbers using alert window. - Write a java script to validate the following fields in a registration page - Name (should contains alphabets and the length should not be less than 6 characters) - Password(should not be less than 6 characters) - E-mail(should not contain invalid addresses) - Develop and demonstrate, using JavaScript script, a XHTML document that collects the USN (the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; no embedded spaces allowed) of the user. Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected. - Develop and demonstrate, using JavaScript, a XHTML document that contains three short paragraphs of text, stacked on top of each other, with only enough space of each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible. - Write an XML file which displays the book details that includes the following: - Title of book - Author name - Edition - Price Write a DTD to validate the above XML file and display the details using XSL. - Write XHTML form and PHP to insert name and age information entered by the user into a table created using MySQL and to display the current contents of this table. - Write a PHP program to store current date-time in a COOKIE and display the Last visited on date-time on the web page upon reopening of the same page. - Create a XHTML form with Name, Address and E-mail text fields and use PHP script to store the values in MySQL table and to Retrieve and display the data based on Name.			
Activity :			
Mini project (Carry out a mini project in a team of 2 to 4 members)			
Text Book :			
Robert W. Sebesta: Programming the World Wide Web, 8th Edition, Pearson Education, 2014.			

Course Title	DIGITAL IMAGE PROCESSING		
Course Code	22CS551	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: To study the image fundamentals and mathematical transforms necessary for imageprocessing			
Course Outcomes (COs) : Upon the completion of the course the students will be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Explain the basic principles of Digital image processing	1	-
2.	Apply concepts of Digital image processing, transformation, restoration, compression and segmentation	2,3	-
3.	Analyze image processing algorithms	2	-
4.	Develop image processing application for real time problems	3,4,5,9,10	1,2
Course Contents:			
MODULE – 1			10 Hrs
Introduction: Basic concepts, Examples of fields that use Digital Image Processing, Fundamental steps in Digital Image Processing, Components of an Image Processing System. Digital Image Fundamentals: Elements of visual perception. Image sensing and acquisition: Image sampling and quantization: Basic concepts in sampling and quantization, Representing digital images, Spatial and Intensity resolutions, some basic relationships between pixels: An Introduction to the Mathematical tools used in digital image processing.			
MODULE – 2			10 Hrs
Intensity Transformations and Spatial Filtering: Background: The basics of intensity transformations and spatial filtering, Some basic intensity transformation functions, Histogram Processing. Fundamentals of spatial filtering: The mechanics of spatial filtering, Spatial correlation and convolution. Image Restoration: A model of the image restoration/degradation process. Noise Models: Spatial and Frequency properties of Noise.			
MODULE – 3			10 Hrs
Image Restoration: Some important noise probability density functions, Periodic noise, Estimation of noise parameters, Restoration in the presence of Noise only- Spatial Filtering, Mean Filters. Color Image Processing: Color fundamentals, Color models: The RGB color model. Image Compression: Fundamentals: Coding redundancy, Spatial and Temporal redundancy, Irrelevant information, Measuring image information, Fidelity Criteria.			
MODULE – 4			10 Hrs
Image Compression: Some basic compression methods: Arithmetic coding, LZW coding, Bit_Plane coding, Digital image watermarking. Image Segmentation : Fundamentals, Point, Line, and Edge Detection, Background, Detection of Isolated Points, Line Detection, Edge Models, Basic Edge Detection: The Image Gradient and its Properties, Gradient Operators, Combining the Gradient with Thresholding, Thresholding: Foundation, The Basics of Intensity Thresholding, The Role of Noise in Image Thresholding, The Role of Illumination and Reflectance in Image Thresholding.			

Text Book:

1. Rafael C. Gonzales, Richard E. Woods, “Digital Image Processing”, 4th Edition, Pearson publications, 2018

Reference Books:

1. A.K. Jain, “Fundamentals of Digital Image Processing”, Pearson 2nd Edition, 2018.
2. B. Chanda, Dutta Majumder, “Digital Image Processing and Analysis”, Prentice-Hall of India Pvt.Ltd., 2nd Edition, 2011.
3. “Introduction to Digital Image Processing with Matlab”, Rafael C. Gonzales, Richard E. Woods, Steven L. Eddins, McGraw Higher Ed, 2nd Edition, 2010.

MOOC:

<http://nptel.ac.in/courses/106105032>

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	2	1	3	-	-	-	3	3	-	-	3	2

Course Title	DATA MINING AND WAREHOUSING		
Course Code	22CS552	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Students will be able to select appropriate Data mining and warehousing techniques for real-time application			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe the fundamentals of data mining and data preprocessing techniques	1,3	
2.	Acquire the knowledge of Data Warehouse design, Modelling, and usage	1	1
3.	Use the process of Classification, Clustering and Association Analysis for a given problem	1,2	-
4.	Implement appropriate data mining algorithm for a given scenario	3,5,9	2
Course Contents:			
MODULE – 1			10 Hrs
Introduction: Data: Why Data Mining? What is Data Mining? What kinds of data can be mined? What kinds of pattern can be mined?, Which technologies are used? Major issues in data mining. Getting to know your data: Data objects and attribute types, Basic statistical description of data: measuring the central tendency, Measuring the dispersion of data, measuring data similarity and dissimilarity			
MODULE – 2			10 Hrs
Data Pre-processing: Data Pre-processing: An overview, Data cleaning, Data integration, Data Reduction: overview of data reduction strategies, wavelet transforms, Principal component analysis, attributes subset selection, Data Transformation: min-max normalization and Z-score normalization. Data Warehouse and online Analytical processing: Data Warehouse: Basic Concepts ,Data Warehouse modelling : Data cube and OLAP , Data warehouse design and usage: A business analysis frame work for data warehouse design, Data warehouse design process, Data warehouse usage for information processing.			
MODULE – 3			10 Hrs
Classification: Preliminaries, General Approach to Solving a Classification Problem, Decision Tree Induction, Rule-based classification, K- Nearest-neighbour Classifier. Mining frequent patterns. Association and correlations: Basic Concepts and Methods: Basic Concepts, Frequent item set mining methods: Apriori Algorithm, generating association rules from frequent item sets, Improving the efficiency of Apriori, A Pattern growth Approach for Mining Frequent item sets.			
MODULE – 4			10 Hrs
Cluster Analysis: Basic Concepts and Methods, Cluster Analysis, Partitioning Methods, Agglomerative versus divisive hierarchical clustering, DBSCAN. Data Mining Trends and research frontiers: Data Mining Applications, Data mining and society, Data mining trends.			
Text Books:			
1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, 1st Edition (Reprint) Pearson Education, 2014.			
2. Jiawei Han and Micheline Kamber, Data Mining – Concepts and Techniques, Morgan Kaufmann, 3rd Edition, 2012.			

Reference Books:

1. K.P. Soman, Shyam Diwakar, V.Ajay, Insight into Data Mining – Theory and Practice, PHI, 2006.
2. G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi, 2009.

MOOCs:

1. <http://nptel.ac.in/courses/110106064/>
2. <http://nptel.ac.in/courses/106106093/>
3. <https://www.edx.org/course/analytics-for-decision-making>

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	3	-	2	-	-	-	2	-	-	-	-	-

Course Title	INTERNET OF THINGS		
Course Code	22CS553	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Explore the interconnection, integration of the physical world and design IOT applications.			
Course Outcomes (COs) : Upon the completion of the course the students will be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Explain the impact and challenges posed by IoT networks, compare IoT architectures	1	-
2.	Illustrate smart objects and IoT Access Technologies to leverage connectivity.	1	-
3.	Design IoT interface module using RaspberryPi for a given problem.	2,3	2
Course Contents:			
MODULE – 1			10 Hrs
What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, IoT Data Management and Compute Stack.			
MODULE – 2			10 Hrs
Smart Objects: The “Things” in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects: Communications Criteria, IoT Access Technologies: IEEE 802.15.4, IEEE 802.15.4g and IEEE 802.15.4e.			
MODULE – 3			10 Hrs
IP as the IoT Network Layer: The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances. Application Protocols for IoT: The Transport Layer, IoT Application Transport Methods.			
MODULE – 4			10 Hrs
IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, Exploring the RaspberryPi Board; Operating System setup on RaspberryPi, RaspberryPi commands, Programming RaspberryPi with Python. Securing IoT: A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment.			
Text Books:			
1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1st Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743). 2. Srinivasa K G, Siddesh G M Hanumantha Raju R “Internet of Things”, CENGAGE Learning India, 2017.			

Reference Books:

1. Internet of Things - A Hands on Approach, Arshdeep Bahga and Vijay Madisetti Universities Press, 2015.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols, 2nd Edition, Wiley ISBN: 978-1-119-99435-0, 370 pages, January 2012.

Course Articulation matrix

[illegible]

Course Title		OBJECT ORIENTED MODELING AND DESIGN		
Course Code	22CS554		L-T-P-C	(3-0-0)3
Exam Hours	3		Hours / Week	3
SEE	50 Marks		Total Hours	40
Course Objective: Describe object oriented modeling concept and apply them to solve the problems.				
Course Outcomes (COs) : Upon completion of the course, students shall be able to:				
COs	Statement		Mapping to POs	Mapping to PSOs
1.	Explore the basic concepts of object oriented modeling.		1,2	-
2.	Design the state diagrams and identify the relationship between class and state models.		3	-
3.	Design use case models, sequence models and activity models.		3	1
4.	Identify appropriate design pattern for a given problem.		2	-
Course Contents:				
MODULE 1				10 Hrs
Introduction, Modeling Concepts, Class Modeling: What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; Modeling as Design Technique: Modeling; abstraction; The three models. Class Modeling: Object and class concepts; Link and associations concepts Generalization and inheritance; A sample class model; Navigation of class models; Practical tips. Advanced Class Modeling, State Modeling: Advanced Class Modeling: Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes. Multiple inheritance; Metadata; Reification. Constraints; Derived data; Packages; Practical tips, State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips.				
MODULE 2				10 Hrs
Advanced State Modeling, Interaction Modeling: Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips, Interaction Modeling: Use case models; Sequence models; Activity models. Use case relationships. Interaction Modeling: Process Overview, System Conception: Procedural sequence models; Special constructs for activity models. Process Overview: Development stages; Development life cycle. System Conception: Devising a system concept; Elaborating a concept; preparing a problem statement.				
MODULE 3				10 Hrs
Domain Analysis, Application Analysis, System Design: Domain Analysis: Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis. Application Analysis: Application interaction model; Application class model; Application state model; Adding operations, Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems. System Design , Class Design: Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example, Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms. Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; organizing a class design; ATM example.				
MODULE 4				10 Hrs

ADVANCE JAVA				
Course Code	22CS555		LTPC	(3-0-0)3
Exam. Hours	3		Hours / Week	3
SEE:	50 Marks		Total hours	40
Course Objective: Students should be able to use J2EE concepts to create an application.				
Course Outcomes(COs): Upon completion of the course, students shall be able to :				
COs	Course Outcomes	Mapping to POs	Mapping to PSOs	
1.	Explain and use java enumerations, collections, type wrapper and auto boxing in developing modular programs	1	-	
2.	Design GUI using swings and applets	3	-	
3.	Build database applications using JDBC.	2,3	-	
4.	Develop distributed web application using Servlets and JSP.	2,3	-	
Course Contents:				
MODULE – 1				10 Hrs
Enumeration and Autoboxing: Enumeration fundamentals, values() and valuesOf() Methods, Java Enumerations are class types, example, Type Wrappers, Autoboxing and Autounboxing. Event Handling The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes				
MODULE – 2				10 Hrs
User Interface components with Swing Components and containers, Layout managers, A first simple swing example, Event Handling, Creating a swing applet, Exploring Swing Controls-JLabel and ImageIcon, Jtextfield The Swing buttons, JTabbedPane, JScrollPane, JList, JCombobox.				
MODULE – 3				10 Hrs
The Collections Framework – Collections overview, The collection Interfaces, The collection classes, Accessing collection via an iterator. Database Access- The Concept of JDBC, JDBC Driver Types, JDBC Packages, A Brief Overview of the JDBC process, Database Connection, Statement Objects, Result Set				
MODULE – 4				10 Hrs
Servlets and JSP - Lifecycle of a sevelet, A simple servlet, The Servlet API, javax.servlet Package, Reading Servlet parameters, The javax.servlet.http Package, Handling HTTP Request and Responses, Using Cookies, Session tracking. Java Server Pages (JSP): JSP, JSP Tags, User Sessions, Cookies, Session Objects. RMI -. Java Remote Method Invocation: Remote Method Invocation concept; Server side, Client side.				
Text Books:				
1. Herbert Schildt: Java The Complete Reference Eighth Edition, McGraw Hill, 2013.				
2. Jim Keogh: J2EE The Complete Reference, Tata McGraw Hill, 2007.				
Reference Books:				

1. Advanced Java Programming ,Uttam.K.Roy , Oxford Press,2015
2. Java Fundamentals Herbert Schildt Dale Skrien, McGrawHill 2013
3. "Head First Servlets and JSP" by Shroff,2nd Edition, O,Reilly Publications ,2008.

MOOCs

1. http://www.nptelvideos.com/java/java_video_lectures_tutorials.php
2. https://www.youtube.com/watch?v=0KL_zftem4g/

Course Articulation matrix

[illegible]

Course Title	OPERATIONS RESEARCH		
Course Code	22CS556	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Solve optimization problems using various methods			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Develop mathematical model for a given problem.	1	-
2.	Apply techniques of Operations Research.	2	-
3.	Solve prediction and estimation problems.	1, 2	-
4.	Expose to the significance of various scientific tools.	5	-
Course Contents:			
MODULE – 1			10 Hrs
Introduction: Introduction: The origin, nature and impact of OR; Overview of the Operations Research Modeling Approach: Defining the Problem and Gathering Data; Formulating a Mathematical Model; Deriving Solutions from the Model; Testing the Model; Preparing to Apply the Model; Implementation Linear Programming – 1: Prototype example; The Linear Programming (LP) Model, Assumptions of LP, Additional Examples			
MODULE – 2			10 Hrs
Simplex Method - 1: The Essence of the Simplex Method; Setting up the Simplex Method; The Algebra of the Simplex Method; The Simplex Method in Tabular Form; Tie Breaking in the Simplex Method Simplex Method – 2: Adapting to other Model Forms; Post Optimality Analysis, Computer implementation			
MODULE – 3			10 Hrs
Revised Simplex Methods: Foundations of the Simplex Method, The revised simplex method, A Fundamental Insight Duality Theory: The Essence of Duality Theory; Economic Interpretation of Duality. Primal-Dual Relationships, Adapting to other primal forms, The role of duality in sensitive analysis; The essence of sensitivity analysis; Applying sensitivity analysis, The dual simplex method ; Parametric linear programming; The upper bound technique.			
MODULE – 4			10 Hrs
Transportation Model: Definition of the Transportation Model, Nontraditional Transportation Models, The Transportation Algorithm. Assignment Model and Network Models : The Assignment Model, CPM and PERT			
Text Books: 1. Frederick S. Hillier and Gerald J. Lieberman, “Introduction to Operations Research”, Tata McGrawHill, 9th Edition, 2012. (Chapters: 1.1 to 1.3, 2, 3.1 to 3.3, 4.1 to 4.7, 5, 6.1 to 6.7, 7.1) 2. Hamdy A Taha, “Operations Research: An Introduction”, Prentice Hall India, 8th Edition, 2005.(Chapters: 5, 6.4)			
Reference Book: Wayne L. Winston, “Operations Research Applications and Algorithms”, Thomson Course Technology, 4th Edition 2003			

Course Title	RESEARCH METHODOLOGY & INTELLECTUAL PROPERTY RIGHTS		
Course Code	22RIP	L-T-P	(3-0-0) 3
CIE	50	Hours/Week	3
SEE	50	Total Hours	40
Course Objective: To give an overview of technical research activities and patenting methodology. Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Carry out Literature Review and write technical paper	2,3,4,8,12	-
2.	Describe the fundamentals of patent laws and the patent drafting procedure.	6,8,10,12	-
3.	Elucidate the copyright laws and subject matters of copyright	6,8, 10,12	-
MODULE-1			10 Hrs.
Introduction: Meaning of Research, Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research. Ethics in Engineering Research: Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship. Literature Review and Technical Reading, New and Existing Knowledge, Analysis and Synthesis of Prior Art ,Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The Way Forward, Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading.			
MODULE-2			10 Hrs.
Attributions and Citations: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions. Technical Writing and Publishing : Free Writing and Mining for Ideas, Attributes and Reasons of Technical Writing, Patent or Technical Paper?—The Choice, Writing, Journal Paper: Structure and Approach: Title, Abstract, and Introduction, Methods, Results, and Discussions, Table, Figures, Acknowledgments, and Closures			
MODULE-3			10 Hrs.
Introduction To Intellectual Property: Role of IP in the Economic and Cultural Development of the Society, IP Governance, IP as a Global Indicator of Innovation, Origin of IP, Major Amendments in IP Laws and Acts in India. Patents: Conditions for Obtaining a Patent Protection, To Patent or Not to Patent an Invention. Rights Associated with Patents. Enforcement of Patent Rights. Inventions Eligible for Patenting. Non-Patentable Matters. Patent Infringements. Process of Patenting: Prior Art Search. Choice of Application to be Filed. Patent Application Forms. Jurisdiction of Filing Patent Application. Publication. Pre-grant Opposition. Examination. Grant of a Patent. Validity of Patent Protection. Post-grant Opposition. Do I Need First to File a Patent in India. Patent Related Forms. Fee Structure. Types of Patent Applications.			
MODULE-4			10 Hrs
Copyrights and Related Rights: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright. Copyrights of the Author. Copyright Infringements. Copyright Infringement is a Criminal Offence. Copyright Infringement is a Cognizable Offence. Copyrights and Internet. Non-Copyright Work. Copyright Registration. Judicial Powers of the Registrar of Copyrights. Fee Structure. Copyright Symbol. Validity of Copyright. Copyright Profile of India. Copyright and the word 'Publish'. Transfer of Copyrights to a			

Publisher. Copyrights and the Word ‘Adaptation’. Copyrights and the Word ‘Indian Work’. Joint Authorship. Copyright Society. Copyright Board. Copyright Enforcement Advisory Council (CEAC).

Trademarks: Eligibility Criteria. Who Can Apply for a Trademark. Acts and Laws. Designation of Trademark Symbols. Classification of Trademarks. Registration of a Trademark is Not Compulsory. Validity of Trademark. Types of Trademark Registered in India. Trademark Registry. Process for Trademarks Registration.

Self study: Case Studies on Patents. Case study of Curcuma (Turmeric) Patent, Case study of Neem Patent, IP Organizations In India.

Text Books:

1. Dipankar Deb, Rajeeb Dey, Valentina E, Balas, “Engineering Research Methodology”, Springer, 2019.
2. Prof. Rupinder Tewari, Ms. Mamta Bhardwa, “Intellectual Property” , Professor Guppal Singh Sandhu Honorary Director, Publication Bureau, Panjab University, 2021.

Reference Books:

1. David V. Thiel, “Research Methods for Engineers”, Cambridge University Press, 2014.
2. N.K.Acharya, “Intellectual Property Rights”, Asia Law House, 8th Edition, 2021.

MOOC:

https://onlinecourses.swayam2.ac.in/ntr24_ed08/preview

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	3	2	3	-	-	-	2	-	-	-	3	-	-
CO2	-	-	-	-	-	3	-	2	-	3	-	3	-	-
CO3	-	-	-	-	-	3	-	2	-	3	-	3	-	-

Course Title	ENVIRONMENTAL STUDIES			
Course Code	22EVS	L-T-P	(0-0-2) 1	
Exam	3 Hrs.	Hours/Week	2	
CIE	100 Marks	Total Hours	20	
Course Objective: To create environmental awareness among the students.				
Course Outcomes: At the end of the course, student will be able to:				
#	Course Outcomes (CO)	Mapping to POs	Mapping to PSOs	
1.	Acquire an awareness of sensitivity to the total environment and its allied problems.	7, 9,12	-	
2.	Develop strong feelings of concern, sense of ethical responsibility for the environment and the motivation to act in protecting and improving it.	6,8	-	
3.	Analyze and evaluate environmental measures in real world situations in terms of ecological, political, economical, societal and aesthetic factors.	6, 7,8, 9	-	
MODULE-1			5 Hrs	
Environment: Definition, Ecosystem, Balanced ecosystem, Effects of human activities on environment Agriculture Housing Industry Mining and Transportation.				
MODULE-2			5 Hrs	
Natural Resources: Water resources, Availability and Quality, Water borne diseases, Water induced diseases, Fluoride problem in drinking water. Mineral Resources - Forest Resources - Material Cycles - Carbon, Nitrogen and Sulphur Cycles.				
MODULE-3			5 Hrs	
Pollution: Effects of pollution - Water pollution - Air pollution Land pollution - Noise pollution.				
MODULE-4			5 Hrs	
Current Environmental issues of importance: Acid Rain, Ozone layer depletion - Population Growth, Climate change and Global warming. Environmental Impact Assessment and Sustainable Development Environmental Protection - Legal aspects. Water Act and Air Act.				
Text Books:				
1. Environmental Studies - Dr. D.L Manjunath, Pearson Education -2006				
2. Environmental Studies - Dr. S. M. Prakash - Elite Publishers - 2006				
Reference Books:				
1. Environmental Studies - Benny Joseph - Tata McGraw ill- 2005				
2. Principles of Environmental Science and Engineering P. Venugopala Rao, Prentice Hall of India.				
3. Environmental Science and Engineering - Meenakshi, Prentice Hall India.				
Assessment Strategy				
CIE	Schedule	Assessment Method	Marks	Duration (Min.)
CIE I	At the end of 8 weeks	Objective Questions	25	60
CIE II	At the end of 11 weeks	Objective Questions	25	60
Project	At the end of 14 weeks	Project/Presentation/Prototype development/Plantation	50	-

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	3	-	3	-	-	-	-	-
CO2	-	-	-	-	-	3	-	3	-	-	-	-	-	-
CO3	-	-	-	-	-	3	3	3	2	-	-	-	-	-

Course Title	MACHINE LEARNING		
Course Code	22CS601	L-T-P-C	(3-0-2) 4
Exam Hrs.	3	Hours / Week	5
SEE	50 Marks	Total Hours	40L + 10P
Course Objective: To apply the techniques of machine learning for real time projects.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe and Apply preprocessing, Modeling, Evaluation and concept learning for the given problem.	2, 3	-
2.	Design and Develop various supervised and unsupervised machine learning algorithms for solving the given problem	3, 5	1, 2
3.	Illustrate the Neural networks, Bayesian learning and other forms of learning for the given problem	3, 4, 5	1
4.	Implement various machine learning algorithms for a given data sets.	3, 5	1, 2
Course Contents			
MODULE - 1			10 Hrs
Introduction to Machine learning: Human learning and its types, Machine learning and its types, Applications, tools and issues in machine learning, Activities in machine learning, Types of data, Exploring structure of data, Data quality and Preprocessing. Modelling and Evaluation: Introduction, Selecting a model, training a model, model representation and interpretability, Evaluating performance of a model.			
MODULE – 2			10 Hrs
Learning Problems and Concept Learning: Well Posed learning problems, Designing a Learning systems, Concept Learning Tasks, Search, Find-S, Version Spaces and Candidate Elimination Algorithm, Inductive bias. Supervised Learning: Introduction, example, classification model, classification learning steps, and Common algorithms – KNN, Decision Tree, and Random forest model.			
MODULE - 3			10 Hrs
Supervised Learning (contd.): SVM, Regression-Simple linear regression, Multiple linear regression, Assumptions in Regression analysis. Unsupervised Learning: Supervised Vs Unsupervised, Application, clustering, Finding pattern using Association rule.			
MODULE – 4			10 Hrs
Basics of Neural Networks: Exploring the artificial neuron, Types of activation function, Early implementations of ANN, Architectures of NN, Learning process in ANN, Backpropagation algorithm. Bayesian learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Bayesian Belief Networks. Other types of Learning – Representation learning, Active Learning, Instance based Learning, Association rule Learning, Ensemble learning			
Practical Component: - Demonstration of Python Libraries for Machine Learning-Pandas, Sklearn, numpy, matplotlib. - Demonstration of Exploratory Data Analysis and Data Visualization. - Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file. - For a given set of training data examples stored in a .CSV file, implement and demonstrate the			

Course Title	COMPUTER NETWORKS		
Course Code	22CS602	L-T-P-C	(3-0-2)4
Exam Hrs.	3	Hours / Week	5
SEE	50 Marks	Total Hours	40L+12P
Course Objective: Acquire knowledge of working mechanisms of different types of Networks, Address Mechanisms and Protocols.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Recognize the importance of the Network Layer Services, different versions of IP and Network addressing mechanisms	1,2	-
2.	Analyse the performance of Unicast and Multicast routing algorithms and their uses	2,4,5	-
3.	Design and apply the Transport Layer Protocols for different services.	2,4,5	-
4.	Apply and Investigate the use of different QoS models and their applications	1, 2,4	-
Course Content			
MODULE-1			12 Hrs
Network Layer: Network Layer Services, IPv4 Addresses: Address Space, Classful Addressing, Classless Addressing, DHCP, NAT; Network Layer Protocols: Internetwork Protocol: Datagram format, Fragmentation, Options, Security of IPV4 Datagrams; ICMPv4: Messages, Mobile IP: Addressing, Agents, Three Phases, Inefficiency in Mobile IP.			
MODULE-2			12 Hrs
Unicast Routing: Introduction: General Idea, Least Cost Routing; Routing Algorithms: Distance Vector, Link-State Routing , Path-Vector Routing; Unicast Routing Protocols: Internet Structure, Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Border Gateway Protocol Version 4 (BGP4); Multicast Routing: Introduction: Unicasting, Multicasting, Broadcasting; MULTICASTING BASICS: Multicast Addresses, Delivery at Data-Link Layer, Collecting Information about Groups, Multicast Forwarding, Two Approaches to Multicasting.			
MODULE-3			12 Hrs
INTRADOMAIN MULTICAST PROTOCOLS: Multicast Distance Vector (DVMRP), Multicast Link State (MOSPF) Protocol Independent Multicast (PIM); INTERDOMAIN MULTICAST PROTOCOLS: IGMP: Messages, Propagation of Membership Information, Encapsulation; Next Generation IP: IPV6 Addressing ,The IPV6 Protocol; Transport Layer protocols: Introduction: Services, Port Numbers, User Datagram Protocol(UDP): User Datagram, UDP Services, UDP Applications.			
MODULE-4			12 Hrs
Transmission Control Protocol: TCP Services, TCP Features , Segment, A TCP Connection, Windows in TCP ; Flow Control, Error Control, TCP Congestion Control; TCP Timer and Options; Stream Control Transmission Protocol (SCTP): Services, Features, Packet Format and Association; Quality of Services: Data Flow Characteristics; Flow Control to Improve QoS: Scheduling, Traffic Shaping or Policing, Resource Reservation, Admission Control; INTEGRATED SERVICES (INTSERV): Flow Specification, Admission, Service Classes, Resource Reservation Protocol (RSVP). DIFFERENTIATED SERVICES (DFFSERV).			
Text Book: Behrouz A. Forouzan, Data Communications and Networking, Tata McGraw-Hill, 5th Edition			

1. Alberto Leon-Garcia and Indra Widjaja, “Communication Networks–Fundamental Concepts and Keyarchitectures”, Tata McGraw- Hill, 2nd Edition.
2. William Stallings, “Data and Computer Communication”, Pearson Education, 8th Edition.
3. Nader F. Mir, Computer and Communication Networks, Pearson Education, 2014.

1. <http://nptel.ac.in/courses/106105081/>
2. <https://www.edx.org/course/computer-networks-internet-kironx-fhlcnx>

1. Learn Networking Commands
2. Simulation of error correction code (like CRC).
3. Simulate the transmission of ping messages over a network topology consisting of 6 nodes.
4. Simulate a three nodes point – to – point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets dropped.
5. Simulate a three nodes point – to – point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets sent with different types of traffic.
6. Implement distance vector algorithm to find the suitable path for transmission between sender and receiver.
7. Simulation of Link State Routing algorithm.
8. Simulation of Routing Information Protocol.
9. Simulate an Ethernet LAN using n nodes, change error rate and data rate and compare throughput.
10. Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.

[illegible]

Course Title	FINITE AUTOMATA AND FORMAL LANGUAGES		
Course Code	22CS603	L-T-P-C	(3-1-0)3
Exam Hrs.	3	Hours / Week	4
SEE	50 Marks	Total Hours	40L+10T
Course Objective: To design grammar production for the programming constructs. Course Outcomes (COs) : Upon Completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe various automata to write grammar productions	1	-
2.	Apply appropriate automata to obtain grammar productions	1,2	-
3.	Design automata for a given programming construct	3	-
4.	Construct an automata and grammar for a given scenario using a simulation tool	3,5	1,2
Course Contents:			
MODULE – 1			10 Hrs
Introduction to Finite Automata: Why Study Automata Theory? The Central Concepts of Automata Theory. Finite Automata: An Informal Picture of Finite Automata, Deterministic Finite Automata, Non-Deterministic Finite Automata, Finite Automata with Epsilon-Transitions.			
MODULE – 2			10 Hrs
Regular Expressions and Languages: Regular Expressions, Finite Automata and Regular Expressions, Applications of Regular Expressions. Properties of Regular Languages: Proving Languages Not to Be Regular – Pumping Lemma, Closure Properties of Regular Languages, Equivalence and Minimization of Automata.			
MODULE – 3			10 Hrs
Context-Free Grammars and Languages: Context-Free Grammars, Parse Trees, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages. Pushdown Automata: Definition of the Pushdown Automata, The languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata.			
MODULE – 4			10 Hrs
Properties of Context-Free Languages: Normal Forms for Context-Free Grammars- Eliminating Useless symbols, Eliminating epsilon productions, Eliminating Unit productions, Chomsky Normal Form (CNF), Greibach Normal Form (GNF). Introduction to Turing Machines: Problems that Computers cannot Solve, The Turing Machine Programming Techniques for Turing Machines.			
Text Book: John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Introduction to Automata Theory, Languages and Computation, 3 rd Edition, Pearson Education, 2013.			

MINI PROJECT			
Course Code	22CS604	L-T-P-C	(0-0-4)2
Exam Hrs.	3	Hours / Week	4
SEE	50 Marks	Total Hours	52
Course Objective: Design and implement solution for an identified real world problem.			
Course Outcomes (COs): Upon completion of course the students will be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Identify the requirements of a chosen real world problem	1,2,6,7	-
2.	Design the solution for the chosen problem and document the same.	1,3,4,10	1,2
3.	Implement the design using appropriate tools	3,5,8,11	1,2
4.	Demonstrate the project work along with report	1, 5,10	1,2
5.	Demonstrate the ability to work effectively as a project member.	1,9	-
- A team of FOUR students must develop the mini project. However, during the final evaluation, each student must demonstrate the project individually. - The team shall implement a mini project on Web programming and DBMS domain. - The team must submit a Brief Project Report (25 to 30 Pages) after completion with the following contents - Introduction - Requirements - Development Process and Models Adopted - Analysis and Design Models - Implementation - Testing - The project report will be evaluated for 25 marks, Demonstration for 50 marks and Viva Voce for 25 marks.			

Rubrics for Evaluation of Mini Project (Inter-Discipline)					
Phase I (Project Proposal Submission and Evaluation Scheme):					
After finalizing the topic with the guidance of Supervisor, students should submit the project proposal along with Synopsis not exceeding 10 pages. Approval of synopsis is done for 15 marks by concerned project committee.					
Sl. No	Performance Indicators	Needs Improvement (0-1 mark)	Average (2-3 marks)	Good (4-5 marks)	Max marks
1	Literature Survey	Survey of literature is not recent or no literature survey	Survey of literature is not clear	Literature survey is sufficient.	5
2	Synopsis writing	Objective of the work is not identified.	Objective of the work is identified but no evidence of Inter disciplinary approach found.	Objective of the work is identified with evidence of Inter disciplinary approach found.	5
3	Presentation	Contents delivered not completely.	Contents not delivered clearly.	Contents delivered clearly with confidence.	5
Total					15

Phase II (Project Progress):					
Evaluation of project phase II is carried out by evaluation committee.					
Sl. No.	Performance Indicators	Needs Improvement (0-1 marks)	Average (2-3 marks)	Good (4-5 marks)	Max marks
1.	System design and development	System specification is not identified.	System specification is identified but not satisfactory.	System specification is identified correctly.	5
2.	Identification of appropriate tool for application	Application tools are not identified.	Application tools identified but not used.	Application tools identified and used.	5
3.	Oral presentation	Entire contents not delivered.	Contents not delivered clearly.	Contents delivered clearly with confidence.	5
Total					15
Phase III (Project Demonstration with Report):					
Evaluation of this phase is done by evaluation committee.					
Sl. No	Performance Indicators	Needs Improvement (0-1 marks)	Average (2-3 marks)	Good (4-5 marks)	Total marks allocated
1.	Design and Implementation	Not done	Incomplete.	Complete.	5
2.	Demonstration	Incomplete	Complete but not satisfactory.	Complete and satisfactory	5
3.	Documentation	Organization and clarity of report and technical content is not clear and complete	Organization and clarity of report and technical content is clear but not complete.	Organization and clarity of report and technical content is clear and complete.	5
4.	Oral presentation	Presentation with ppt is not clear.	Presentation with ppt is clear but not satisfactory	Presentation with ppt is clear and satisfactory.	5
Total					20

Semester End Evaluation				
Evaluation committee consists of panel of examiners containing external as well as internal evaluators. This evaluation is carried out for 50 marks.				
SN	Performance Indicators		Marks allocated	Marks awarded
	Project execution	Project specification	5	
		Progress	5	
	Methodology /Result Analysis	System Design	5	
		System Implementation	5	
		System Testing	5	
	Project Report	Organization and Clarity	5	
		Technical content	5	
		Conclusion and Future Work	5	
Final presentation			10	
Total Marks			50	
Rubrics for Semester End Exam				
	Marks	Overall criteria		
1.	48-50	Project is reaching professional standards.		
2.	40-47	Project is excellent and may contain publishable material. Presentation is excellent.		
3.	35-39	Project and presentation are very good. All design aims are met.		
4.	30-34	Project and presentation are good. Most design aims are met.		
5.	25-29	Minimum core of design aims has been met. Presentation is satisfactory.		
6.	20-24	Design aims and implementation are met partially. Presentation is moderate.		
7.	0-20	Most design aims are not met and implementation does not work. Presentation is not satisfactory.		

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	2	2	-	-	-	-	-	-	-
CO2	3	-	3	3	-	-	-	-	-	3	-	-	3	3
CO3	-	-	3	-	3	-	-	2	-	-	2	-	3	3
CO4	3	-	-	-	3	-	-	-	-	3	-	-	3	3
CO5	3	-	-	-	-	-	-	-	3	-	-	-	-	-

Course Title	MAIN PROJECT PHASE - I		
Course Code	22CS605	L-T-P-C	(0-0-4)2
Exam Hrs.	3	Hours / Week	4
SEE	50 Marks	Total Hours	-
Course Objective:	To be able to identify a relevant problem that requires technical solution and conduct survey for the same.		
Course Outcomes (COs):	Upon the completion of the course the students will be able to:		
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Identify a problem, through Extensive literature Survey leading to publication of a survey paper.	1,2	-
2.	Plan & design the solution to the chosen problem	3	2
3.	Make oral presentation and documentation of the work carried out	9,10	-
Course Contents:			
During VII semester, candidates in consultation with the guides shall carry out literature survey to finalize the topic of the project. <i>The same project will be continued in Eighth semester.</i> Students are expected to present the project synopsis, system analysis, requirements specification and should publish a technical paper on Literature Survey. The evaluation will be carried out in three stages ● Project Stage 1 – Team Formation , Topic Selection & Guide allotment (No marks) ● Project Stage 2 – Extensive Literature Survey , Problem Definition ● Project Stage 3 – Preliminary Design, Report Preparation and Publication The evaluation of the project phases shall be carried out by the evaluation committee comprising of project guide & other faculty members. The committee will be constituted by the project coordinator in consultation with the Head of the department. <i>For Multidisciplinary projects guides will be allotted from each concerned branch.</i>			
Performance Indicators	Low (40%)	Medium(70%)	High(100%)
Literature Survey and Problem Definition (20 Marks)	Literature Survey not pertaining to the title of the project (8)	Incomplete literature survey and improper problem definition (14)	Extensive literature survey with clear state of the art problem definition (20)
Preliminary Design (10 Marks)	Has no coherent strategies for problem Solving (4)	Has some strategies for problem – solving, but does not apply them consistently (7)	Formulates strategies for solving problems (10)
Presentation (10 marks)	Disorganized and ineffective presentation (4)	Organized, but ineffective presentation (7)	Effective organized presentation (10)
Report Preparation (30 Marks)	Disorganized and contents are not sufficient	Organized but not good content wise	Effectively organized and well framed contents
Paper Publication (20 Marks)	Paper submitted & awaiting results (8)	National conference International Conference (14)	Journal (20)

Punctuality (Project Dairy Maintenance) (10 marks)	Not meeting the guide regularly (4)	Meeting regularly but doesn't document details of every session (7)	Up to date dairy maintenance(10)
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Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	2	-	-
CO2	-	-	3	-	-	-	-	-	-	-	-	-	-	3
CO3	-	-	-	-	-	-	-	-	3	3	-	-	-	-

Course Title	APPLICATION DEVELOPMENT LABORATORY		
Course Code	22CS606A	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	Total Hours	14P
Course Objective: Design and develop apps for android devices. Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Develop simple applications, using built-in widgets and components of android studio.	3,5,9	1,2
2.	Document the apps designed.	10	1
Course Contents:			
1. Develop an android application which accepts the SGPA of all the six semesters and displays your CGPA. 2. Develop an android application to login into a system which is redirected to the Home screen. The login should be successful on email: admin@example.com password: rtWi2p_10 If the email/password is invalid display a Toast with an error message 3. Assume you are accepting employee details: Name, Designation, Salary, Phone number. Develop app that displays an alert message if phone number entered is more than 10 digits. 4. Design an app that displays the names of all planets in our universe. Clicking on “Solar System” in first activity should display all the planet’s names in second activity and it should return the total number of planets to first activity. 5. Develop a QUIZ app that displays a question with four answers as options. Clicking an option should display whether the selected option is right or wrong. 6. Assume you need to accept order online for fast food items. Design an app such that it accepts the order for multiple items and displays the total amount to be paid on placing the order. 7. Design an app to display menu options on clicking a button “FILE”. The menu options are: New, Open, Save, Save as, And Print. Clicking on any option should display the relevant information. 8. Design an app to accept your name, roll number and branch programmatically. 9. Develop an android application to list all the engineering branches of MCE and displays a brief information of any department which the user clicks on in a separate page. 10. Consider a scenario where you need to send an email to multiple users. Design an app to implement the same. 11. Develop an android application to display a gallery view (Grid View) of at least 10 images. 12. Develop an android application to render the text data into Text View from the remote server. Show progress bar when the data is loading or Toast message if data fails to load.			

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	3		3	-	-	-	3	-	-	-	2	2
CO2	-	-	-	-	-	-	-	-	-	3	-	-	2	-

Course Title	FULL STACK DEVELOPMENT LABORATORY		
Course Code	22CS606B	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	Total Hours	14P
Course Objective: To gain knowledge of full-stack development.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Implement Web Pages using Basic and Advanced HTML	2, 5	-
2.	Develop a complete web application for a given scenario	3, 5, 9, 12	-
Course Contents:			
1. HTML and CSS Webpage: Create a simple webpage that showcases your favorite hobby. Use HTML to structure the content and CSS to style the page, including adding colors, fonts, and images. 2. JavaScript Form Validation: Develop a web form with fields for name, email, and password. Implement JavaScript validation to ensure that all fields are filled correctly before submitting the form. 3. Node.js Server with Express: Build a basic server using Node.js and Express. Create routes to handle HTTP requests like GET and POST and respond with simple JSON data. 4. Database Integration: Extend the previous Node.js server by integrating a database (e.g., SQLite or MongoDB). Implement endpoints to perform CRUD operations on a dataset. 5. RESTful API: Design and implement a RESTful API using Node.js, Express, and a database of your choice. Define endpoints for managing resources, such as creating, reading, updating, and deleting data. 6. React Component Library: Create a library of reusable React components. Build components like buttons, cards, and modals and use them in a sample React application. 7. Write a program to create a simple calculator Application using React JS. 8. Create a Simple Login form using React JS. 9. Full-Stack Task Manager: Develop a task manager application with React on the front end and Node.js/Express on the back end. Allow users to add, update, and delete tasks. 10. Real-Time Chat Application: Build a real-time chat application using React for the front end and Node.js with Socket.IO for the back end. Enable users to send and receive messages in real-time.			

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	2	-	-	3	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	3	-	-	-	3	-	-	2	-	-

Course Title	INTRODUCTION TO COMPUTER VISION		
Course Code	22CS661	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: To learn basic principles of image formation, image processing algorithms and different algorithms for recognition from single or multiple images (video). Course Outcome: Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Explain Image formation process	1	-
2.	Perform shape analysis	3	-
3.	Develop applications using computer vision techniques	2	-
4.	Explain video processing and motion computation	1	-
Course Content			
MODULE – 1			10 Hrs
Introduction and Image Formation: What is computer vision? A brief history, Geometric primitives and transformations, Photometric image formation, The digital camera. Pinhole Perspective, Weak Perspective, Cameras with Lenses, The Human Eye, Intrinsic Parameters and Extrinsic Parameters, Geometric Camera Calibration.			
MODULE – 2			10 Hrs
Early Vision – One Image: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates, Local Image Features, Texture.			
MODULE - 3			10 Hrs
Early Vision – Multiple Images: Stereopsis and Structure from Motion Early Vision – Mid-level Vision: Segmentation by Clustering, Grouping and Model fitting, Tracking.			
MODULE – 4			10 Hrs
High-level Vision: Registration, Smooth Surface and their Outlines, Range Data Detecting Objects in Images, Recognition.			
Text Books: 1. Computer Vision: Algorithms and Applications (CVAA), Richard Szeliski, Springer, 2nd edition, 2020, http://szeliski.org/Book/ 2. Computer Vision – A modern approach, by D. Forsyth and J. Ponce, Prentice Hall, 2nd edition, 2012 Reference Books: 1. R. C. Gonzalez, R. E. Woods. Digital Image Processing. Addison Wesley Longman, Inc., 1992. 2. D. H. Ballard, C. M. Brown. Computer Vision. Prentice-Hall, Englewood Cliffs, 1982. 3. Image Processing, Analysis, and Machine Vision. Sonka, Hlavac, and Boyle. Thomson. 4. Simon J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University, Press, 2012 5. Introductory Techniques for 3D Computer Vision, by E. Trucco and A. Verri, Publisher: Prentice Hall. 6. Building Computer Vision Applications Using Artificial Neural Networks - With Step-by-step Examples in OpencvAndTensorflow With Python, Shamshad Ansari, Apress, 2020			

Course Articulation matrix

[illegible]

Course Title	ARTIFICIAL INTELLIGENCE		
Course Code	22CS662	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Students will be able to apply the concepts of Artificial Intelligence to construct knowledge-based.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe different types of Artificial Intelligence agents and search strategies.	1	-
2.	Analyze different search strategies for a given problem.	2	-
3.	Design simple knowledge-based systems using first-order logic.	2,3	2
4.	Analyze different learning techniques.	2	-
Course Contents:			
MODULE – 1			10 Hrs
Introduction: What is AI? Intelligent Agents: Agents and environment; Good behavior: The Concept of Rationality; The nature of environment; The structure of agents. Problem-solving: Problem-solving agents. Example problems; Searching for solution; Uninformed search strategies: Breadth-first search, Uniform- cost search.			
MODULE – 2			10 Hrs
Uninformed search strategies: Depth-first search, Depth-limited search, Iterative deepening depth first search, Bidirectional search, Comparing uninformed search strategies; Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Optimality of A*, Memory-bounded heuristic search; Heuristic functions; Local Search Algorithms and Optimization Problems: Hill-climbing search, Simulated annealing, Local beam search, Genetic algorithms.			
MODULE – 3			10 Hrs
On-line search agents and unknown Environments: Online search problems, Online search agents, online local search, learning in online search, Logical Agents: Knowledge-based agents; The Wumpus world; First-Order Logic: Representation revisited; Syntax and semantics of first-order logic; Using first-order logic, Knowledge engineering in first-order logic.			
MODULE – 4			10 Hrs
Learning from Examples: Forms of Learning; supervised learning; Learning decision trees; Practical Machine Learning. Statistical and Reinforcement learning: Statistical learning, maximum likelihood parameter learning, Bayesian parameter, learning, passive reinforcement learning, active reinforcement learning.			
Text Book: Artificial Intelligence - A Modern Approach, Stuart Russell and Peter Norvig, Third edition, Pearson, 2014.			
Reference Books: 1. Artificial Intelligence, Elaine Rich, Kevin Knight and Shivashankar B Nair, Third edition, McGraw- Hill Education, 2015. 2. Introduction to Artificial Intelligence and Expert Systems, Dan W Patterson, Pearson, 2015.			

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-		-	-	-	-	-	-	-	-	-
CO2	-	3	-	-		-	-	-	-	-	-	-	-	-
CO3	-	3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	-	3	-	-	-	-	-	-	-	-	-	-	-	-

Course Title	WIRELESS NETWORKS		
Course Code	22CS663	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours/Week	3
SEE	50Marks	Total Hours	40
Course Objective: Gain knowledge of various terminology, principles, devices, schemes, concepts, algorithms and different methodologies used in Wireless Communication Networks.			
Course Outcomes(COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping To POs	Mapping To PSOs
1.	Explain fundamentals of wireless communications.	1	-
2.	Analyse security, energy efficiency, mobility, scalability, and their unique characteristics in wireless networks.	2	-
3.	Demonstrate basic skills for cellular networks design.	3	-
4.	Apply knowledge of TCP/IP extensions for mobile and wireless networking.	1	-
Course Contents:			
MODULE-1			10 Hrs
Introduction: Wired Network vs. Wireless Network, Overview of Wireless Applications, Wireless Transmission: Path loss, Multi-path propagation, Doppler shift, Fading, Time Division Multiplexing, Frequency Division Multiplexing, Code, Spread Spectrum Technique, Satellite Communication;			
MODULE-2			10 Hrs
CELLULAR SYSTEM: Cellular Network Organization, Cellular System Evolution, Cellular Fundamentals: Capacity, Topology, Operation of Cellular Systems, Handoff, Power control, Case study: Global System for Mobile communication (GSM) Network, General Packet Radio Service (GPRS), Code Division Multiple Access (CDMA 2000), Cordless System, Wireless Local Loop, Mobility Management-Location Management, HLR-VLR scheme, Hierarchical scheme, Predictive location management schemes;			
MODULE-3			10 Hrs
WIRELESS NETWORK: Protocols: Media Access Protocol, Mobile IP, Mobile Transport Layer Protocol, Wireless Access Protocol, Ad-Hoc Networks and Routing, Standards: IEEE 802.11, Wi-Fi, Wireless Broadband-Wi-MAX, Bluetooth, IEEE 802.15, Security in Wireless Network, Hyper LAN.			
MODULE-4			10 Hrs
MOBILE COMPUTING: Mobile Computing, Issues: Resource Management, Interference, Bandwidth, Cell Splitting, Frequency reuse, Mobile Data Transaction Models, File Systems, Mobility Management, Security.			
Text Books:			
1. William Stallings, "Wireless Communications & Networks", 2/E, Pearson Education India, Reprint 2007.			
2. Jochen Schiller, "Mobile Communications", 2/E, Pearson Education India, reprint 2007			
Reference Books:			
1. Sandeep Singhal, "The Wireless Application Protocol", Addison Wesley, India, reprint 2001			
2. T S Rappaport, "Wireless Communications: Principles & Practice", 2/E, Pearson Education, 2002.			

3. C E Perkins, "Ad Hoc Networking", Addison Wesley, 2000.
MOOCs: https://onlinecourses.nptel.ac.in/noc20_ee61/preview

https://onlinecourses.nptel.ac.in/noc20_ee61/preview

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Course Title	SOFTWARE ARCHITECTURE		
Course Code	22CS664	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Learn the principles and concepts of applying various design patterns in designing a wide variety of software systems.			
Course Outcomes (COs) : Upon the completion of the course the students will be able to :			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Identify the significance of software architecture.	1	-
2.	Apply quality attributes to create an architecture for the given application.	2	-
3.	Analyze the architectural pattern to build the system from components.	2	-
4.	Create documentation relevant to the chosen architecture.	1,10	2
Course Contents:			
MODULE – 1			10 Hrs
What Is Software Architecture? : What Software Architecture Is and What It Isn't; Architectural Structures and Views; Architectural Patterns; What Makes a “Good” Architecture? Why Is Software Architecture Important? Inhibiting or Enabling a System's Quality Attributes; Reasoning About and Managing Change ; Predicting System Qualities; Enhancing Communication among Stakeholders; Carrying Early Design Decisions ; Defining Constraints on an Implementation; Influencing the Organizational Structure ; Enabling Evolutionary Prototyping Improving Cost and Schedule Estimates ;Supplying a Transferable, Reusable Model; Allowing Incorporation of Independently Developed Components; Restricting the Vocabulary of Design Alternatives; Providing a Basis for Training; The Many Contexts of Software Architecture: Architecture in a Technical Context, Architecture in a Project Life-Cycle Context, Architecture in a Business Context, Architecture in a Professional Context, Stakeholders, How Is Architecture Influenced?, What Do Architectures Influence?, Quality Attributes Understanding Quality Attributes; Architecture and Requirements ; Functionality; Quality Attribute ;Considerations ; Specifying Quality Attribute; Requirements ; Achieving Quality Attributes through Tactics, Guiding Quality Design Decisions.			
MODULE – 2			10 Hrs
Availability: Availability General Scenario; Tactics for Availability; Modifiability: Modifiability General Scenario; Tactics for Modifiability Performance: Performance General Scenario; Tactics for Performance; Security: Security General Scenario; Tactics for Security;			
MODULE – 3			10 Hrs
Architectural Patterns – 1: Introduction; from mud to structure: Layers, Pipes and Filters. Architectural Patterns – 2: Distributed Systems: Broker;			
MODULE – 4			10 Hrs

Architectural Patterns – 3: Adaptable Systems: Microkernel; **Some Design Patterns:** Structural decomposition: Whole – Part;

Documenting Software Architectures: Uses and Audiences for Architecture; Documentation; Notations for Architecture; Documentation; Views; Choosing the Views; Combining Views; Building the Documentation Package; Documenting Behavior; Architecture Documentation and Quality Attributes; Documenting Architectures That Change Faster Than You Can Document Them.

Text Books:

1. Len Bass, Paul Clements, Rick Kazman: Software Architecture in Practice, 3rd Edition, Addison-Wesley, 2013.
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2009.

Reference Books:

1. Mary Shaw and David Garlan: Software Architecture- Perspectives on an Emerging Discipline, PHI, 2008.
2. E. Gamma, R. Helm, R. Johnson, J. Vlissides: Design Patterns- Elements of Reusable Object-Oriented Software, Addison-Wesley, 1995.

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	2	-	-	-	2

Course Title	C# PROGRAMMING AND .NET		
Course Code	22CS665	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours/Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Students will be able to develop various console and windows applications.			
Course Outcomes(COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Develop programs that use reusability properties and namespaces.	3	-
2.	Design applications using classes, methods, interfaces and inheritance techniques and manage exceptions.	1, 3	-
3.	Create delegates, packages and manage database.	2, 3	-
4.	Demonstrate windows application system and build their own applications	3	1
Course Contents:			
MODULE – 1			10 Hrs
Overview of C#: Introduction , A Simple C# Program, Namespaces , Adding Comments, Main Returning a Value, Using Aliases for Namespace Classes, Passing String Objects to WriteLine Method, Command Line Arguments, Main with a Class, Providing Interactive Input, Using Mathematical Functions, Multiple Main Methods, Compile Time Errors. Literals, Variables and Data Types: Introduction, Literals , Variables , Data Types , Value Types Reference Types, Declaration of Variables , Initialization of Variables , Default Values ,Constant Variables , Scope of Variables , Boxing and Unboxing. Operators and Expressions : Introduction, 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 Conversions ,Operator Precedence and Associatively. Mathematical Functions. Decision Making and Branching: Introduction, Decision Making with if Statement, Simple if Statement, The if... else Statement, Nesting of if... else Statements, The else if Ladder, The Switch Statement The? : Operator. Decision Making and Looping: Introduction, The while Statement The do Statement, The for Statement, The foreach Statement. Methods in C#: Introduction, Declaring Methods, The Main Method, Invoking Methods, Nesting of Methods, Method Parameters, Pass by Value, Pass by Reference, The Output Parameters, Variable Argument Lists, Methods Overloading. Handling Arrays: One-Dimensional Arrays, Creating an Array, Two- Dimensional Arrays, Variable- Size Arrays, the System. Array Class. Manipulating Strings : Creating Strings, String Methods, Inserting Strings, Comparing Strings, Finding Substrings, Mutable Strings, Arrays of Strings			
MODULE – 2			10 Hrs
Classes and Objects : Introduction, Basic principles of OOP, Defining a Class, Adding Variables and Methods, Member Access Modifiers, Creating Objects, Accessing Class members, Constructors, Overloaded Constructors, Static Members, Static Constructors, Private Constructors, Copy Constructors, Destructors, Member Initialization. Inheritance and Polymorphism: Introduction, Classical Inheritance, Containment Inheritance, Defining a Subclass, Visibility Control, Defining Subclass Constructors, Multilevel Inheritance, Hierarchical Inheritance, Overriding Methods, Hiding Methods, Abstract Classes, Abstract Methods, Sealed Classes: Preventing Inheritance, Sealed Methods, The this reference, Nesting of Classes, Constant Members, Read-only Members, Properties, Indexers. Polymorphism, Interface: Multiple Inheritance, Multiple Inheritance: Introduction, Defining an Interface, Extending an Interface, Implementing Interfaces, Interfaces and Inheritance, Explicit Interface Implementation, Abstract Class and Interfaces.			

Operator Overloading: Introduction, Over loadable Operators, Need for Operator Overloading, Overloading Unary Operators, Overloading Binary Operators, Overloading Comparison Operators
Delegates and Events: Introduction, Delegates, Delegate Declaration, Delegate Methods, Delegate Instantiation, Delegate Invocation, Using Delegates, Multicast Delegates, Events. Managing Errors and Exceptions: Introduction, What is Debugging? Types of Errors, Exceptions, Syntax of Exception Handling Code, Multiple Catch statements, The Exception Hierarchy, General Catch Handler, Using Finally statement, Nested Try Blocks, Throwing our Own Exceptions, Checked and Unchecked Operators, Using Exceptions for Debugging.

MODULE – 3	10 Hrs
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10 Hrs

Understanding. NET: The C# Environment: Building a Better Window (Introducing Windows Forms): Overview of the System. Windows. Forms Namespace, Working with the Windows Forms Types, The Role of the Application Class ,The Anatomy of a Form, The Functionality of the Control Class, The Functionality of the Form Class, Building Windows Applications with Visual Studio 2005, Working with MenuStrips and ContextMenuStrips, Working with StatusStrips.

Programming with Windows Forms Controls: The World of Windows Forms Controls, Adding Controls to Forms by and, Adding Controls to Forms Using Visual Studio 2005, Working with the Basic Controls, Configuring the Tab Order, Setting the Form's Default Input Button, Working with More Exotic Controls, Building Custom Windows Forms Controls, Testing the CarControl Type, Building a Custom CarControl Form Host.

MODULE –4	10 Hrs
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10 Hrs

Data Access with ADO.NET: A High-Level Definition of ADO.NET, Understanding, DO.NET Data Providers, Additional ADO.NET Namespaces, The System. Data Types, Abstracting Data Providers Using Interfaces, Increasing Flexibility Using Application ,Configuration Files, The .NET 2.0 Provider Factory Model, The <connectionStrings> Element Installing the Cars Database, Understanding the Connected Layer of ADO.NET, Working with Data Readers, Modifying Tables Using Command Objects, Working with Parameterized Command Objects, Executing a Stored Procedure Using DbCommand, Asynchronous Data Access Under .NET 2.0, Understanding the Disconnected Layer of ADO.NET.

ASP.NET Web Pages and Web Controls: The Role of HTTP, Understanding Web Applications and Web Servers, The Role of HTML, The Role of Client-Side Scripting, Submitting the Form Data (GET and POST), Building a Classic ASP Page, Problems with Classic ASP, The ASP.NET 2.0 Namespaces, The ASP.NET Web Page Code Model, Details of an ASP.NET Website Directory Structure, The ASP.NET 2.0 Page Compilation Cycle, The Inheritance Chain of the Page Type, Interacting with the Incoming HTTP Request, Interacting with the Outgoing HTTP Response, The Life Cycle of an ASP.NET Web Page, Understanding the Nature of Web Controls

Text Books :

1. Andrew Troelsen , “Pro C# and the .NET 3, Special edition, A Press, 2012
2. E. Balagurusamy," Programming in C# A Primer", 3rd edition, TMH, 2010.

Reference Book:

1. Tom Archer: Inside C#, WP Publishers, 2001.

MOOCs:

1. <https://www.udemy.com/course/c-net-for-beginners/>
2. <https://www.udemy.com/course/aspnet-webforms/>

Course Articulation matrix

[illegible]

Course Title	MANAGEMENT INFORMATION SYSTEMS		
Course Code	22CS666	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: To describe the role of information technology and decision support systems in business .			
Course Outcomes (COs) : Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to POs
1.	Describe basic concepts and technologies used in the field of management information systems.	1, 11	-
2.	Compare the processes of developing and implementing information systems.	1, 2	-
3.	Outline the role of the ethical, social, and security issues of information systems.	1,8	-
4.	Apply information systems to accomplish the objectives of an organization.	1, 10	-
Course Contents:			
MODULE – 1			10 Hrs
Management Information System (MIS): Concept , MIS: Definition ,Role of the Management Information System , Impact of the Management Information System , MIS and the User , Management as a Control System , MIS: A Support to the Management , Management Effectiveness and MIS , Organisation as a System , MIS: Organisation Effectiveness , MIS for a Digital Firms			
MODULE – 2			10 Hrs
System Engineering-Analysis and design: System Concepts, System control, Types of system, Handling System Complexity, Classes of Systems, General Model of MIS, Need for system analysis, System analysis of the existing system, System analysis of a new requirements, System Development Model.			
MODULE – 3			10 Hrs
Decision Support Systems and Knowledge Management: Decision Support Systems (DSS): Concept and Philosophy ,DSS Models: Behavioural, Management Science and Operations Research Models ,Group Decision Support System (GDSS) ,Artificial Intelligence (AI)system, Knowledge based Expert System (KBES) , DSS Application in E-enterprise , MIS and the Benefits of DSS.			
MODULE – 4			10 Hrs
Technology of information system: Data processing, Transaction processing ,application processing, Information system processing, OLAP for Analytical Information ,TQM of Information System , Human Factors and User Interface , Real Time Systems and Good Design , Case Tools and I-Case , Strategic Nature of IT Decision , Evaluation and Feasibility of IT Solutions , MIS: Choice of the ‘Information Technology’			

Text Book:

1. Jawadekar, W.S., “Management Information Systems”, Tata McGraw Hill Private Limited, New Delhi, 2013, 5th edition.

Reference Books:

1. Goyal, D.P.: “Management Information System”, MACMILLAN India Limited, New Delhi, 2008.
2. Mahadeo Jaiswal, Monika Mital: “Management Information System”, Oxford University Press, New Delhi.
3. Kenneth C. Laudon and Jane P. Laudon: “Management Information Systems” 9/e, Pearson Education, New Delhi.

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		-	-	-	-	-	-	-	-	2	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	2	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	2	-	-	-	-

Course Title	INTRODUCTION TO CLOUD COMPUTING		
Course Code	22OECS61	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: To expose students to frontier areas of cloud computing service models and applications.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Uncover history and leverage elements of cloud computing	1	-
2.	Recognize the different virtualization techniques, architecture and types of clouds	2	-
3.	Ascertain different cloud platforms and adopt Cloud Computing services and tools in real life scenarios.	2,7	-
4.	Integrate new standards for access management, security and privacy at different levels of cloud services	6,8	-
5.	Develop and deploy an application for cloud platform	5,9,10,12	1,2
Course Contents:			
MODULE – 1			10 Hrs
Introduction: Cloud computing at a glance, historical developments, building cloud computing environments, computing platforms and technologies. Principles of parallel and Distributed computing: Eras of computing, parallel vs. Distributed computing, elements of parallel computing, elements of distributed computing, technologies for distributed computing.			
MODULE – 2			10 Hrs
Virtualization: Introduction, characteristics of virtualized environments, Taxonomy of virtualization techniques, virtualization and cloud computing, pros and cons of virtualization technology. Cloud Computing architecture: Introduction, Cloud reference model, types of clouds, economics of thecloud, open challenges.			
MODULE – 3			10 Hrs
Cloud platforms in industry: Amazon Web Services, Google AppEngine, Microsoft Azure. Advanced topics in cloud computing: Energy efficiency in clouds, Market based management of clouds, Federated clouds/Inter clouds, Third party cloud services.			
MODULE – 4			10 Hrs
Infrastructure security, IAM: Infrastructure security: network level, host level, application level, Identity and Access management: trust boundaries and IAM, why IAM? IAM challenges, IAM definitions, IAM architecture and practices, getting ready for cloud, IAM standards and protocols for cloud services, IAM practices in the cloud, cloud authorization management; Security management in the cloud: security management standards, security management in the cloud, availability management, Saas, Paas. Iaas availability management, access control, security vulnerability, patch and configuration management. Privacy: What is privacy? What is data life cycle? What are the key privacy concerns in cloud? who is responsible for protecting privacy?			

Text Books:

1. Mastering Cloud Computing, McGraw Hill publication, Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi
2. Cloud security and privacy an enterprise perspective on risks and compliances, 2013, Tin Mather, Subra Kumarswamy, Shahed Latif

Reference Books:

1. Cloud Computing: Theory and Practice, Dan C Marinescu, first edition, MK publishers.
2. Cloud Computing- A practical approach, McGraw Hill publication, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter.

MOOCs:

1. <https://www.youtube.com/watch?v=Eg4AAGCE7X4>
2. <https://www.coursera.org/learn/cloud-computing>
3. <https://www.edx.org/course/introduction-cloud-computing-microsoft-cloud200x>

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-		2	-	-	-	-	-	-	-
CO4	-	-	-	-	-	2	-	2	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	3	2	-	2	3	2

Course Title	INTRODUCTION TO JAVA PROGRAMMING		
Course Code	22OECS62	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Develop java application programs using object-oriented concepts.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1	Explain Object Oriented concepts and basics of java programming	1	-
2	Analyze the given code snippet	2	-
3	Develop a java program for the given problem.	3	-
Course Contents:			
MODULE – 1			10 Hrs
Object Oriented Concepts and Java: Concepts of Object-Oriented programming language: Object, Class, Message passing, inheritance, encapsulation, and polymorphism Difference between OOP and other conventional programming – advantages and disadvantages of OOP. Java Programming Fundamentals: The Byte Code, The Java Buzzwords, A first Simple program, The Java Keywords, Identifiers in Java. Data Types and Operators: Java's Primitive Types, The Scope and Lifetime of Variables, Operators: Arithmetic, Bitwise, Relational, Boolean Logical, Assignment Operators, the "?" Operator, Type conversion and Casting, Arrays, Strings			
MODULE – 2			10 Hrs
Program Control Statements: Input characters from the Keyboard, if statement, Nested ifs, if-else-if Ladder, Switch Statement, Nested switch statements, for Loop, While Loop, do-while Loop, Use of break and continue. Introducing Classes, Objects and Methods: Class Fundamentals, Declaring Objects, Object Reference Variables, Methods, Constructors, the "This" keyword, Garbage collection, Overloading Methods and constructors, Argument Passing, Returning Objects, Access Control, Understanding Static, Nested and Inner Classes.			
MODULE – 3			10 Hrs
Inheritance: Inheritance Basics, Member Access and Inheritance, Constructors and inheritance, Using super to C all Superclass constructors, Using super to Access Superclass Members, Creating a Multilevel Hierarchy, When are Constructors Executed, Superclass References and Subclass Objects, Method Overriding, Overridden Methods support polymorphism, Why overridden Methods, Using Abstract Classes, Using final.			
MODULE – 4			10 Hrs
Interfaces: Interface Fundamentals, Creating an Interface, Implementing an Interface, Implementing Multiple Interfaces, Packages: Package Fundamentals, Packages and Member Access, Importing Packages. Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and Catch, Multiple catch Clauses, throw, finally.			
Text Book: Java –The complete Reference, Herbert Schildt, Eight Edition, Tata Mcgraw Hill Education			
Reference Books: 1. Programming in JAVA2, Dr K Somasundaram ,Jaico publications 2. Java Programming ,Hari Mohan Pandey, Pearson Education, 2012. 3. Deitel and Deitel – "Java How to Program" – 6th Ed. – Pearson.			

1. <http://nptel.ac.in/courses/106106147/>
2. http://www.nptelvideos.com/java/java_video_lectures_tutorials.php
3. https://www.youtube.com/watch?v=0KL_zftem4g
4. <https://www.coursera.org/specializations/object-oriented-programming>

[illegible]

Course Title	ANALYTICAL ABILITY AND SOFT SKILLS		
Course Code	22ASK	L-T-P	(0-0-2)1
Exam	1	Hours/Week	2
SEE	50 Marks	Total Hours	24
This course will be conducted at the end of fifth semester for two weeks by TAP department. Course Objective: To Enhance problem solving skills and communication skills Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping toPO's	Mapping to PSO's
1.	Apply methods to solve numerical and reasoning problems	2,3	-
2.	Lead a team in corporate offices	8,9	-
3.	Communicate effectively in professional ambience	10	-
Course Content			
MODULE – 1			
Hard Skills: Speed/Distance, Probability, Permutations/Combinations, Profit/Loss, Simple Interest/Compound Interest, Number theories, Number/Letter series, Coding/Decoding, Blood relations, Directions, Clock, Calendar. Logical reasoning problems			
MODULE – 2			
Soft Skills: Basic grammar, Spotting errors, Sentence formation, Email writing, Public speaking, Client communication, Leadership, Managerial skills, Stress management, Presentation Skills			
MODULE -3			
Technical Skills: Review of C programming, Simple coding, Syntax rules, MCQs on C language.			
MODULE -4			
Activities: GD, JAM, Mock Interview, Pick and speak, Presentation			

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	2	2	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-	-	-

MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution Affiliated to VTU, Belagavi)



**Autonomous programme
Bachelor of Engineering**



**DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING**

SCHEME and SYLLABUS

**VII Semester & VIII Semester
(2022-23 Admitted Batch)**

Academic Year 2025-2026

VISION

To become a prominent department of Computer Science & Engineering producing competent professionals with research and innovation skills, inculcating moral values and societal concerns.

MISSION

1. Impart world class engineering education to produce technically competent engineers.
2. Provide facilities and expertise in advanced computer technology to promote research.
3. Enhance Industry readiness and entrepreneurial abilities through innovative skills
4. Nurture ethical values and social responsibilities

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- PEO 1 : Graduates will be efficient software developers in diverse fields and will be successful professionals and/or pursue higher studies.
- PEO 2 : Graduates will be capable to adapt to new computing technology for professional excellence and Research and will be lifelong learners.
- PEO 3 : Graduates will work productively exhibiting ethical qualities for the betterment of society.
- PEO 4 : Graduates will possess leadership qualities, work harmoniously in a team with effective communication skills.

PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, natural science, computing engineering fundamentals, and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
3. **Design/development of solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
4. **Conduct investigations of complex problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
5. **Engineering tool usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
6. **The engineer and the world:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
7. **Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
8. **Individual and collaborative team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary settings.
9. **Communication:** Communicate effectively and inclusively within the community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
10. **Project management and finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
11. **Life-long learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAM SPECIFIC OUTCOMES (PSOs)

Upon graduation, students with a degree B.E. in Computer Science & Engineering will be able to:

PSO – 1: To make the students industry ready by facilitating them with software tools in recent technologies

PSO – 2: To develop IT based solutions for problems in diverse domains

Course Title	SYSTEM SOFTWARE AND COMPILER DESIGN		
Course Code	22CS701	L-T-P-C	(2-2-0) 3
Exam Hrs.	3	Hours / Week	4
CIE	50 Marks	SEE	50 Marks
Total Hours			50
Course Objective:	To get acquainted with the features of system software and the various phases of compiler design.		
Course Outcomes (COs):	Upon the completion of the course the students will be able to:		
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe the concepts of system software and the features of various machine architectures.	1	-
2.	Demonstrate the functions and features of an assembler used to generate the object program.	2,3	-
3.	Apply the concepts of Loaders, Linkers and Macro Processors for a given problem	2,3	-
4.	Apply Lexical and Syntactic analysis for a given grammar.	3,4,5	1
Course Contents:			
MODULE – 1			10 Hrs
Machine Architecture, Assembler 1: The Simplified Instructional Computer (SIC) Assemblers: Basic assembler functions, Machine dependent assembler features. Assembler 2: Machine Independent Assembler Features, Assembler Design Options.			
MODULE – 2			10 Hrs
Loaders and Linkers: Basic Loader Functions, Machine-Dependent Loader Features, Machine-Independent Loader Features, Loader Design Options. Macro Processor: Basic Macro Processor Functions, Machine-Independent Macro Processor Features.			
MODULE – 3			10 Hrs
Introduction: Language Processors, The structure of a Compiler, Applications of Compiler Technology, Programming Language Basics. Lexical Analysis: Role of Lexical Analyzer, Input buffering, Specifications of tokens, Recognition of Tokens.			
MODULE – 4			10 Hrs
Syntax Analysis: Introduction, Context –free Grammar and Structure of Language, Parser and its Types, Top- Down parser-Recursive descent parsing and Non-Recursive descent parsing, Predicting parsing table, Error recovering strategies.			
Tutorial 1. a) Write and execute a LEX program to count the number of characters, words, spaces & no. of lines in a given input file. b) Write a LEX program to count the number of comment lines in a given C program. Also eliminate them and copy that program into separate file. 2. Write a LEX program to recognize a valid arithmetic expression and to recognize the identifiers and operators present and to print them separately. 3. a) Write a LEX program to recognize and count the number of identifiers in a given input file.			

- b) Write a LEX program to find & replace String.
4. a) Write a LEX program to check the validity of a Date.
b) Write LEX program by reading input file and copy the content with line number to another file.
5. Write YACC program to recognize a valid arithmetic expression that uses operators +, -, * & /.
6. Write YACC program to evaluate an arithmetic expression involving operators +, -, * and /.
7. Write a YACC program to convert infix to postfix.
8. a) Write YACC program to recognize the grammar ($a^n b$, $n \geq 10$).
b) Write a YACC Program to recognize the grammar ($a^n b^m c^k$, $m, n, k \geq 0$ and $m = n + k$).

Text Book :

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	System Software – An Introduction to Systems Programming	Leland Beck, D. Manjula	3 rd	Pearson Education	2013
2.	Compilers- Principles, Techniques and Tools	Alfred V Aho, Ravi Sethi, Jeffrey D Ullman		Addison-Wesley	2013

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Systems Programming and Operating Systems	D. M. Dhamdhare	2 nd	Tata McGraw Hill Company	2009
2.	Systems Programming	John J. Donovan	2 nd	Tata McGraw Hill Company	2000
3.	Lex and Yacc	John. R. Levine, Tony Mason and Doug Brown		O'Reilly, SPD	2012
4.	Principles of Compiler Design	S. V. Raghavan		Tat McGraw Hill Education	2010

MOOC:

<https://in.udacity.com/course/compilers-theory-and-practice--ud168>

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conducted for 20 marks(Module 1) & reduced to 10 marks	10
	CIE2	Conducted for 20 marks(Module 2) & reduced to 10 marks	10
	CIE3	Conducted for 20 marks(Module 3) & reduced to 10 marks	10
Activity Details		Lab test and Object code generation activity	20

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	2	-	-	-	-	-	-	-	-	-	-
CO3	-	3	2	-	-	-	-	-	-	-	-	-	-
CO4	-	-	3	2	2	-	-	-	-	-	-	3	-

Course Title	NETWORK SECURITY AND CYBER LAW		
Course Code	22CS702	L-T-P-C	(3-0-0) 3
Exam Hrs.	3	Hours/Week	3
CIE	50 Marks	SEE	50 Marks
Total Hours			40
Course Objective:	To learn cryptography techniques, cyber law, IPR, and IT Act.		
Course Outcomes(COs):	Upon the completion of the course the students will be able to:		
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe the various types of Security attacks and Ciphers	1, 11	-
2.	Develop and apply the Traditional and Modern Block Ciphers	3, 4	2
3.	Analyse the Symmetric and Asymmetric key Cryptography Algorithms	2, 4	-
4.	Assess the new strategies and regulations of Cyber law and IT act	6, 7	
Course Contents:			
MODULE-1			10Hrs
Introduction: Security goals, Cryptographic attacks, Services and Mechanisms, Techniques for security goals implementation, Mathematics of cryptography: Integer Arithmetic, The Extended Euclidean Algorithm; Traditional Symmetric-Key Ciphers: Symmetric-Key Ciphers, Categories of traditional ciphers. Self-Study Component (Not included in SEE):: Modular Arithmetic, Matrices and Linear Congruence			
MODULE-2			10Hrs
Stream and Block ciphers; Introduction to Modern Symmetric-Key Ciphers: Modern block ciphers, Components of modern block ciphers, Two classes of Product Ciphers, Attacks designed for block ciphers.; Data Encryption Standard: History and Data Encryption Standard, DES Structure, DES Analysis, Security of DES, Multiple DES-Conventional Encryption Algorithm. Self-Study Component (Not included in SEE): Mathematics of Symmetric-Key cryptography: Field and GF (2n) Fields.			
MODULE-3			10Hrs
The CAST Block Cipher, Data Encryption Standard Blowfish, IDEA; Advanced Encryption Algorithm: History and Advanced Encryption Algorithm, Transformation used by AES; Asymmetric Key cryptography: Difference between symmetric cryptography and asymmetric Key cryptography Cryptosystem, RSA cryptosystem, Rabin Cryptosystem ; Self-Study Component (Not included in SEE): Mathematics of Asymmetric-Key cryptography: Primes, Primality testing, Factorization, Chinese Remainder Theorem.			
MODULE-4			10Hrs
Security and Cyber Law: INTRODUCTION: Cyberspace , Cyber security, Cyber security Policy , Cyber Crime, Nature of Threat , Enabling People, Mission and Vision of Cyber security Program , OBJECTIVES : Emerging Trends of Cyber Law , Create Awareness , Areas of Development , International Network on Cyber security; Intellectual Property Rights: Types of Intellectual Property Rights, Advantages of Intellectual Property Rights, Intellectual Property Rights in India, Intellectual Property in Cyber Space; The information Technology Act - IT act aim and objectives, Scope of the act, Major Concepts, Important provisions, Attribution, acknowledgement, and dispatch of electronic records, Secure electronic records and secure digital signatures, Regulation of certifying authorities: Digital Signature certificates, Duties of Subscribers, Penalties and adjudication.			

Text Book :													
Sl. No	Book Title				Authors				Edition	Publisher		Year	
1.	Cryptography and Network Security				Behrouz A Forouzan, Debdeep Mukhopadhyay				3 rd	McGraw Hill Education		2017	
2.	Cryptography, Network Security and Cyber Laws				Bernard Menezes				1 st	Cengage Learning		2010	
Reference Books:													
Sl. No	Book Title				Authors				Edition	Publisher		Year	
1.	Introduction to Cryptography: Principles and Applications				Hans Delfs, Helmut Knebl				1 st	Springer			
2.	Number theory and cryptography				Neal Koblitz				1 st	Springer		2007	
3.	Cryptography and Network Security				William Stallings				5 th	Pearson Education		2013	
MOOCs:													
1. http://nptel.ac.in/courses/106105031/													
2. https://www.edx.org/learn/cybersecurit													
3. https://www.tutorialspoint.com/information_security_cyber_law/index.htm													
Proposed Assessment Plan (for 50 marks of CIE):													
Tool					Remarks							Marks	
CIE		CIE			Conducted for 20 marks and reduced to 10 marks							10	
		CIE			Conducted for 20 marks and reduced to 10 marks							10	
		CIE			Conducted for 20 marks and reduced to 10 marks							10	
Activity Details					Group Based Activity							20	
Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-		-	-	-	-	-	-	-	2	-	-
CO2	-	-	3	2	-	-	-	-	-	-	-	-	2
CO3	-	3	-	2	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	3	2		-	-	-	-	

MAIN PROJECT PHASE - II					
Course Code	22CS703	L-T-P-C	(0-0-8) 4		
Exam Hrs.	3	Hours / Week	4		
SEE	50 Marks	Total Hours	-		
Course Objective: Design and implement solution for the identified real world problem in Phase I. Course Outcomes (COs): Upon completion of course the students will be able to					
#	Course Outcomes	Mapping to POs	Mapping to PSOs		
1.	Implement the design with appropriate techniques, resources and contemporary tools for solving the chosen problem	3,4,5,10	1,2		
2.	Communicate effectively as a team member and make presentations and publish technical document.	8,9	-		
3.	Use ethical practices in all activities related to project implementation.	7,11	-		
4.	Demonstrate the ability to effectively collaborate with in a team to address societal and environmental aspects through technology	6,8,9,11	1,2		
The project teams will implement the project started in their seventh semester					
The project work is to be evaluated in three stages: • Stage I (30M) - First internal evaluation shall be taken up during this phase. This includes presentation on fine tuning of SRS & Design carried out in seventh semester. • Stage II (20 M) – Mid phase evaluation shall be taken up during this phase. This includes presentation, intermediate project demonstration, draft copy of the technical paper. • Stage III (50 M) – Final project Demo, report submission and details of technical paper publication. • The evaluation of the project stages shall be carried out by the evaluation committee comprising of project guide & other faculty members. The committee will be constituted by the project coordinator in consultation with the Head of the department. For Multidisciplinary projects guides will be allotted from each concerned branch.					
Students shall strictly adhere to the project policy document announced in the beginning of the semester					
Rubrics for Evaluation of project					
Stage I (Project Progress):					
<i>Evaluation of Main Project Phase II is carried out by evaluation committee.</i>					
Sl. No.	Performance Indicators	Average	Good	Excellent	Max marks
1.	SRS	Inappropriate information. (1-2)	Not in accordance to the format. (3-4)	Appropriate information in correct format. (5)	05
2	System design and development	System specification is not identified. (0 – 3)	System specification is identified but not satisfactory. (4 – 6)	System specification is identified correctly. (7 – 10)	05
2.	Identification of appropriate tool for application	Application tools are not identified. (0 – 3)	Application tools identified but not used. (4 – 6)	Application tools identified and used. (7 – 10)	10

3.	Oral presentation	Entire contents not delivered. (1-2)	Contents not delivered clearly. (3-4)	Contents delivered clearly with confidence. (5)	5
4.	Group Participation	Did less work than others. Listened mainly; Rarely spoke up, and ideas were off the mark. Needed much reminding; submission was late. (1-2)	Did almost as much work as others. Participated in discussions; on some occasions, made suggestions. Completed assigned work on time. (3-4)	Did a full share of the work or more and volunteers to help others? Provided many good ideas; inspired others; clearly communicated ideas and needs. Completed assigned work ahead of time. (5)	5
Total					30
Stage II (Mid Phase Project Demonstration with Draft paper):					
Evaluation of this phase is done by evaluation committee.					
Sl. No.	Performance Indicator	Average	Good	Excellent	Total marks allocated
1.	Design and Implementation	Design not complete. (1-2)	Design partially completed. (3-4)	Design completed. (5)	5
2.	Intermediate Demonstration	Incomplete. (1-2)	Complete but not satisfactory. (3-4)	Complete and satisfactory. (5)	5
3.	Technical paper Draft	Organization and technical content not relevant. (1-2)	Organization and technical content of paper complete but needs improvement. (3-4)	Organization and technical content of the report are complete and satisfactory. (5)	5
4.	Oral presentation	Presentation slides are not clear. (1-2)	Presentation slides are clear, but not satisfactory. (3-4)	Presentation slides are clear and satisfactory. (5)	5
Total					20
Stage III (Final Project Demonstration):					
Evaluation of this phase is done by evaluation committee.					
Sl. No.	Performance Indicator	Average	Good	Excellent	Total marks allocated
1.	Final project demonstration	Project incomplete (0 – 3)	Project complete but needs improvement in interface design/ functionality, etc. (4-6)	Project completed (7-10)	10

2.	Oral Presentation	Disorganized and ineffective presentation (4)	Organized, but ineffective presentation (7)	Effective organized presentation (10)	5
3.	Ethics	Upholds the standards of honesty and integrity.(1-2)	Upholds the standards of honesty and integrity. Addressed few societal and environmental issues(3-4)	Upholds the standards of honesty and integrity. Addressed the societal and environmental issues and responsibilities.(5)	5
4.	Report submission	Disorganized and contents are not sufficient (0-8)	Organized but not good content wise (9-14)	Effectively organized and well framed contents (15-20)	20
5.	Technical paper publication/KSC ST/Any Proposal Submitted (Granted) to VGST/DST/University/ sponsoring agency	Paper submitted for National Conference (8)	Paper submitted / published in an International Conference (9)	Paper submitted / published in a Journal (10)	10
Total					50

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Phases	Phase 1 Evaluation	20
	Phase 2 Evaluation	30
	Phase 3 Evaluation	50

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	3	3	3	-	-	-	-	3	-	3	3
CO2	-	-	-	-	-	-	-	3	3	-	-	-	-
CO3	-	-	-	-	-	-	3	-	-	-	3	-	-
CO4	-	-	-	-	-	3	-	3	3	-	3	3	3

Course Title	DEEP LEARNING		
Course Code	22CS771	L-T-P	(3-0-0)3
Exam	3	Hours/Week	3
CIE	50 Marks	SEE	50 Marks
		Total Hours	40
Course Objective:	Deploy deep learning algorithms and their applications to solve real world problems.		
Course Outcomes (COs):	At the end of the course, student will be able to:		
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe the fundamentals of deep learning algorithms	1	1
2.	Apply suitable deep learning algorithms for the given problem.	3	2
3.	Use tensor-flow and keras for training the models.	3,5	
4.	Solve problems using Deep Neural networks, CNN and RNN.	3,4,5,9,10	
Course Contents :			
MODULE-1			10 Hrs
Introduction to Artificial Neural Networks with Keras- From Biological to Artificial Neurons, Biological Neurons, Logical Computations with Neurons, Architectures of Neural Network, Learning Process in ANN, The Perceptron, MultiLayer Perceptron (MLP) and Backpropagation, Types of Activation Functions, Regression MLPs, Classification MLPs. Implementing MLP's with Keras, : Installing TensorFlow 2, Building an Image Classifier Using the Sequential API, Building a Regression MLP Using the Sequential API, Building Complex Models Using the Functional API, Saving and Restoring a Model, Using Callbacks, Visualization Using TensorBoard, Fine-Tuning Neural Network Hyperparameters			
MODULE-2			10 Hrs
Training Deep Neural Networks- Vanishing/Exploding Gradients, Glorot and He Initialization, Nonsaturating Activation Functions, Batch Normalization, Gradient Clipping, Reusing Pretrained Layers, Transfer Learning With Keras, Unsupervised Pretraining, Pretraining on an Auxiliary Task. Faster Optimizers, Momentum Optimization, Nesterov Accelerated Gradient, AdaGrad, RMSProp, Adam and Nadam Optimization, Learning Rate Scheduling. Avoiding Overfitting Through Regularization, ℓ_1 and ℓ_2 Regularization, Dropout, Monte-Carlo (MC) Dropout, Max-Norm Regularization.			
MODULE-3			10 Hrs
Loading and Preprocessing Data with TensorFlow – The Data API, Chaining Transformations, Shuffling the Data, Preprocessing the Data, Putting Everything Together, Prefetching, Using the Dataset With tf.keras. The TF Record Format, Compressed TFRecord Files, A Brief Introduction to Protocol Buffers, TensorFlow Protobufs, Loading and Parsing Examples, Handling Lists of Lists Using the Sequence Example Protobuf. The Features API, TF Transform, The TensorFlow Datasets (TFDS) Project. Deep Computer Vision Using Convolutional Neural Networks - Architecture of Visual Cortex, Convolutional Layer, Filters, Stacking Multiple Feature Maps, TensorFlow Implementation, Memory Requirements, Pooling Layer, TensorFlow Implementation.			

MODULE-4											10 Hrs		
Deep Computer Vision Using Convolutional Neural Networks : CNN Architectures, LeNet-5, AlexNet, GoogLeNet, VGGNet, ResNet, Xception, SEnet, Implementing a ResNet-34 CNN Using Keras, Using Pretrained Models From Keras, Pretrained Models for Transfer Learning, Classification and Localization, Object Detection: Fully Convolutional Networks (FCNs), You Only Look Once (YOLO), Semantic Segmentation													
Processing Sequences Using RNNs and CNNs - Recurrent Neurons and Layers, Training RNNs, Forecasting a Time Series, Baseline Metrics, Implementing a Simple RNN.													
Text Book :													
Sl.No	Book Title					Authors		Edition	Publisher			Year	
1.	Hands-On Machine Learning with Scikit-Learn- Keras and Tensor Flow: Concepts, Tools and Techniques to Build Intelligent Systems					Aurelien Geron		2 nd				2019	
Reference Books:													
Sl.No	Book Title					Authors		Edition	Publisher			Year	
1.	Python Machine Learning					Sebastian Raschka and Vahid Mirjalili		3 rd					
e-Book: https://www.oreilly.com/library/view/hands-on-machine-learning/9781492032632/													
MOOCs: 1. https://www.edx.org/course/deep-learning-with-tensorflow 2. https://www.deeplearning.ai/tensorflow-in-practice/													
Proposed Assessment Plan (for 50 marks of CIE):													
Tool				Remarks								Marks	
CIE		CIE-1	Conducted for 20 marks(Module 1) & reduced to 10 marks								10		
		CIE-2	Conducted for 20 marks(Module 2) & reduced to 10 marks								10		
		CIE-3	Conducted for 20 marks(Module 3) & reduced to 10 marks								10		
Activity Details		Act	Project Based activity								20		
Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	2	-
CO2	-	-	2	-	-	-	-	-	3	-	-	-	3
CO3	-	-	3	-	3	-	-	-	3	3	-	-	3
CO4	-	-	2	2	3	-	-	-	2	2	-	2	3

Course Title	DATA SCIENCE		
Course Code	22CS772	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
CIE	50 Marks	SEE	50 Marks
Total Hours			40
Course Objective: Students will be able to apply the data science process to real-time data.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe the basic concepts of data science	1	-
2.	Apply different techniques for EDA using the R tool	2, 5	-
3.	Apply supervised and unsupervised algorithms for a given problem	3, 4	2
4.	Use data visualization tools and plot graphs.	5, 9	1
Course Contents:			
MODULE – 1			10 Hrs
Introduction: What is Data Science? Big Data and Data Science hype - and getting past the hype, Why now? –Datafication, Current landscape of perspectives, Skill sets needed. Statistical Inference - Populations and samples, Statistical modelling, probability distributions, fitting a model. Demonstration: 1. R-Installation and basics. 2. Construct a dataset of students' grades, attendance, and extracurricular involvement. Use R to perform statistical tests and visualizations to analyze the impact of attendance on academic performance.			
MODULE – 2			10 Hrs
Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA. The Data Science Process, Case Study: RealDirect (online real estate firm). Three Basic Machine Learning Algorithms - Linear Regression. Demonstration: 3. Import a .csv file and perform various Exploratory Data Analysis and Data Visualization techniques such as Box plot, Histogram, pie charts and bar charts using R Programming. 4. Design and implement a linear regression model using the iris dataset to predict sepal length. Include variable selection, model training, evaluation, and visual representation of the results. Justify the insights gained from the analysis.			
MODULE – 3			10 Hrs
k-Nearest, Neighbors (k-NN), k-means. One More Machine Learning Algorithm and Usage in Applications -Motivating application: Filtering Spam, Why Linear Regression and k-NN are poor choices for Filtering Spam, Naive Bayes and why it works for Filtering Spam Data Wrangling: APIs and other tools for scrapping the Web. Demonstration: 5. Design an R script to calculate and visualize correlation and covariance between variables in a self-constructed dataset. Interpret your findings and suggest data-driven decisions based on the results. 6. Using the iris dataset, build a KNN classification model in R to predict flower species based on their measurements. Analyze how varying the value of k affects model accuracy.			

7. Develop an R program to apply the K-means clustering algorithm for data analysis. Demonstrate the process of selecting the appropriate number of clusters, executing the algorithm, and interpreting the clustering results.														
8. Design and implement a Naïve Bayes classifier in a R programming language to classify a sample dataset stored in a .CSV file. After training the model, evaluate its accuracy by testing it on a separate set of test data. Analyze the classifier's performance and interpret the results.														
MODULE – 4												10 Hrs		
Recommendation Systems: Building a User-Facing Data Product - Algorithmic ingredients of a Recommendation Engine, Dimensionality Reduction, Singular Value Decomposition, Principal Component Analysis, Exercise: build your own recommendation system.														
Data Visualization - Data Visualization History, What Is Data Science, Redux?, A Sample of Data Visualization Projects.														
Text Book :														
Sl.No	Book Title				Authors				Edition		Publisher		Year	
1.	Doing Data Science, Straight Talk from The Frontline				Cathy O’Neil and Rachel Schutt						O'Reilly		2014	
Reference Books:														
Sl.No	Book Title				Authors				Edition		Publisher		Year	
1.	Mining of Massive Datasets				Jure Leskovek, Anand Rajaraman and Jeffery Ullman				V2.1		Cambridge University Press		2004	
2.	Machine Learning: A Probabilistic Perspective				Kevin P. Murphy				ISBN 0262018 020				2013	
MOOCs:														
1. Introduction to data Analytics nptel.ac.in/courses/110106064/ E-Books: a) An Introduction to Data Science. By J. Stanton, 2013.														
2. Data Science https://drive.google.com/file/d/0B6iefdnF22XQeVZDSkxjZ0Z5VUE/edit														
Proposed Assessment Plan (for 50 marks of CIE):														
Tool				Remarks								Marks		
CIE	CIE-1			Conducted for 20 marks(Module 1) & reduced to 10 marks								10		
	CIE-2			Conducted for 20 marks(Module 2) & reduced to 10 marks								10		
	CIE-3			Conducted for 20 marks(Module 3) & reduced to 10 marks								10		
Activity Details		Act		Project Based activity								20		
Course Articulation matrix														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	
CO2	-	3	-	-	3	-	-	-	-	-	-	-	-	
CO3	-	-	3	2	-	-	-	-	-	-	-	-	3	
CO4	-	-	-	-	2	-	-	-	2	-	-	3	-	

Course Title		MOBILE COMMUNICATIONS			
Course Code	22CS773	(L-T-P) C		(3-0-0)3	
Exam. Hours	3	Hours / Week		3	
CIE	50 Marks	SEE		50 Marks	
		Total Hours		40	
Course Objective: To build real time applications by deploying Mobile Communication technologies.					
Course Outcomes (COs) : Upon completion of the course, students shall be able to :					
COs	Statement		Mapping to POs	Mapping to PSOs	
1.	Explore the applications, marketing and reference model of Mobile communication system.		1,2,11	-	
2.	Classify the different types of transmissions, medium access control techniques and satellite Systems.		1,2	-	
3.	Develop the suitable wireless and/or mobile network for a given scenario.		3	1,2	
4.	Study the performance of protocols involved in mobile network layer, mobile ad-hoc networks and transport layer.		2,4	-	
Course Contents:					
MODULE – 1				10 Hrs	
Introduction to Mobile Communications: Applications, History of Wireless Communication, A Market for Mobile Communications, Some open research Topics, A simplified reference model. Wireless Transmission: Frequencies for Radio Transmission, Signals, Antennas, Signal Propagation, Multiplexing, Modulation, Cellular Systems.					
MODULE – 2				10 Hrs	
Medium Access Control: Motivation for a specialized MAC, TDMA, CDMA, Comparison of S/T/F/CDMA. Satellite Systems: History, Applications, Basics, Routing, Localizations, Handover; Broadcast Systems: Overview, Cyclical Repetition of data, DAB, DVB, Convergence of Broadcasting and Mobile communications.					
MODULE – 3				10 Hrs	
Wireless LAN: Infrared versus radio transmission, Infrastructure and Adhoc Network, IEEE-802.11-System Architecture and Protocol Architecture. Mobile Network Layer: Mobile IP: Goals, assumptions and requirements, Entities and terminology, IP packet delivery, Agent discovery, Registration, Tunnelling and encapsulation, Optimizations; Dynamic host configuration protocol					
MODULE – 4				10 Hrs	
Mobile ad-hoc networks: Routing, Destination sequence distance vector, Dynamic source routing,Alternative metrics , Overview ad-hoc routing protocols Mobile Transport Layer: Traditional TCP, Classical TCP improvements, TCP over 2.5/3G wireless networks, Performance enhancing proxies.					
Text Book :					
Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Mobile communications	Jochen Schiller	2 nd	Pearson Education	
Reference Books:					

Sl.No	Book Title	Authors	Edition	Publisher	Year								
1.	Mobile Computing – Technology, Applications and ServiceCreation	Asoke K. Talkukder, Roopa R Yavagal		Tata McGraw Hill	2012								
2.	Mobile Computing Principles – Designing and Developing Mobile Applications withUML and XML	Reza B’Far	5 th	Cambridge University press	2013								
Proposed Assessment Plan (for 50 marks of CIE):													
Tool		Remarks				Marks							
CIE	CIE-I	Conducted for 20 marks(Module 1) & reduced to 10 marks				10							
	CIE-II	Conducted for 20 marks(Module 2) & reduced to 10 marks				10							
	CIE-III	Conducted for 20 marks(Module 3) & reduced to 10 marks				10							
Activity Details	Activity	Designing a Protocol using Network Simulation and Problem solving assignment.				20							
Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	2	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	2	2
CO4	-	3	-	2	-	-	-	-	-	-	-	-	-

Course Title	SOFTWARE TESTING				
Course Code	22CS774	L-T-P-C	(3-0-0)3		
Exam Hrs.	3	Hours/Week	3		
SEE	50 Marks	CIE	50 Marks		
		Total Hours	40		
Course Objective: Apply effective testing techniques for developing quality software products.					
Course Outcomes(COs): Upon the completion of the course the students will be able to:					
#	Course Outcomes	Mapping to POs	Mapping to PSOs		
1.	Explore the concepts of software testing and its documentation.	1,2	-		
2.	Analyze various software testing methods and strategies	2,3	2		
3.	Apply suitable test case generation techniques	3,5	2		
Course Contents:					
MODULE-1			10Hrs		
Basics of Software Testing: Human Errors and Testing; Software Quality; Requirements, Behavior and Correctness; Correctness versus Reliability; Testing and Debugging; Test Metrics. Software and Hardware Testing; Testing and Verification; Defect Management; Execution History; Test-generation Strategies, Static Testing. Model-Based Testing and Model Checking; Control-Flow Graph; Types of Testing; The Saturation Effect.					
MODULE-2			10Hrs		
Test Generation from Requirements: Introduction; The Test-Selection Problem; Equivalence Partitioning; Boundary Value Analysis; Category-Partition Method. Test Generation from Requirements: Cause-Effect Graphing, Test Generation from Predicates.					
MODULE-3			10Hrs		
Structural Testing: Overview; Statement testing; Branch testing; Condition testing, Path testing; Procedure call testing; Comparing structural testing criteria; The infeasibility problem. Dependence, Data Flow Models, and Data Flow Testing: Definition-Use pairs; Data flow analysis; Classic analyses; From execution to conservative flow analysis; Data flow analysis with arrays and pointers; Inter-procedural analysis; Overview of data flow testing; Definition-Use associations; Data flow testing criteria; Data flow coverage with complex structures; The infeasibility problem.					
MODULE-4			10Hrs		
Test Case Selection and Adequacy, Test Execution: Overview; Test specification and cases; Adequacy criteria; Comparing criteria; Overview of test execution; From test case specification to test cases; Scaffolding; Generic versus specific scaffolding; Test oracles; Self-checks as oracles; Capture and replay. Process: Test and analysis activities within a software process: The quality process; Planning and monitoring; Quality goals; Dependability properties; Analysis; Testing; Improving the process; Organizational factors. Integration and component-based software testing: Overview; Integration testing strategies; Testing components and assemblies. System, Acceptance and Regression Testing: Overview; System testing; Acceptance testing; Usability; Regression testing; Regression test selection techniques; Test case prioritization and selective execution.					
Text Book :					
Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Foundations of Software Testing (Chapters 1 excluding 1.15, 1.16, 1.17, 2, 6).	Aditya P Mathur		Pearson Education	2014

2.	Software Testing and Analysis – Process, Principles and Techniques (Chapters 4, 6, 9, 12, 13, 17, 21, 22).	Mauro Pezze, Michal Young		John Wiley & Sons	2008								
Reference Books:													
Sl.No	Book Title	Authors	Edition	Publisher	Year								
1.	Software testing Principles and Practices	Srinivasan Desikan, Gopalaswamy Ramesh	2 nd	Pearson	2007								
2.	Software Testing	Ron Patton	2 nd	Pearson	2004								
MOOC: http://nptel.ac.in/courses/106105150													
Proposed Assessment Plan (for 50 marks of CIE):													
Tool		Remarks				Marks							
CIE	CIE	Conducted for 20 marks(Module 1) & reduced to 10 marks				10							
	CIE	Conducted for 20 marks(Module 2) & reduced to 10 marks				10							
	CIE	Conducted for 20 marks(Module 3) & reduced to 10 marks				10							
Activity Details		Design a test case for various web and desktop applications				20							
Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	3	-	-	-	-	-	-	-	-	-	2
CO3	-	-	3	-	3	-	-	-		-	-	-	3

PATTERN RECOGNITION					
Course Code	22CS781		L-T-P-C		(3-0-0)3
Exam Hours	3		Hours / Week		3
CIE	50 Marks		SEE		50 Marks
			Total Hours		40
Course Objective :		Apply pattern recognition techniques to real world problems.			
Course Outcomes (COs) :		Upon completion of the course, students shall be able to:			
COs	Statement			POs	PSOs
1.	Describe the fundamental concepts of pattern recognition systems and their applications.			1	-
2.	Explain various classification and decision-making techniques.			1	-
3.	Implementation of pattern recognition techniques			3	2
Course Contents:					
Module 1				10 Hrs	
Introduction: Machine perception, an example; Pattern Recognition System; The Design Cycle; Learning and Adaptation.					
Bayesian Decision Theory: Introduction, Bayesian Decision Theory; Continuous Features, Minimum error rate, classification, classifiers, discriminate functions, and decision surfaces; The normal density; Discriminant functions for the normal density.					
Module 2				10 Hrs	
Maximum-likelihood and Bayesian Parameter Estimation: Introduction; Maximum-likelihood estimation; Bayesian Estimation; Bayesian parameter estimation: Gaussian Case, general theory; Hidden Markov Models.					
Non-parametric Techniques: Introduction; Density Estimation; Parzen windows; kn – Nearest-Neighbor Estimation; The Nearest- Neighbor Rule; Metrics and Nearest-Neighbor Classification.					
Module 3				10 Hrs	
Linear Discriminant Functions: Introduction; Linear Discriminant Functions and Decision Surfaces; Generalized Linear Discriminant Functions; The Two-Category Linearly Separable case; Minimizing the Perception Criterion Functions; Relaxation Procedures; Non-separable Behavior; Minimum Squared-Error procedures; The Ho-Kashyap procedures.					
Stochastic Methods: Introduction; Stochastic Search; Boltzmann Learning; Boltzmann Networks and Graphical Models; Evolutionary Methods.					
Module 4				10 Hrs	
Non-Metric Methods: Introduction; Decision Trees; CART; Other Tree Methods; Recognition with Strings; Grammatical Methods.					
Unsupervised Learning and Clustering: Introduction; Mixture Densities and Identifiability; Maximum-Likelihood Estimates; Application to Normal Mixtures; Unsupervised Bayesian Learning; Data Description and Clustering; Criterion Functions for Clustering.					
Text Book :					
Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Pattern Classification	Richard O. Duda, Peter E. Hart, and David G.Stork	2 nd	Wiley-Interscience	2012
Reference Books:					
Sl.No	Book Title	Authors	Edition	Publisher	Year

1.	Pattern Recognition and Image Analysis	Earl Gose, Richard Johnsonbaugh, Steve Jost		Pearson Education	2007								
Activity:													
1.	Develop a Bayesian classifier to predict whether a patient is likely to have a particular disease based on observed symptoms and historical data.												
2.	Develop a K-Nearest Neighbor (KNN) classifier to predict whether a customer will buy a product based on their demographic information and past purchasing behavior												
3.	Design a Linear Discriminant Function to classify emails as 'Spam' or 'Not Spam' based on extracted textual features												
4.	Apply stochastic methods to optimize the scheduling of tasks in a smart factory to minimize production time and resource conflicts												
5.	Build a Decision Tree model to predict whether a loan application should be approved based on applicant details such as income, credit history, employment status, and existing debts												
6.	Estimate the parameters of a Gaussian distribution to model and predict student test scores using Maximum Likelihood Estimation												
Proposed Assessment Plan (for 50 marks of CIE):													
Tool		Remarks				Marks							
CIE	CIE	Conducted for 20 marks and reduced to 10 marks				10							
	CIE	Conducted for 20 marks and reduced to 10 marks				10							
	CIE	Conducted for 20 marks and reduced to 10 marks				10							
Activity Details		Demonstration concepts will be evaluated as activity				20							
Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-	2

Course Title		BIG DATA ANALYTICS		
Course Code	22CS782	L-T-P-C		(3-0-0)3
Exam Hrs.	3	Hours/Week		3
CIE	50 Marks	SEE		50 Marks
Total Hours				40
Course Objective: Introduce Big Data technologies for solving the real world problems				
Course Outcomes(Cos):Upon completion of the course the students will be able to:				
#	Course Outcomes			Mapping to PSOs
1.	Describe the basic concepts of Big Data and Big data analytics		1	-
2.	Apply Big data framework for data analysis		2,3	1
3.	Use Big data tools and techniques in processing the data		3,5	1,2
Course Contents:				
MODULE – 1				10Hrs
Introduction to Big Data: Types of Digital Data, Characteristics, Evolution and definition of Big data, What is Big data, Why Big data, Traditional Business Intelligence Vs Big Data, Typical data warehouse and Hadoop environment. Big Data Analytics: What is Big data Analytics, Classification of Analytics, Importance of Big Data Analytics, Technologies used in Big data Environments Demonstration: Working on varieties of Data and their representations				
MODULE – 2				10Hrs
Introduction to Hadoop: Introducing hadoop, Why hadoop, Why not RDBMS, RDBMS Vs Hadoop, History of Hadoop, Hadoop overview, HDFS (Hadoop Distributed File System), Processing data with Hadoop, Interacting With Hadoop Ecosystem. Demonstration: Install Hadoop and Implement the file management tasks in Hadoop: Adding files and directories Retrieving files Deleting files and directories.				
MODULE – 3				10Hrs
Introduction to Map Reduce Programming: Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression. Introduction to MongoDB: What is MongoDB? Why MongoDB, Terms Used in RDBMS and MangoDB, Data Types in MangoDB, MangoDB Query Language Demonstration: Application of Map Reduce to various scenarios				
MODULE – 4				10Hrs
Introduction To HIVE: What is Hive?, HIVE Architecture, HIVE Data Types, HIVE File Format, HIVE Query Language, User Defined Functions Introduction TO PIG: What is PIG? The Anatomy of PIG, PIG on Hadoop, PIG Philosophy, Use Case for PIG – ETL Processing, PIG Latin Overview, Data Types in PIG, Execution Modes of PIG, Relational Operators, User Defined Functions, Word Count Example Using PIG. Demonstration: Working with PIG and HIVE				
Text Book :				
Sl.No	Book Title	Authors	Edition	Publisher
				Year

1.	Big data and Analytics	Seema Acharya and Subhashini Chellappan	2 nd	Wiley India	2019								
Reference Books:													
Sl.No	Book Title	Authors	Edition	Publisher	Year								
1.	Big Data Imperatives	Soumendra Mohanty, Madhu Jagadeesh, Harsha Srivatsa	1 st	A press	2012								
2.	Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today’s Business	Michael Minelli, Michehe Chambers	1 st	Wiely CIO Series	2013								
3.	Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics	Bill Franks	1 st	Wiley and SAS Business Series	2012								
MOOC: https://nptel.ac.in/courses/106/104/106104189													
Proposed Assessment Plan (for 50 marks of CIE):													
Tool		Remarks				Marks							
CIE	CIE	Conducted for 20 marks and reduced to 10 marks				10							
	CIE	Conducted for 20 marks and reduced to 10 marks				10							
	CIE	Conducted for 20 marks and reduced to 10 marks				10							
Activity Details		Demonstration concepts will be evaluated as activity				20							
Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	2	-	-	-	-	-	-	-	-	-	3
CO3	-	-	3	-	3	-	-	-	-	-	-	-	2

Course Title	CLOUD COMPUTING		
Course Code	22CS783	L-T-P-C	(3-0-0) 3
Exam Hrs.	3	Hours/Week	3
CIE	50Marks	SEE	50 Marks
Total Hours			40
Course Objective: To expose students to frontier areas of cloud computing service models and applications.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Explore different cloud computing delivery models and services	1,7	-
2.	Analyse various cloud computing resource management and virtualization techniques.	2,3	-
3.	Integrate new standards for access management, security and privacy at different levels of cloud services.	3, 6	
4.	Demonstrate the usage of various cloud computing platforms and resources.	5, 11	1, 2
Course Contents:			
MODULE-1			10Hrs
Introduction: Cloud computing: An old idea whose time has come, Cloud computing delivery models and services, Ethical issues in cloud computing, Cloud vulnerabilities, Major challenges faced by cloud computing. Cloud Infrastructure: Cloud computing at Amazon, Cloud computing the Google perspective, Microsoft Windows Azure and online services, Open-source software platforms for private clouds, Cloud storage diversity and vendor lock in, Energy use and ecological impact of Large-Scale Data Centres, Service- and Compliance level agreements, User experience and software licensing.			
MODULE-2			10Hrs
Cloud Computing: Applications and Paradigms: Challenges of cloud computing, Architectural styles for cloud applications, Workflows: Coordination of multiple activities, Coordination based on a state machine model: The Zookeeper, The Map Reduce programming model, Clouds for science and engineering, High-performance computing on a cloud, Cloud computing for Biology research, social computing, Digital Content, and Cloud Computing.			
MODULE-3			10Hrs
Cloud Resource Virtualization: Virtualization, Layering and virtualization, Virtual machine monitors, Virtual Machines, Performance and Security Isolation, Full virtualization and paravirtualization, Hardware support for virtualization. Cloud Resource Management and Scheduling: Policies and mechanisms for resource management, Application of control theory to task scheduling on a cloud, Resourcing bundling: Combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds, Fair queuing, Start-time fair queuing.			
MODULE-4			10Hrs
Cloud Security: Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine Security, Security of virtualization, Security risks posed by shared images, Security risks posed by a management OS, A trusted virtual machine monitor. Cloud Application Development: Amazon web services: EC2 instances, connecting clients to cloud instances through firewalls, Security rules for application and transport layer protocols in EC2, How to launch an EC2 Linux instance and connect to it, Cloud-based simulation of a distributed trust algorithm.			

Text Book :													
Sl.No	Book Title					Authors		Edition		Publisher		Year	
1.	Cloud Computing: Theory and Practice					Dan C Marinescu		1 st		Elsevier (MK),		2013	
Reference Books:													
Sl.No	Book Title					Authors		Edition		Publisher		Year	
1.	Cloud Computing- A practical approach					Anthony T. Velte, Toby J. Velte, Robert Elsenpeter		1 st		McGraw Hill			
MOOCs:													
1. https://www.javatpoint.com/cloud-computing-tutorial													
2. https://www.tutorialspoint.com/cloud_computing/index.htm													
3. https://www.digimat.in/nptel/courses/video/106105167/L01.html (Video Lectures)													
Proposed Assessment Plan (for 50 marks of CIE):													
Tool			Remarks									Marks	
CIE		CIE-1	Conducted for 20 marks and reduced to 10 marks									10	
		CIE-2	Conducted for 20 marks and reduced to 10 marks									10	
		CIE-3	Conducted for 20 marks and reduced to 10 marks									10	
Activity Details			Group Activity will be conducted using various cloud platforms									20	
Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	2	-	-	-	-	-	-
CO2	-	3	2	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	2	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	2	2	2

Course Title	GREEN COMPUTING		
Course Code	22CS784	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours/Week	3
CIE	50 Marks	SEE	50 Marks
Total Hours			40
Course Objective: To enable students to design, manufacture, and dispose computing devices in a way that reduces their environmental impact.			
Course Outcomes(COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Explore fundamentals of Green Computing	1,7	-
2.	Analyze various sustainability challenges and strategies that can reduce the environmental impact of usage of computers	2,7	-
3.	Relate the green computing practices to make business more energy efficient and Green compliant.	6,11	-
4.	Document and present the technical paper with proposed sustainable solution for Green Computing.	3,4,7,8,9,10	-
Course Contents:			
MODULE – 1			10 Hrs
Green IT: An Overview, Introduction, Environmental Concerns and Sustainable Development, Environmental Impacts of IT, Green IT, Holistic Approach to Greening IT, Greening IT, Applying IT for enhancing Environmental sustainability, Green IT Standards and Eco-Labeling of IT, Enterprise Green IT strategy, Green IT: Burden or Opportunity, Green Devices and Hardware: Introduction, Life Cycle of a device or hardware, Reuse, Recycle and Dispose. Green Software: Introduction, Energy-saving software techniques, Evaluating and Measuring software Impact to platform power. Sustainable Software Development: Introduction, Current Practices, Sustainable Software, Software Sustainability Attributes, Software Sustainability Metrics			
MODULE – 2			10 Hrs
Green Data Centres: Data Centres and associated energy challenges, Data centre IT infrastructure, Data Centre facility infrastructure: Implications for energy efficiency, IT infrastructure management. Green Networks and Communications: Introduction, Objectives of Green Network Protocols, Green Network Protocols and Standards. Enterprise Green IT Strategy: Introduction, Approaching Green IT Strategies, Business Drivers of Green IT Strategy, Business Dimensions for Green IT Transformation, Organizational Considerations in a Green IT Strategy, Steps in Developing a Green IT Strategy. Green Enterprises and Role of IT: Introduction, Organization and Enterprise Greening, Information systems in Greening Enterprises, Greening Enterprise: IT Usage and Hardware, Inter-Organizational Enterprise activities and Green Issues.			
MODULE – 3			10 Hrs
Managing Green IT: Introduction, Strategizing Green Initiatives, Implementation of Green IT, Information Assurance. Regulating Green IT: Laws, Standards and Protocols: Introduction, The regulatory environment and IT manufacturers, Non regulatory government initiatives, Industry associations and standards bodies, Green building standards, Green data centres, Social movements and Greenpeace Green Cloud Computing and Environmental Sustainability: Introduction, what is Cloud Computing? Cloud Computing and Energy Usage Model: A Typical Example, Features of Clouds Enabling Green Computing, Towards Energy Efficiency of Cloud Computing, Green Cloud Architecture			

MODULE – 4												10 Hrs	
Harnessing Semantic Web Technologies for the Environmental: Introduction, Information Management for Environmental Sustainability, Ecosystem of Software Tools, Examples of Managing Data. Green IT-An Outlook: Introduction, Awareness to implementations, Greening by IT, Green IT: A megatrend, A seven-step approach to creating green IT strategy, Research and Development directions.													
Text Book :													
Sl.No	Book Title				Authors				Edition	Publisher		Year	
1.	Harnessing Green IT: Principles and Practices				San Murugesan, G. R. Gangadharan				1 st	Wiley& IEEE		2017	
Reference Books:													
Sl.No	Book Title				Authors				Edition	Publisher		Year	
1.	Green IT Strategies and Applications-Using Environmental Intelligence				BhuvanUnhelkar				1 st	CRC Press		2011	
2.	Green Communications: Principles, Concepts and Practice				Konstantinos Samdanis, Peter Rost, Andreas Maeder, Michela Meo, Christos Verikoukis				1 st	Wiley		2015	
Proposed Assessment Plan (for 50 marks of CIE):													
Tool				Remarks								Marks	
CIE		CIE-1		Conducted for 20 marks and reduced to 10 marks								10	
		CIE-2		Conducted for 20 marks and reduced to 10 marks								10	
		CIE-3		Conducted for 20 marks and reduced to 10 marks								10	
Activity Details				Group based activity								20	
Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	3	-	-	-	-	-	-
CO2	-	2	-	-	-	-	2	-	-	-	-	-	-
CO3	-	-	-	-	-	3	-	-	-	-	2	-	-
CO4	-	-	2	2	-	-	2	3	3	3	-	-	-

Course Title		INTRODUCTION TO DATA SCIENCE (OPEN ELECTIVE)						
Course Code		22OECS71		L-T-P		(3-0-0)3		
Exam		3 Hrs.		Hours/Week		3		
CIE		50 Marks		SEE		50 Marks		
				Total Hours		40		
Course Objective: Introduce major data science approaches and their applications to solve real world problems.								
Course Outcomes: At the end of the course, student will be able to:								
#	Course Outcomes				Mapping to POs	Mapping to PSOs		
1.	Comprehend the basic data operations and overview of simple statistical models.				1	-		
2.	Apply specific Supervised, and Unsupervised algorithms to obtain solutions for appropriate problems.				3, 5	-		
3.	Explore the various Network Analysis and Recommendation Systems real world problems.				3, 5	-		
MODULE-1						10 Hrs		
Introduction, Toolboxes: Python, fundamental libraries for data Scientists. Integrated development environment (IDE). Data operations: Reading, selecting, filtering, manipulating, sorting, grouping, rearranging, ranking, and plotting.								
Descriptive statistics: data preparation. Exploratory Data Analysis data summarization, data distribution, measuring asymmetry. Sample and estimated mean, variance and standard score.								
MODULE-2						10 Hrs		
Statistical Inference: Statistical Inference frequency approach, variability of estimates, hypothesis testing using confidence intervals, using p-values								
Supervised Learning: First step, learning curves, training-validation and test. Learning models generalities, support vector machines, random forest. Examples								
MODULE-3						10 Hrs		
Regression analysis, Regression: Linear regression simple linear regression, multiple & Polynomial regression, Sparse model.								
Unsupervised learning: Introduction, Clustering, similarity and distances, quality measures of clustering, case study.								
MODULE-4						10 Hrs		
Network Analysis: Basic Definitions in Graphs, Social Network Analysis, Centrality, drawing centrality of Graphs, PageRank, Ego-Networks, Community Detection.								
Recommender Systems: Introduction, Works: Content-Based Filtering, Collaborative Filtering, Hybrid Recommenders, Modeling User Preferences, Evaluating Recommenders, Practical Case.								
Text Book :								
Sl.No	Book Title		Authors		Edition	Publisher		Year
1.	Introduction to Data Science a Python approach to concepts, Techniques and Applications		Laura Igual and Santi Segui'			Springer, ISBN:978-3-319-50016-4		
Reference Books:								

Sl.No	Book Title	Authors	Editi on	Publisher	Year								
1.	Data Analysis with Python A Modern Approach	David Taieb,	1 st	Packt, ISBN-9781789950069									
2.	Python Data Analysis	Armando Fandango	2 nd	Packt, ISBN: 9781787127487									
e-Books:													
1. https://dokumen.pub/introduction-to-data-science-a-python-approach-to-concepts-techniques-and-applications-9783319500171-3319500171.html													
MOOCS													
1. https://www.lewagon.com/events/data-science-foundations-free-online-course													
2. https://onlinecourses.nptel.ac.in/noc22_cs32/preview													
Proposed Assessment Plan (for 50 marks of CIE):													
Tool		Remarks				Marks							
CIE	CIE-1	Conducted for 20 marks(Module 1) & reduced to 10 marks				10							
	CIE-2	Conducted for 20 marks(Module 2) & reduced to 10 marks				10							
	CIE-3	Conducted for 20 marks(Module 3) & reduced to 10 marks				10							
Activity Details		Project Based Activity				20							
Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	3	-	-	-	-	-	-	-	-
CO3	-	-	3	-	3	-	-	-	-	-	-	-	-
CO4													

Course Title		IOT AND ITS APPLICATIONS			
Course Code	22OECS72	L-T-P-C		(3-0-0)3	
Exam Hrs.	3	Hours / Week		3	
CIE	50 Marks	SEE		50	
Total Hours				40	
Course Objective: Explore the interconnection and integration of the physical world and design IOT applications.					
Course Outcomes (COs) : Upon the completion of the course the students will be able to:					
#	Course Outcomes		Mapping to POs	Mapping to PSOs	
1.	Describe the fundamental concepts of physical, logical design and domain-specific applications.		1	-	
2.	Analyze IoT system management techniques and Machine-to-Machine (M2M) communication		2	-	
3.	Design IoT applications using Raspberry Pi.		3,5	-	
Course Contents:					
MODULE – 1				10 Hrs	
Introduction & Concepts- Introduction of IoT; Physical Design of IoT; Logical Design of IoT; IoT Enabling Technologies; IoT Levels & Deployment Templates. Domain Specific IoTs- Introduction, Home Automation; Cities; Environment; Energy; Retail; Logistics; Agriculture; Industry; Health & Lifestyle					
MODULE – 2				10 Hrs	
IoT and M2M-Introduction; M2M; Difference between IoT and M2M; SDN and NFV for IoT; IoT System management with NETCONF-YANG- Need for IoT Systems management; SNMP; Network Operator Requirements; NETCONF; YANG; IoT Systems management with NETCONF-YANG; NETOPEER IoT Platforms Design Methodology; Introduction; IoT Design Methodology; Case Study on IoT System for Weather Monitoring; Motivating for using Python.					
MODULE – 3				10 Hrs	
IoT Systems- Logical Design using Python- Introduction; Installing Python; Python Data Types & Data structures; Control Flow; Functions; Modules; Packages; File Handling; Date/Time Operations; Classes. What is an IoT Device; Exemplary Device: Raspberry Pi; About the Board; Linux on Raspberry Pi; Raspberry Pi Interfaces ; Programming Raspberry Pi with Python					
MODULE – 4				10 Hrs	
Case Studies Illustrating IoT: Introduction; Home Automation; Cities; Environment. Environment; Agriculture ; Productivity Applications					
Text Book :					
Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Internet of Things - A Hands-on Approach	Arshdeep Bahga and Vijay Madiseti		Universities Press	2015
Reference Books:					
Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	IoT Fundamentals: Networking	David Hanes, Gonzalo Salgueiro, Patrick	1 st	Pearson Education	

	Technologies, Protocols, and Use Cases for the Internet of Things	Grossetete, Robert Barton, Jerome Henry		(Cisco Press Indian Reprint)									
2.	Internet of Things	Srinivasa K G, Siddesh G M Hanumantha Raju R	1 st	CENGAGE Leaning India	2017								
3.	Olivier Hersent, David Boswarthick, Omar Elloumi	The Internet of Things: Key Applications and Protocols	2 nd	Wiley ISBN: 978-1-119- 99435-0	2012								
Proposed Assessment Plan (for 50 marks of CIE):													
Tool		Remarks			Marks								
CIE	CIE-1	Conducted for 20 marks and reduced to 10 marks			10								
	CIE-2	Conducted for 20 marks and reduced to 10 marks			10								
	CIE-3	Conducted for 20 marks and reduced to 10 marks			10								
Activity Details		Group Based Activity			20								
Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	2	-	-	-	-	-	-	-	-
CO4													

Course Title		INTRODUCTION TO BIG DATA					
Course Code		22OECS73		L-T-P-C		(3-0-0)3	
Exam Hrs.		3		Hours/Week		3	
CIE		50 Marks		SEE		50 Marks	
		Total Hours				40	
Course Objective: Acquire the knowledge to handle Big Data.							
Course Outcomes(COs):Upon completion of the course the students will be able to:							
#	Course Outcomes				Mapping to POs	Mapping to PSOs	
1.	Describe basic Concepts of Big data Analytics				1	-	
2.	Apply Big data framework for data analysis				2,3	-	
3.	Use Big Data tools and techniques in processing of data				3,5	-	
Course Contents:							
MODULE-1						10Hrs	
Introduction: Velocity, Variety, Veracity; Drivers for Big Data, Sophisticated Consumers, Automation, Monetization.							
Big Data Analytics Applications: Social Media Command Center, Product Knowledge Hub, Infrastructure and Operations Studies, Product Selection, Design and Engineering, Location-Based Services, Online Advertising, Risk Management.							
MODULE-2						10Hrs	
Architecture Components: Massively Parallel Processing (MPP) Platforms, Unstructured Data Analytics and Reporting: Search and Count, Context-Sensitive and Domain-Specific Searches, Categories and Ontology, Qualitative Comparisons, Data Privacy Protection, Real-Time Adaptive Analytics and Decision Engines.							
Advanced Analytics Platform: Real-Time Architecture for Conversations, Orchestration and Synthesis Using Analytics Engines, Entity Resolution, Model Management, Discovery Using Data at Rest, Integration Strategies.							
MODULE-3						10Hrs	
Implementation of Big Data Analytics: Revolutionary, Evolutionary, or Hybrid, Big Data Governance, Integrating Big Data with MDM, Evolving Maturity Levels.							
Map-Reduce and the New Software Stack: Distributed File Systems. Physical Organization of Compute Nodes, Large-Scale File-System Organization, Map-Reduce features: Map Tasks, Grouping by Key, Reduce Tasks, Combiners, Map-Reduce Execution, Coping With Node Failures.							
MODULE-4						10Hrs	
Communication Cost Models: Complexity Theory for Map-Reduce, Reducer Size and Replication Rate, Graph Model and Mapping Schemas, Lower Bounds on Replication Rate.							
Mining Data Streams, Stream Data Mode l and Management Stream Source, Stream Queries, and issues, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Ones in a Window, Decaying Windows.							
Text Book :							
Sl.No	Book Title			Authors	Edition	Publisher	Year

1.	Big Data Analytics: Disruptive Technologies for Changing the Game	Dr. Arvind Sathi	1 st	IBM Corporation	2012
2.	Mining of Massive Datasets	Anand Rajarama, Jure Leskovec, Jeffrey D. Ullman	1 st	E-book	2013

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Big Data Imperatives	Soumendra Mohanty, Madhu Jagadeesh, Harsha Srivatsa,	1 st	A press, e-book	2012
2.	Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business	Michael Minelli, Michehe Chambers, Ambiga Dhiraj	1 st	Wiely CIO Series	2013
3.	Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics	Bill Franks	1 st	Wiley and SAS Business Series	2012
4.	Big Data Imperatives	Soumendra Mohanty, Madhu Jagadeesh, Harsha Srivatsa	1 st	Apress, e-book	2012

MOOC:

<https://nptel.ac.in/courses/106/104/106104189>

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE-1	Conducted for 20 marks and reduced to 10 marks	10
	CIE-2	Conducted for 20 marks and reduced to 10 marks	10
	CIE-3	Conducted for 20 marks and reduced to 10 marks	10
Activity Details		Project based activity	20

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	2	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	3	-	-	-	-	-	-	-	-
CO4													

Course Title	PROFESSIONAL ELECTIVE THROUGH NPTEL		
Course Code	22SW02	L-T-P-C	(3-0-0)3
Course Objective: To promote self-learning ability.			
Guideline: Students must register for one course from the bucket of courses announced by the department in Swayam NPTEL portal. The selected course must be a 12-week, 3-credit course. There will be direct credit transfer of 3 credits. Students are permitted to complete this course anytime between their second to fourth year of the program. The result will be entered in eighth semester grade card.			

Course Title	PROFESSIONAL ELECTIVE THROUGH NPTEL		
Course Code	22SW03	L-T-P-C	(3-0-0)3
Course Objective: To promote self-learning ability.			
Guideline: Students must register for one course from the bucket of courses announced by the department in Swayam NPTEL portal. The selected course must be a 12-week, 3-credit course. There will be direct credit transfer of 3 credits. Students are permitted to complete this course anytime between their second to fourth year of the program. The result will be entered in eighth semester grade card.			

Course Title	RESEARCH / INDUSTRY INTERNSHIP - III			
Course Code	22INT	L-T-P-C	(0-0-24)10	
Exam Hrs.	3	Hours / Week	-	
CIE	100 Marks	Total Hours	-	
Course Objective: To gain the perspective of work environment in Research organization/Industry or Complete MOOC Courses contributing to technical skill enhancement.				
Course Outcomes (COs): Upon completion of the course, students shall be able to:				
#	Course Outcomes	Mapping to POs	Mapping to PSOs	
1.	Apply the domain knowledge in solving the real world problems.	1,2	1,2	
2.	Work as a team member towards the chosen problem	9	1,2	
3.	Work with industry professionals and practice ethics in work environment.	8, 10	1,2	
4.	Document, publish and present the work carried out.	9,10,11	1,2	
The Internship work is to be evaluated in two stages:				
Phase I (50M) - First internal evaluation shall be taken up during this phase. This includes Topic Relevance, Application of Technology and Weekly Report (Dairy) & Presentation.				
Phase II (50 M) – Mid phase evaluation shall be taken up during this phase. This includes presentation, Internship Report, Update of the work dairy, Demonstration or Working Methodology (Write-up).				
Guideline: Students shall undergo In-house/ Research organization/Industry internship for a duration of one semester. Internal evaluation will be conducted in the phase manner according to the schedule announced at the beginning of the semester.				
Phase I Evaluation Rubrics for Industry/Research Internship (50 Marks Total)				
Includes: Topic Relevance, Application of Technology, Weekly Report (Diary), Presentation				
Criteria	Excellent	Good	Average	Poor
Ability to apply domain knowledge (20M)	16-20	11-15	6-10	0-5
Ability to demonstrate effective oral and written communication skills (10M)	8-10	6-7	3-5	0-2
Presentation & Weekly Report (10M)	8-10	6-7	3-5	0-2
Ethical behavior and integrity (10M)	8-10	6-7	3-5	0-2
Phase II Evaluation Rubrics for Industry/Research Internship (50 Marks Total)				
Includes: Presentation, Internship Report, Updated Work Diary, Demonstration/Working Methodology				
Criteria	Excellent	Good	Average	Poor
Ability to develop/implement solutions with appropriate techniques (20M)	16-20	11-15	6-10	0-5
Ability to work independently and in collaboration/multidisciplinary environment (10M)	8-10	6-7	3-5	0-2
Time management and task completion (10M)	8-10	6-7	3-5	0-2
Prototype of the Internship Project/Research Paper Presentation (10M)	8-10	6-7	3-5	0-2
OR				
FOUR MOOC Courses offered by VTU should be completed.				
Proposed Assessment Plan (for 100 marks of CIE):				
Tool		Remarks	Marks	
CIE	Phase-1	Conducted for 50 marks based on above 4 criteria	50	
	Phase-2	Conducted for 50 marks based on above 4 criteria	50	

Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	3	-	-	-	-	-	-	-	-	-	3	2
C02	-	-	-	-	-	-	-	-	3	-	-	3	2
C03	-	-	-	-	-	-	-	3	-	3	-	3	2
C04	-	-	-	-	-	-	-	-	3	3	3	3	2