Sri Krishna College of Engineering and Technology

An Autonomous Institution, Affiliated to Anna University

Coimbatore – 641 008

CURRICULUM AND SYLLABI

B.TECH. INFORMATION TECHNOLOGY

REGULATION 2020

DEPARTMENT OF INFORMATION TECHNOLOGY

SRI KRISHNA COLLEGE OF ENGINEERING AND TECHNOLOGY

KUNIAMUTHUR, COIMBATORE-641008

DEPARTMENT OF INFORMATION TECHNOLOGY

Department Vision

To impart quality education by providing opportunities for shaping and transforming students into eminent and ethical IT professionals, researchers, innovators and entrepreneurs with requisite skill set to excel in the dynamic field of IT.

Department Mission

- To provide state of art computer education.
- To equip staff and students with the latest skills in the field
- To keep pace with new invention and technology development, thereby set the trend for the futuristic information technology education and research with ethical and moral values.

SRI KRISHNA COLLEGE OF ENGINEERING AND TECHNOLOGY

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DEPARTMENT OF INFORMATION TECHNOLOGY

PROGRAMME OUTCOMES

a. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

b. 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.

c. 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.

d. 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.

e. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

f. 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.

g. 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.

h. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

i. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

j. 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.

k. 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.

l. 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.

SRI KRISHNA COLLEGE OF ENGINEERING AND TECHNOLOGY KUNIAMUTHUR, COIMBATORE-641008

DEPARTMENT OF INFORMATION TECHNOLOGY

PROGRAMME EDUCATIONAL OBJECTIVES

PEO 1: Graduates will have a profound knowledge in the various programming languages and possess globally competent skill sets by inculcating continuous up gradation of their technical skills and personality traits.

PEO 2: Graduates will be able to analyze and find solutions to various applications and reconcile the dynamic trends in the field of Information Technology.

PEO 3: Graduates will contribute to the society by their ethical behaviour and effective teamwork.

PEO 4: Graduates will excel with different skills like effective communication, leadership qualities, and provide smart solutions in business environment

Mapping of PO's to PEO's

Programme Educational Objectives	Programme Outcomes											
	a	**B**	**c**	**d**	**E**	**f**	**g**	**h**	**i**	**j**	**k**	**l**
PEO 1	3	3	3	3	3	3	3	2	1	2	2	3
PEO 2	3	3	3	3	3	2	2	2	2	1	2	2
PEO 3	2	2	2	2	2	2	2	3	3	3	2	1
PEO 4	2	2	3	2	2	2	3	3	3	3	3	3

1	Reasonably agreed	**2**	Moderately agreed	**3**	Strongly agreed

SRI KRISHNA COLLEGE OF ENGINEERING AND TECHNOLOGY

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DEPARTMENT OF INFORMATION TECHNOLOGY

PROGRAMME SPECIFIC OBJECTIVES

PSO 1:

Graduates will demonstrate multidisciplinary knowledge for problem solving by creating solutions for product based and application-based software for the advancement of the society.

PSO 2:

Graduates attain advance knowledge in Information and Communication Technologies (ICT) thereby creating real time solutions for different projects by using modern tools prevailing in the current trends.

PSO 3:

Graduates will exhibit state of the art technologies by applying their knowledge in various programming skills to overcome the demand of sustainable development.

R2020

SEMESTER I							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credit**	**Ext/Int**	**Category**
THEORY CUM PRACTICAL							
1.	20MA101	Engineering Mathematics I	2/1/2	5	4	40/60	BSC
2.	20CH101	Engineering Chemistry	3/0/3	6	4.5	40/60	BSC
3.	20EN101	Technical Communication Skills	2/0/2	4	3	40/60	HSMC
4.	20IT101	Python Programming	3/0/2	5	4	40/60	PCC
5.	20CS101	Application Development Practices	2/0/2	4	3	40/60	PCC
PRACTICAL							
6.	20ME111	Engineering Graphics	1/0/3	4	2.5	40/60	ESC
MANDATORY COURSE							
7.	20MC101	Mandatory Course – I (Induction Programme)	3 Weeks			0/100	MC
			Total	**28**	**21**	**700**	

SEMESTER II							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credit**	**Ext/Int**	**Category**
THEORY							
1.	20GE201	Universal Human Values	3/0/0	3	3	50/50	HSMC
2.	20CS201	C and Data Structures	3/0/0	3	3	50/50	PCC
THEORY CUM PRACTICAL							
3.	20MA201	Engineering Mathematics II	2/1/2	5	4	40/60	BSC
4.	20PH104	Physics	3/0/3	6	4.5	40/60	BSC
5.	20EE111	Basics of Electrical and Electronics Engineering	3/0/2	5	4	40/60	ESC
PRACTICAL							
6.	20ME103	Engineering Practices Laboratory	0/0/3	3	1.5	40/60	ESC
7.	20CS202	Data Structures Laboratory	0/0/3	3	1.5	40/60	PCC
MANDATORY COURSE							
8.	20MC102	Mandatory Course II (Environmental Sciences)	2/0/0	2	0	0/100	MC
			Total	**30**	**21.5**	**800**	

SEMESTER III							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credit**	**Ext/Int**	**Category**
THEORY							
1.	20IT301	Computer Architecture	3/0/0	3	3	50/50	PCC
THEORY CUM PRACTICAL							
2.	20MA302	Mathematical Structures	2/1/2	5	4	40/60	BSC
3.	20EC311	Digital Logic and Design	3/0/2	5	4	40/60	ESC
4.	20IT302	Software Engineering and Management	3/0/2	5	4	40/60	HSMC
5.	20CS301	C++ and Advanced Data Structures	3/0/2	5	4	40/60	PCC
6.	20CS302	Operating Systems	3/0/2	5	4	40/60	PCC
MANDATORY COURSE							
7.	20MCXXX	Mandatory Course-III	2/0/0	2	0	0/100	MC
			Total	**30**	**23**	**700**	

SEMESTER IV							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credit**	**Ext/Int**	**Category**
THEORY							
1.	20CS401	Database Management Systems	3/0/0	3	3	50/50	PCC
2.	20IT401	Computational Biology	3/0/0	3	3	50/50	ESC
3.	20IT402	Design and Analysis of Algorithms	3/0/0	3	3	50/50	PCC
THEORY CUM PRACTICAL							
4.	20MA404	Random Variables and Statistics	2/1/2	5	4	40/60	BSC
5.	20EC411	Fundamentals of Data and Mobile Communications	3/0/2	5	4	40/60	ESC
6.	20IT403	Web and Java Programming	3/0/2	5	4	40/60	PCC
PRACTICAL							
7.	20CS405	Database Management Systems Laboratory	0/0/3	3	1.5	40/60	PCC
MANDATORY COURSE							
8.	20MCXXX	Mandatory Course-IV	2/0/0	2	0	0/100	MC
			Total	**29**	**22.5**	**800**	

SEMESTER V							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credit**	**Ext/Int**	**Category**
THEORY							
1.	20IT501	Formal Languages and Automata Theory	3/0/0	3	3	50/50	PCC
2.	20IT502	Data Communications and Computer Networks	3/0/0	3	3	50/50	ESC
3.	20IT9XX	Professional Elective-I	3/0/0	3	3	50/50	PEC
4.	20IT9XX	Professional Elective-II	3/0/0	3	3	50/50	PEC
5.	20XX0XX	Open Elective – I	3/0/0	3	3	50/50	OEC
THEORY CUM PRACTICAL							
6.	20MA501	Fourier Series and Computational Methods	2/1/2	5	4	40/60	BSC
PRACTICAL							
7.	20IT503	Computer Networks Laboratory	0/0/3	3	1.5	40/60	ESC
PROJECT WORK							
8.	20IT504	Mini Project – I	0/0/2	2	1	40/60	PW
MANDATORY COURSE							
9.	20MCXXX	Mandatory Course - V	2/0/0	2	0	0/100	MC
			Total	**27**	**21.5**	**900**	

SEMESTER VI							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credit**	**Ext/Int**	**Category**
THEORY							
1.	20IT601	Machine Learning Techniques	3/0/0	3	3	50/50	PCC
2.	20CS601	Principles of Compiler Design	3/0/0	3	3	50/50	PCC
3.	20IT9XX	Professional Elective-III	3/0/0	3	3	50/50	PEC
4.	20IT9XX	Professional Elective-IV	3/0/0	3	3	50/50	PEC
5.	20XX0XX	Emerging Elective-I	3/0/0	3	3	50/50	EEC
THEORY CUM PRACTICAL							
6.	20IT602	Cloud Computing and its Applications	3/0/2	5	4	40/60	PCC
PRACTICAL							
7.	20IT603	Machine Learning Lab	0/0/3	3	1.5	40/60	PCC
PROJECT WORK							
8.	20IT604	Mini Project – II	0/0/2	2	1	40/60	PW
			Total	**25**	**21.5**	**800**	

SEMESTER VII							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credit**	**Ext/Int**	**Category**
THEORY							
1.	20IT9XX	Professional Elective-V	3/0/0	3	3	50/50	PEC
2.	20IT9XX	Professional Elective-VI	3/0/0	3	3	50/50	PEC
3.	20XX0XX	Open Elective-II	3/0/0	3	3	50/50	OEC
4.	20XX0XX	Emerging Elective-II	3/0/0	3	3	50/50	EEC
THEORY CUM PRACTICAL							
5.	20IT701	Big Data Analytics	3/0/2	5	4	40/60	PCC
6.	20IT702	Embedded Systems and Internet of Things	3/0/2	5	4	40/60	PCC
EMPLOYABILITY ENHANCEMENT SKILLS							
7.	20EES01	Employability Enhancement Skills			2	0/100	EES
			Total	**22**	**22**	**700**	

SEMESTER VIII							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credit**	**Ext/Int**	**Category**
PROJECT WORK							
1	20IT801	Project	0/0/24	24	12	40/60	PW
			Total	**24**	**12**	**100**	

HUMANITIES AND MANAGEMENT COURSES (10 credits)

S. No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	Credits	Category
1.	20EN101	Technical Communication Skills	2/0/2	4	3	HSMC
2.	20GE201	Universal Human Values	3/0/0	3	3	HSMC
3.	20IT302	Software Engineering and Management	3/0/2	5	4	HSMC

BASIC SCIENCE COURSES (29 Credits)

S. No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	Credits	Category
1.	20MA101	Engineering Mathematics I	2/1/2	5	4	BSC
2.	20CH101	Engineering Chemistry	3/0/3	6	4.5	BSC
3.	20MA201	Engineering Mathematics II	2/1/2	5	4	BSC
4.	20PH104	Physics	3/0/3	6	4.5	BSC
5.	20MA302	Mathematical Structures	2/1/2	5	4	BSC
6.	20MA404	Random Variables and Statistics	2/1/2	5	4	BSC
7.	20MA501	Fourier Series and Computational Methods	2/1/2	5	4	BSC

ENGINEERING SCIENCE COURSES (23.5 Credits)

S. No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	Credits	Category
1.	20ME111	Engineering Graphics	1/0/3	4	2.5	ESC
2.	20ME103	Engineering Practices Laboratory	0/0/3	3	1.5	ESC
3.	20EE111	Basics of Electrical and Electronics Engineering	3/0/2	5	4	ESC
4.	20EC311	Digital Logic and Design	3/0/2	5	4	ESC
5.	20EC411	Fundamentals of Data and Mobile Communications	3/0/2	5	4	ESC
6.	20IT401	Computational Biology	3/0/0	3	3	ESC

7.	20IT502	Data Communications and Computer Networks	3/0/0	3	3	ESC
8.	20IT503	Computer Networks Laboratory	0/0/3	3	1.5	ESC

PROFESSIONAL CORE COURSES (56.5 Credits)

S. No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	Credits	Category
1.	20CS101	Application Development Practices	2/0/2	4	3	PCC
2.	20IT101	Python Programming	3/0/2	5	4	PCC
3.	20CS201	C and Data Structures	3/0/0	3	3	PCC
4.	20CS202	Data Structures Laboratory	0/0/3	3	1.5	PCC
5.	20CS301	C++ and Advanced Data Structures	3/0/2	5	4	PCC
6.	20IT301	Computer Architecture	3/0/0	3	3	PCC
7.	20CS302	Operating Systems	3/0/2	5	4	PCC
8.	20CS401	Database Management Systems	3/0/0	3	3	PCC
9.	20IT402	Design and Analysis of Algorithms	3/0/0	3	3	PCC
10.	20IT403	Web and Java Programming	3/0/2	5	4	PCC
11.	20CS405	Database Management Systems Laboratory	0/0/3	3	1.5	PCC
12.	20IT501	Formal Languages and Automata Theory	3/0/0	3	3	PCC
13.	20CS601	Principles of Compiler Design	3/0/0	3	3	PCC
14.	20IT601	Machine Learning Techniques	3/0/0	3	3	PCC
15.	20IT602	Cloud Computing and its Applications	3/0/2	5	4	PCC
16.	20IT603	Machine Learning Lab	0/0/3	3	1.5	PCC
17.	20IT701	Big Data Analytics	3/0/2	5	4	PCC
18.	20IT702	Embedded Systems and Internet of Things	3/0/2	5	4	PCC

PROFESSIONAL ELECTIVE COURSES

S. No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	Credits	Category
Networking and Communications						
1.	20IT901	Game Theory and its Applications	3/0/0	3	3	PEC
2.	20CS902	Fault Tolerant Computing	3/0/0	3	3	PEC
3.	20CS602	Cryptography and Network Security	3/0/0	3	3	PEC
4.	20IT902	Distributed Systems	3/0/0	3	3	PEC
5.	20IT903	Socket Programming	3/0/0	3	3	PEC
6.	20CS907	Cyber Forensics	3/0/0	3	3	PEC
7.	20IT904	Mobile AdHoc Networks	3/0/0	3	3	PEC
8.	20EC921	Wireless Sensor Networks	3/0/0	3	3	PEC
9.	20IT905	Mobile Communication	3/0/0	3	3	PEC
Data Science and Intelligent Systems						
1.	20IT911	Deep Learning	3/0/0	3	3	PEC
2.	20CS921	Speech and Natural Language Processing	3/0/0	3	3	PEC
3.	20IT912	Data Visualization	3/0/0	3	3	PEC
4.	20CS922	Signal and Image Processing	3/0/0	3	3	PEC
5.	20IT913	Artificial Intelligence and its Applications	3/0/0	3	3	PEC
6.	20IT914	Block Chain Technology	3/0/0	3	3	PEC
7.	20IT915	Evolutionary Computing	3/0/0	3	3	PEC
8.	20IT916	Cognitive Science and Analytics	3/0/0	3	3	PEC
9.	20IT917	Data Warehousing and Data Mining	3/0/0	3	3	PEC
Software Development						
1.	20IT921	Data Analysis using R	3/0/0	3	3	PEC

2.	20IT922	Web Applications using Java	3/0/0	3	3	PEC
3.	20IT923	Open Source Systems	3/0/0	3	3	PEC
4.	20IT924	Industrial Ethics	3/0/0	3	3	PEC
5.	20IT925	Computer Graphics and Multimedia	3/0/0	3	3	PEC
6.	20IT926	Software Testing	3/0/0	3	3	PEC
7.	20CS911	Mobile Application Development	3/0/0	3	3	PEC
8.	20CS925	Design Patterns and Design Thinking	3/0/0	3	3	PEC
9.	20CS914	Human Computer Interaction	3/0/0	3	3	PEC

OPEN ELECTIVE COURSES

S. No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	Credits	Category
1.	20IT001	Mobile Applications Development using Android	3/0/0	3	3	OEC
2.	20IT002	PHP and MySQL	3/0/0	3	3	OEC
3.	20IT003	Block Chain Essentials	3/0/0	3	3	OEC
4.	20IT004	Cloud and Virtualization	3/0/0	3	3	OEC
5.	20IT005	Web Technologies	3/0/0	3	3	OEC
6.	20IT006	Cyber Security	3/0/0	3	3	OEC

EMERGING ELECTIVE COURSES

S. No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	Credits	Category
1.	20IT007	Tensorflow and Keras for Deep Learning	3/0/0	3	3	EEC
2.	20IT008	Kotlin for Cross-platform Application Development	3/0/0	3	3	EEC
3.	20IT009	Virtual and Augmented Reality	3/0/0	3	3	EEC
4.	20IT010	Computational Methods in Synthetic Biology	3/0/0	3	3	EEC
5.	20IT011	Principles of Industry 4.0	3/0/0	3	3	EEC
6.	20IT012	Autonomous Robotics	3/0/0	3	3	EEC

EMPLOYABILITY ENHANCEMENT SKILLS (2 Credits)

S. No	Course Code	Course Title	Credits	Category
1.	20EES01	Employability Enhancement Skills	2	EES

MANDATORY COURSES

S.No	Course Code	Course Title	Category
1.	20MC101	Induction Programme	MC
2.	20MC102	Environmental Sciences	MC
3.	20MC103	Soft Skills	MC
4.	20MC105	General Aptitude	MC
5.	20MC106	Life Skills and Ethics	MC
6.	20MC107	Stress Management	MC
7.	20MC108	Constitution of India	MC
8.	20MC109	Essence of Indian Traditional Knowledge	MC

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

S. No	Stream	Credits/Semester									Credits	AICTE Norms
		I	II	III	IV	V	VI	VII	VIII			
1.	Humanities (HSMC)	3	3	4							10	**12**
2.	Basic Sciences (BSC)	8.5	8.5	4	4	4					29	**24**
3.	Engineering Sciences (ESC)	2.5	5.5	4	7	4.5					23.5	**29**
4.	Professional Core (PCC)	7	4.5	11	11.5	3	11.5	8			56.5	**49**
5.	Professional Electives (PEC)					6	6	6			18	**18**
6.	Open Electives (OEC)					3		3			6	**12**
7.	Emerging Elective (EEC)						3	3			6	
8.	Project Work (PW)					1	1		12		14	**15**
9.	Employability Enhancement Skills (EES)							2			2	
10.	Mandatory Course (MC)											**Non-Credit**
Total		21	21.5	23	22.5	21.5	21.5	22	12		**165**	
AICTE (CSE)		**17.5**	**20.5**	**23**	**22**	**21**	**22**	**18**	**15**			**159**

20MA101	ENGINEERING MATHEMATICS I *(COMMON TO MECH / MCT / CIVIL / ECE / EEE / CSE, IT / AI&DS)*	2/1/2/4

Nature of Course	J (Problem analytical)
Pre requisites	Concept of Differentiation and Matrices

Course Objectives:

1.	To develop the skill to use matrix algebra techniques that is needed by engineers for practical applications.
2.	To know about system of linear equations and its solution set and how to write down the coefficient matrix and augmented matrix of a linear system
3.	To familiarize with functions of several variables applicable in many branches of engineering.
4.	To find the solution of ordinary differential equations as most of the engineering problems are characterized in this form.

Course Outcomes:

Upon completion of the course, students shall have ability to

C101.1	Recall the concepts of matrices, ordinary and partial derivatives.	[R]
C101.2	Express square matrix in the diagonal form.	[U]
C101.3	Solve systems of linear equations numerically and to find inverse matrices.	[AP]
C101.4	Apply numerical techniques effectively to analyse and visualize data to solve basic engineering-related problems.	[AP]
C101.5	Find the extreme values of the given functions to solve the engineering problems.	[AP]
C101.6	Find the solution of second and higher order differential equations connected with electric circuits and simple harmonic motion.	[AP]

Course Contents:

MATRICES **14 Hours**

Definition – Types of matrices – Characteristic equation – Eigenvalues and eigenvectors of a real matrices and their properties (statement only) – Cayley-Hamilton theorem (statement only) – Verification and application to find inverse and powers of real matrices – Orthogonal transformation of a real symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by Orthogonal transformation.

SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS **16 Hours**

Newton-Raphson method – Fixed point iteration method – Gauss-Elimination method – Gauss-Jordan method – Iterative methods of Gauss-Jacobi and Gauss-Seidel – Matrix Inversion by Gauss-Jordan method – Eigenvalue of a matrix by Power method and Jacobi method.

CALCULUS **18 Hours**

Concepts of limits and continuity – Functions of several variables – Total derivatives – Differentiation of implicit functions – Jacobians – Taylor series expansion – Maxima and Minima – Method of Lagrangian multipliers – Ordinary differential equations – Higher order linear differential equations with constant coefficients –Euler Cauchy's equations – Applications of ODE: Solving electrical circuits and simple harmonic motion.

Lab Component

1. Entering row vector, column vector, accessing blocks of elements in MATLAB.
2. Entering matrices, to locate matrix elements and Correcting any entry through indexing in MATLAB.
3. Sum, product, transpose, inverse, determinant and rank of a matrices using MATLAB.
4. Eigenvalues and eigenvectors of a matrix using MATLAB.
5. System of linear equations in MATLAB using Gaussian elimination.
6. System of linear equations in MATLAB using matrix inverse method.
7. System of linear equations in MATLAB using linsolve.
8. First and second derivative of single variable functions using MATLAB.
9. Maxima and Minima of a function using MATLAB.
10. Higher Order Equations of constant coefficients using MATLAB.

Total Hours: (48+12)	**60**

Text Books:	
1.	G.B. Thomas and R.L. Finney, Calculus and Analytic Geometry, 14th Edition, Pearson, Reprint, 2018
2.	Kreyszig. E, "Advanced Engineering Mathematics" Tenth Edition, John Wiley and Sons (Asia) Limited, Singapore 2018.
3.	Grewal. B.S, "Higher Engineering Mathematics", 43rd Edition, Khanna Publications, Delhi, 2018.
Reference Books:	
1.	Veerarajan. T, "Engineering Mathematics I", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2018.
2.	Glyn James, —Advanced Modern Engineering Mathematics, Pearson Education, 4th Edition, 2012.
3.	N.P.Bali and Dr.Manish Goyal, "A Text book of Engineering Mathematics" 9th Edition, Laxmi publications ltd, 2014.
Web References:	
1.	http://www.nptel.ac.in/courses/111105035
2.	http://www.nptel.ac.in/courses/122104017
3.	http://nptel.ac.in/courses/122102009
4.	http://nptel.ac.in/courses/111107063
Online Resources:	
1.	https://www.coursera.org/learn/linearalgebra2
2.	https://www.coursera.org/learn/differentiation-calculus
3.	https://www.coursera.org/learn/single-variable-calculus
4.	https://alison.com/courses/Algebra-Functions-Expressions-and-Equations

Assessment Methods & Levels (based on Blooms' Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	**Continuous Assessment**				**End Semester Examination (Theory) [40 marks]**
	Theory			**Practical& Project**	
	CIA-I [10 marks]	**CIA-II [10 marks]**	**CIA-III [10 marks]**	**Rubric based CIA [30 Marks]**	
Remember	20	20	20	20	20
Understand	30	30	30	30	30

Apply	50	50	50	50	50
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

Course Outcomes (CO)	**Programme Outcomes (PO)**												**Programme Specific Outcomes (PSO)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C101.1	3	2	3						2				3	2	1
C101.2	2	2	2						1				3	2	1
C101.3	1	2	2										3	2	1
C101.4	2	2	2						2				3	1	2
C101.5	2	3	2						2				3	2	1
C101.6	2	3	2						2				3	2	1

20CH101	ENGINEERING CHEMISTRY *(COMMON TO ALL I YEAR B.E. / B.Tech.)*	3/0/3/4.5

Nature of Course	: E (Theory skill based)
Pre requisites	: NIL

Course Objectives:

1	To make the students conversant with water treatment, boiler feed water techniques.
2	To learn the effect of corrosion in materials and the methods for prevention of corrosion.
3	To understand the principles and applications of electrochemistry and to learn electroanalytical methods.
4	To understand the basic concepts, synthesis, and applications of nanomaterials.
5	To explore the synthesis and properties of important engineering plastics, energy sources and drug molecules.
6	To understand the concepts of photophysical and photochemical processes in spectroscopy.

Course Outcomes:
Upon completion of the course, students shall have ability to

C101.1	Recall the requirements of water treatment procedures and boiler feed water for industries.	[R]
C101.2	Apply the various corrosion control techniques in real time industrial environments.	[AP]
C101.3	Understand the principle and working of reference electrodes and conductivity meters as an analyzer.	[U]
C101.4	Understand the basic concepts and applications of Nanochemistry.	[U]
C101.5	Use the knowledge of polymers, various energy sources and storage devices in engineering field.	[AP]
C101.6	Understand the principle and working of certain analytical techniques, and synthesis of some common drug molecules.	[U]

Course Contents:

Water Chemistry and Corrosion: **15 Hours**

Water treatment-characteristics of water-hardness-types and estimation by EDTA method with numerical problems. Boiler feed water–requirements-disadvantages of hard water. Domestic water treatment-disinfection methods (chlorination, Ozonation, UV treatment)-demineralization process–desalination-reverse osmosis. Corrosion-types–mechanism of dry and wet corrosion-galvanic corrosion-differential aeration corrosion-protective coatings-electroplating of gold-electroless plating of nickel.

Electrochemistry and Energy Sources: **15 Hours**

Electrochemical cells-electrolytic cell-reversible and irreversible cells - Free energy and emf, cell potentials, Nernst equation and applications. Oxidation and reduction potentials-standard hydrogen electrode, saturated calomel electrode, glass electrode-pH measurement. Nanochemistry-Basics-Comparison of molecules, nanomaterials and bulk materials; Types –nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: Electrochemical deposition and electro spinning. Applications of nanomaterials in science and technology. Energy Sources-Fuel

cells (H_2-O_2). Storage Devices-Batteries- Alkaline-Lead acid, Nickel cadmium and Lithium-ion batteries.

Polymer Chemistry, Spectroscopic Techniques and Synthesis of Drug Molecules:

15 Hours

Introduction-monomers and polymers-classification of polymers-Polymerization-types. Mechanism of addition polymerization (free radical mechanism). Plastics-classification-preparation, properties and uses of Nylon 6,6, Nylon 6, PVC, Bakelite and PET. Moulding methods- moulding of plastics for Car parts, bottle caps (Injection moulding), Pipes, Hoses (Extrusion moulding), Mobile Phone Cases, Battery Trays (Compression moulding) and PET bottles (Blow moulding). Spectroscopy-Beer Lambert's law, principle, instrumentation, and applications of Electronic spectroscopy (UV-visible), Vibrational and rotational spectroscopy (IR) and Flame emission spectroscopy (FES). Synthesis of a commonly used drug molecule-Asprin, p-nitroaniline from acetanilide.

Field work:

Industrial visit- Water treatment plant / Sewage treatment plant / Reverse osmosis plant

Lab Components:

1.	Estimation of hardness of water by EDTA method	[E]
2.	Estimation of alkalinity of water sample	[E]
3.	Determination of chloride content in given water sample	[E]
4.	Estimation of dissolved oxygen in water	[E]
5.	Potentiometry- determination of redox potentials and emf's	[E]
6.	Conductometric titration-mixture of acids vs NaOH	[E]
7.	Determination of strength of strong acid by pH metry	[E]
8.	Corrosion rate of mild steel in acid medium	[E]
9.	Electroplating of nickel over copper	[E]
10.	Spectrophotometry-Estimation of iron in water	[E]
11.	Separation of mixture of amino acids by thin layer chromatography	[E]
12.	Synthesis of Nylon 66	[E]
	Total Hours: (45+30)	**75**

Understanding the concepts by simple Demonstrations/Experiments:

1.	To observe the hardness of given water sample by soap solution test
2.	To view the colour of the different medium of given water sample using litmus paper test
3.	To detect the chlorine content in tap water using simple chemical method
4.	To know the presence of dissolved oxygen in given water sample using glucose by redox principle
5.	To illustrate the rate of corrosion in steel nails using acid medium

Text Books:

1.	Dara S.S, Umare S.S, "Engineering Chemistry", First revised Edition, S. Chand & Company Ltd., New Delhi 2015.
2.	Jain P. C. & Monica Jain., "Engineering Chemistry", 16th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2015.
3.	Fundamentals of Molecular Spectroscopy, 4th Edition, C. N. Banwell Publishing McGraw-Hill Book Company (P) Ltd, England, 1994.

4.	Physical Chemistry, 11th Edition by P. W. Atkins Publishing Oxford University Press (P) Ltd, United Kingdom, 2018.
5.	Nanochemistry, 2nd Edition by K. Klabunde, G. Sergeev Springer Publisher, 2013.
6.	N.Krishna Murthy, Vallinayagam D., "Engineering Chemistry" 3rd Edition, PHI Learning Pvt Ltd.,2014.
7.	Sunita Rattan, "A Text Book of Engineering Chemistry", Student Edition, SK Kataria Publishers, 2013.
8.	R.V.Gadag, A.Nithyananda Shetty "Engineering Chemistry" 3rd Edition PHI Learning Pvt Ltd., 2014.
Reference Books:	
1.	Shikha Agarwal., "Engineering Chemistry and Applications", Cambridge University press, 2016.
2.	Liliya.,Bazylak.I., Gennady.E., Zaikov., Haghvi.A.K., "Polymers and Polymeric Composites" CRC Press,2014.
3.	Lefrou., Christine., Fabry., Pierre., Poignet., Jean-claude., "Electrochemistry - The Basics, with examples" 2012, Springer.
4.	Zaki Ahmad, Digby Macdonald, "Principles of Corrosion Engineering and Corrosion Control", Elsevier Science, 2nd Edition 2012.
5.	Perez, Nestor, "Electrochemistry and Corrosion Science", Springer, 2016.
6.	Sengupta, Amretashis, Sarkar, Chandan Kumar, "Introduction to Nano: basics to Nanoscience and Nanotechnology", Springer Publisher, 2015.
7.	Ghazi A.Karim. "Fuels, Energy and the Environment", CRC Press, Taylor and Francis group, 2012.
Web References:	
1.	http://www.analyticalinstruments.in/home/index.html
2.	www.springer.com › Home › Chemistry › Electrochemistry
3.	https://www.kth.se/.../electrochem/welcome-to-the-division-of-applied-electrochemistry
4.	www.edx.org/
5.	https://www.ntnu.edu/studies/courses
6.	www.corrosionsource.com/
Online Resources:	
1 2 3 4 5 6	nptel.ac.in/courses/105104102/hardness.htm https://ocw.mit.edu/courses/chemistry nptel.ac.in/courses/105106112/1_introduction/5_corrosion.pdf https://alison.com - Spectroscopic technique, Colorimetry https://ocw.mit.edu/courses/chemistry nptel.ac.in/courses/113108051

Assessment Methods & Levels (based on Blooms' Taxonomy)					
Summative assessment based on Continuous and End Semester Examination					
Bloom's Level	**Continuous Assessment**				**End Semester Examination (Theory) [40 marks]**
	Theory			**Practical**	
	CIA-I [10 marks]	**CIA-II [10 marks]**	**Term End Examination [10 marks]**	**Rubric based CIA [30 Marks]**	
Remember	30	30	30	10	20
Understand	60	50	40	20	50
Apply	10	20	30	40	30
Analyse	-	-	-	30	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

Course Outcomes (CO)	**Programme Outcomes (PO)**												**Programme Specific Outcomes (PSO)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C101.1	2	1	1				1						1	1	3
C101.2	2	2	2				2						2	1	3
C101.3	3	2	3				2						1	1	2
C101.4	2	2	3				3		1				2	1	2
C101.5	2	2	2				2						2	1	2
C101.6	2	2	2				2						3	1	1

20EN101	TECHNICAL COMMUNICATION SKILLS *(COMMON TO MECH / MCT / IT / CIVIL / CSE)*	2/0/2/3

Nature of Course	E (Theory Skill Based)
Pre requisites	Basics of English Language

Course Objectives:

1	To enhance learners' LSRW skills.
2	To develop effective communication skills.
3	To facilitate learners to acquire effective technical writing skills.
4	To prepare learners for placement and competitive exams.
5	To facilitate effective language skills for academic purposes and real-life situations.

Course Outcomes:

Upon completion of the course, students shall have ability to

C101.1	Remember language skills for technical communication.	[R]
C101.2	Apply communication skills in corporate environment.	[AP]
C101.3	Understand and communicate effectively in personal and professional situation.	[AP]
C101.4	Understand and analyse a variety of reading strategies to foster comprehension and to construct meaningful and relevant connections to the text.	[U]
C101.5	Apply technical writing skills to write letters, emails and prepare technical documents.	[AP]
C101.6	Apply language skills with ease in academic and real-life situations.	[AP]

Course Contents:

Listening and Speaking **17 Hours**

Introduction to Effective Communication- Basics of English Language - Importance of LSRW Skills - Self Introduction - Introducing Others - **Listening** to Short Conversations or Monologues - Listening to Speeches / Talks - Listening and Responding -- Longer Listening Tasks -Recognise Functions **Speaking**- Speaking about Giving Directions / Instruction - Talk about Preferences-Agree and Disagree - Giving Opinions - Speaking Practices by Giving Examples, Reasons and Additional Information- Short Talk on Business Topics- Non Verbal Communication- Presentation using Digital Tools- Effectiveness of Narration- Leadership, Conflict and Persuasion.

Reading **13 Hours**

Reading Short Texts - Skimming and Scanning - Comparing Facts and Figures - Reading and Understanding Specific Information in a Text - Cloze Reading - Identifying Reasons and Consequences Through Reading Practices - Comprehension - Collocations.

Grammar and Writing **15 Hours**

Parts of Speech- Tenses – Subject Verb Agreement - Sentence Structures - Connectives - Modal Verbs - Question Formation - If Conditionals- Active and Passive - Impersonal Passive Voice - Vocabulary Building - Business Vocabulary -- Synonyms, Antonyms – British and American Words - One Word Substitution- Identifying Common Errors.

Writing Formal Letters (Accepting and Declining Invitations) - Writing Business Letters (Calling for Quotation, Seeking Clarification, Placing an Order and Complaint Letter) - Email Writing – Memo - Circular - Agenda and Minutes of the Meeting - Job Application Letter - Resume Writing - Paragraph Writing – Proof Reading and Editing--Technical Instructions and Recommendations- Jumbled Sentences - Technical Definitions - Report Phrases - Report Writing - Technical Proposal - Transcoding (Bar Chart, Flow Chart).

Lab Components		
1	Listening Comprehension	[E]
2	Pronunciation, Intonation, Stress and Rhythm	[E]
3	Situational Dialogues	[E]
4	Formal Presentation	[E]
5	Group Discussion	[E]
6	Interview Skills- Online and Offline	[E]
	Total Hours:	**60**

Text Books:	
1	Practical English Usage. Michael Swan. OUP. 1995.
2	Remedial English Grammar. F.T. Wood. Macmillan.2007
3	On Writing Well. William Zinsser. Harper Resource Book. 2001
4	Dr. Sumanth S, English for Engineers, Vijay Nicole Imprints Private Limited 2015.
Reference Books:	
1	Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
2	Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
3	Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
Web References:	
1	http://www.academiccourses.com/Courses/English/Business-English
2	https://**steptest**.in
Online Resources:	
1 2 3	https://www.coursera.org/specializations/business-english http://www.academiccourses.com/Courses/English/Business-Englishhttps://scoop.eduncle.com/one-word-substitution-list

Assessment Methods & Levels (based on Blooms' Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	**Continuous Assessment**				**End Semester Examination (Theory) [40 marks]**
	Theory			**Practical**	
	CIA-I [10 marks]	**CIA-II [10 marks]**	**Term End Examination [10 marks]**	**Rubric based CIA [30 Marks]**	
Remember	20	20	20	20	20
Understand	40	40	40	40	40

Apply	40	40	40	40	40
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

Course Outcomes (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C101.1									2	3		2	1	2	1
C101.2									3	3		1	1	2	2
C101.3								2	2	2		1	1	2	1
C101.4								1	1	2			2	1	1
C101.5								1	3	3		2	2	2	1
C101.6								1	3	3		2	1	2	1

20IT101	PYTHON PROGRAMMING *(COMMON TO CSE / IT / ECE / EEE / MCT)*	3/0/2/4
Nature of Course	F (Theory Programming)	
Pre requisites	Nil	
Course Objectives:		
1.	To understand and execute Python script using types and expressions.	
2.	To understand the difference between expressions & statements and to understand the concept of assignment semantics.	
3.	To utilize high level data types such as lists and dictionaries.	
4.	To import and utilize a module and to perform read & write operations on files.	
Course Outcomes		
Upon completion of the course, students shall have ability to		
C101.1	Recognize the general principles and good Algorithmic Problem Solving	[R]
C101.2	Read, write, execute by hand simple Python programs.	[U]
C101.3	Structure simple Python programs for solving problems.	[U]
C101.4	Decompose a Python program into functions.	[AP]
C101.5	Represent compound data using Python lists, tuples and dictionaries.	[AP]
C101.6	Read and write data from / to files in Python Programs.	[AN]

Course Contents:

ALGORITHMIC PROBLEM SOLVING, DATA, EXPRESSIONS, STATEMENTS: 15 Hours

Algorithms, Building Blocks of Algorithms (Statements, State, Control Flow, Functions), Notation (Pseudo Code, Flow Chart, Programming Language), Algorithmic Problem Solving, Simple strategies for developing algorithms (Iteration, Recursion). Illustrative Problems: Find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range. Python Interpreter and Interactive Mode; Values and Types: Int, Float, Boolean, String and List; Variables, Expressions, Statements, Tuple Assignment, Precedence of Operators, Comments; Modules and Functions, Function Definition and Use, Flow of Execution, Parameters and Arguments; Illustrative Programs: Exchange the values of two Variables, Circulate the values of n variables, distance between two points.

CONTROL FLOW, FUNCTIONS: 15 Hours

Conditionals: Boolean Values and Operators, Conditional (If), Alternative (If-Else), Chained Conditional (If-Elif-Else); Iteration: State, While, For, Break, Continue, Pass; Fruitful Functions: Return Values, Parameters, Local and Global Scope, Function Composition, Recursion; Strings: String Slices, Immutability, String Functions and Methods, String Module; Lists as Arrays. Sets -Set Operations, Classes. Illustrative Programs: Sum an array of numbers.

LISTS, FILES, MODULES, PACKAGES: 15 Hours

Lists: List Operations, List Slices, List Methods, List Loop, Mutability, Aliasing, Cloning Lists, List Parameters; Tuples: Tuple Assignment, Tuple as Return Value; Dictionaries:

Operations and Methods; Advanced List Processing - List Comprehension; Files and Exception: Text Files, Reading and Writing Files, Format Operator; Command Line Arguments, Errors and Exceptions, Handling Exceptions, Modules, Packages; Numpy and Numpy Operations, Pandas and pandas operations, Matplotlib: types of plots. Case study: Analyze the academic performance of students and plot a graph.

Total Hours:	**45**

Laboratory Component:

S. No	List of Experiments
1.	Compute the GCD of two numbers.
2.	Find the square root of a number (Newton's method).
3.	Exponentiation (power of a number).
4.	Find the maximum of a list of numbers.
5.	Linear search and Binary search.
6.	Selection sort, Insertion sort.
7.	Merge sort.
8.	First n prime numbers.
9.	Multiply matrices.
10.	Programs that take command line arguments (word count).
11.	Plotting datasets.
12.	File handling and plotting.
Total Hours:	**30**

Text Books:

1.	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist'', 2nd Edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/).
2.	Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python" – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
3.	Tony Gaddis, "Starting out with Python'', 2nd edition, Addison Wesley, Pearson, 2012

Reference Books:

1.	Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
2.	Timothy A. Budd, "Exploring Python‖", Mc-Graw Hill Education (India) Private Ltd., 2015.
3.	John V Guttag, "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press, 2013.

Web References:	
1.	http://nptel.ac.in/courses/106106145/
2.	https://www.codecademy.com/learn/learn-python
3.	https://www.coursera.org/learn/python-data-analysis#syllabus
Online Resources:	
1.	https://www.programiz.com/python-programming
2.	https://www.fullstackpython.com/best-python-resources

Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Level	Continuous Assessment				End Semester Examination (Theory) [40 marks]
	Theory			Practical	
	CIA-1 [10 marks]	CIA-2 [10 marks]	CIA-3 [10 marks]	Rubric based CIA [30 Marks]	
Remember	30	30	20	-	20
Understand	40	30	30	30	30
Apply	30	40	50	70	50
Analyse					
Evaluate					
Create					

Course Outcomes (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C101.1	3	3	3	3	3	3	1	1			1	1	3	3	3
C101.2	3	3	3	3	3	3	1	1			1	1	3	3	3
C101.3	3	3	3	3	3	3	1	1			1	1	3	3	3
C101.4	3	3	3	3	3	3	1	1			1	1	3	3	3
C101.5	3	3	3	3	3	3	1	1			1	1	3	3	3
C101.6	3	3	3	3	3	3	1	1			1	1	3	3	3

20CS101	APPLICATION DEVELOPMENT PRACTICES *(COMMON TO CSE / IT)*	2/0/2/3
Nature of Course	F (Theory Programming)	
Pre requisites	Nil	
Course Objectives:		
1.	To impart the knowledge of web application development platforms.	
2.	To develop the front end user interface using HTML, CSS.	
3.	To recognize the user experience design methodologies like Java script, JSON and JQuery for responsive web design.	
Course Outcomes		
Upon completion of the course, students shall have ability to		
C101.1	Identify working model and learn basic web concepts to develop Static and Dynamic web pages.	[R]
C101.2	Create web pages that demonstrate proficiency in the use of HTML.	[AP]
C101.3	Present a professional document using Cascaded Style Sheets	[U]
C101.4	Use knowledge of HTML and CSS code to create personal and/or business websites following current professional and/or industry standards.	[AP]
C101.5	Apply static and dynamic web page design techniques to construct an interactive web page using Client side technologies.	[AP]
C101.6	Implement dynamic web page with validation and event handling mechanisms.	[AP]

Course Contents:

INTRODUCTION TO HTML **15 Hours**

Basic Web Concepts – Web based Client/Server model – Web Protocols – Working of web browser – Browser & Server Communication – Basics of HTML – Elements and Attributes of HTML – HTML Layouts – HTML forms – HTML Lists and Tables – HTML Media – Getting started with HTML5 – HTML Graphics

INTRODUCTION TO CSS **15 Hours**

Basics of CSS – HTML Style attributes – CSS Syntax – CSS Selectors – Three ways to insert CSS – Element based CSS – CSS Layouts – CSS Image Gallery – Gradients and Shadows – 2D and 3D transforms with CSS – CSS Pagination and Columns – Basics of Responsive UI Design – Basics of CSS frameworks

CLIENT SIDE PROGRAMMING **15 Hours**

Java Script: An introduction to JavaScript – Data Types – Conditionals and Loops – Functions – Classes and Objects – Inbuilt Methods – Arrays – Regular Expressions – Arrow Functions – Debugging in browsers – JS HTML DOM – JS Browser BOM – Introduction to AJAX and JSON – JS vs JQuery – Why JS Frameworks

Laboratory Component:		
S. No	**List of Experiments**	
1.	Design a web page using HTML basic tags	
2.	Develop web site with suitable contents and links	
3.	Design web pages using lists and tables	
4.	Build a web client-side Login, Registration form and Dashboard with dropdown menus.	
5.	Develop a HTML form and validation using HTML5 features.	
6.	Create a website using HTML □ To embed an image map in a web page. □ To fix the hot spots. □ Show all the related information when the hot spots are clicked.	
7.	Apply style specification in HTML page using CSS.	
8.	Simple programs using Java Script	
9.	Develop dynamic web application using HTML, CSS and JavaScript.	
10.	Develop responsive web application using JSON and JQuery	
	Total Hours:	**60**

Text Books:	
1.	Thomas a Powell, “HTML & CSS: The Complete Reference”, 5th Edition, Tata McGraw Hill Education Private Limited, 2010.
2.	Russ Ferguson, “Beginning JavaScript: The Ultimate Guide to Modern JavaScript Development”, Apress Publishers, 3rd Edition, 2019.
3.	Jon Duckett, “HTML and CSS: Design and build websites”, John Wiley & Sons, 2011.
4.	David Flanagan, “JavaScript: The Definitive Guide”, 5th Edition, O’Reilly, 2011
Reference Books:	
1.	Deitel Deitel Goldberg, “Internet and World Wide Web – How to program”, 5th Edition, Prentice Hall Publishers, 2012.
2.	Robert W Sebesta, “Programming the World Wide Web”, 7th Edition, Pearson Education Inc., 2014.
Web References:	
1.	https://developer.mozilla.org/en-US/docs/Web/HTML
2.	https://developer.mozilla.org/en-US/docs/Web/CSS
3.	https://developer.mozilla.org/en-US/docs/Web/JavaScript
Online Resources:	
1.	https://www.coursera.org/learn/html-css-javascript-for-web-developers

2.	https://online-learning.harvard.edu/subject/javascript

Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy					
Summative assessment based on Continuous and End Semester Examination					
Revised Bloom's Level	**Continuous Assessment**				**End Semester Examination (Theory) [40 marks]**
	Theory			**Practical**	
	CIA-1 [10 marks]	**CIA-2 [10 marks]**	**CIA-3 [10 marks]**	**Rubric based CIA [30 Marks]**	
Remember	40	20	10	10	20
Understand	30	30	30	30	30
Apply	30	50	60	60	50
Analyse					
Evaluate					
Create					

Course Outcomes (CO)	**Programme Outcomes (PO)**												**Programme Specific Outcomes (PSO)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C101.1	3	3	2	2	2				2			2	3	3	1
C101.2	3	3	2	2	2				2			2	2	3	1
C101.3	3	3	2	2	2				2			2	3	3	1
C101.4	3	3	2	2	2				2			2	2	3	1
C101.5	3	3	2	2	2				2			3	3	3	1
C101.6	3	3	2	2	2				2			3	3	3	1

20ME111	ENGINEERING GRAPHICS	1/0/3/2.5
Nature of Course	Practical application	
Pre-Requisites	Basic Drawing and Computer Knowledge	

Course Objectives:

1.	To know the method to construct the conic curves used in engineering applications.
2.	To develop an understanding of Isometric to orthographic views and vice versa.
3.	To learn the basic projection of straight lines and plane surfaces.
4.	To develop the imagination of solids inclined to one reference plane.
5.	To know the development of surfaces used in various fields.

Course Outcomes:
Upon completion of the course, students shall have ability to

C111.1	Understand the basic concepts of Engineering Graphics.	[U]
C111.2	Sketch isometric, orthographic projections and projection of lines and planes.	[AP]
C111.3	Develop lateral surfaces of solids including prisms and pyramids.	[AP]
C111.4	Construct projections of lines, planes, solids and isometric views using modelling software.	[A]

Course Contents:

Conic curves and special curves – Isometric projections, Isometric to orthographic projection-Orthographic to Isometric projection - Projection of lines and plane surfaces-Projection of solids-Development of surfaces-Introduction to perspective projection.

S.No	List of Experiments	CO Mapping	RBT
1	Introduction to drafting software.	C111.1	U
2	Construction of conic curves (Ellipse, Parabola and Hyperbola)	C111.1	U
3	Construction of special curves (Cycloid and Involutes)	C111.1	U
4	Isometric to orthographic projections – manual sketches	C111.2	Ap
5	Isometric to orthographic projections – software sketches	C111.4	A
6	Projection of lines - inclined to HP, VP and Both HP & VP	C111.4	A
7	Projection of plane surfaces (Hexagon, Pentagon and circle) – inclined to any one of the principle planes	C111.4	A
8	Projection of solids (Prism and Pyramid) – inclined to HP	C111.3	Ap
9	Projection of solids (Cone and Cylinder) – inclined to VP	C111.3	Ap
10	Development of surfaces (Prism, Pyramid, Cone and Cylinder)	C111.4	A
11	Introduction to perspective projection	C111.2	U

Total Hours: 45

Reference Books:

1	Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2014.
2	K. V. Natarajan, “A Text Book of Engineering Graphics", Dhanalakshmi Publishers, 2018.
3	Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2011.
4	Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2013.

Web References:

1	http://nptel.ac.in/courses/112102101/
2	www.solidworks.com

Tentative Assessment Methods & Levels (based on Bloom's Taxonomy)		
Summative assessment based on Continuous and End Semester Examination		
Bloom's Level	**Rubric based Continuous Assessment [60 marks]**	**End Semester Examination [40 marks]**
Remember	30	30
Understand	30	30
Apply	20	20
Analyze	20	20
Evaluate	0	0
Create	0	0
Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)		

Course Outcomes (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C111.1	2	2	1				2	2	3			2	3	2	
C111.2	2	2	1				2	2	3			2	3	2	
C111.3	2	2	1				2	2	3			2	3	2	
C111.4	2	2	1				2	2	3			2	3	2	

20MC101	INDUCTION PROGRAMME *(FOR ALL BRANCHES OF B.E / B.TECH PROGRAMMES)*	1/0/0/0
Nature of Course	Induction Programme	
Pre requisites	Nil	
Course Objectives:		
1.	To have broad understanding of society and relationships	
2.	To nurture the character and fulfil one's responsibility as an engineer, a citizen and a human being	
3.	To incorporate meta skills and values	
Course Outcomes: **Upon completion of the course, students shall have ability to**		
C101.1	Explore academic interest and activities	[AP]
C101.2	Work for excellence	[AP]
C101.3	Promote bonding and give a broader view of life and character	[AP]

Course Contents:

PHYSICAL ACTIVITY: Research over the past years has shown Yoga to have stress-relieving powers on students, paving the way for improved academic performance with the practice of asanas, meditation and breathing exercises. To prove these words Yoga classes has been planned in this module.(CO mapping: C101.1, C101.2, C101.3)

CREATIVE ARTS (students can select any one of their choice): Cultural development supports students to understand, feel comfortable with, value and appreciate the potential enrichment of cultural diversity. They should challenge discrimination, whether based on cultural or racial difference. Students should experience cultural traditions embedded in arts, crafts, language, literature, theatre, song, music, dance, sport, Science, technology and travel. Students should develop an appreciation of beauty both in experiencing artistic expression and by exploring their own creative powers. To inculcate those skills they are given a chance to exhibit their talents through painting, sculpture, pottery, music, dance, craft making and so on. .(CO mapping: C101.1, C101.2, C101.3)

UNIVERSAL HUMAN VALUES: Moral development involves supporting students to make considered choices around their behaviour and the values that provide a framework for how they choose to live. Moral development is also learning about society's values, understanding the reasons for them, how they are derived and change; and how disagreements are resolved. Students must consider the consequences of personal and societal decisions on the wider community – local and global- and on the environment and future generations. To acquire this the students are exposed to training to enhance their soft skills. .(CO mapping: C101.1, C101.2, C101.3)

LITERARY AND PROFICIENCY MODULES: Social development helps students to work effectively together, developing the inter-personal skills required to relate positively with their peers and people of all ages. Students must also understand how to participate productively in a diverse and plural society and learn about, and how to effectively engage with societal institutions and processes. They should understand that a person may have different roles and responsibilities within society. To reach this the following aspects are given in the form of Reading, writing, speaking – debate, role play etc.Communication and computer skills. (CO mapping: C101.1, C101.2, C101.3)

LECTURES BY EMINENT PEOPLE: Teaching with Lectures. ... It is essential to see lectures as a means of helping students learn to think about the key concepts of a particular subject, rather than primarily as a means of transferring knowledge from instructor to student. During the induction period students will attend to Guest lectures by subject experts.(CO mapping: C101.1, C101.2, C101.3)

VISIT TO LOCAL AREAS: Traveling is in fact a way of learning to learn. You are out of your comfort zone and so you must learn to be able to adapt to a new learning environment in a very short time. It also helps in your overall learning as well. In the induction period students will be taken to different places near college to learn new things. Eg. Meditation centre /orphanage/Hospital. (CO mapping: C101.1, C101.2, C101.3)

FAMILIARIZATION TO DEPARTMENT/BRANCH INNOVATION: Hod's of different branches will present about their department followed by department visit to view various facilities available at their department, new innovations from students and faculties etc.(CO mapping: C101.1, C101.2, C101.3)

Course Outcome (CO)	**Programme Outcomes (PO)**												**Programme Specific Outcomes (PSO)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C101.1						3	3	3	3	3	3	3			1
C101.2						3	3	3	3	3	3	3			1
C101.3						3	3	3	3	3	3	3			1

20GE201	UNIVERSAL HUMAN VALUES *(COMMON TO ALL BRANCHES)*	3/0/0/3

Nature of Course	C (Theory Concept)
Pre requisites	Interpersonal Communication and Value Sciences

Course Objectives:

1.	Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2.	Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
3.	Strengthening of self-reflection.
4.	Development of commitment and courage to act.
5.	Helping the students to appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings
6.	Highlighting plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature

Course Outcomes:

Upon completion of the course, students shall have ability to

C201.1	Understand about themselves and their surroundings (family, society, nature).	[U]
C201.2	Understand and to become more responsible in life, and in handling problems with sustainable solutions while keeping human relationships and human nature in mind.	[U]
C201.3	Apply sensitivity to their commitment towards what they have understood (human values, human relationship and human society).	[AP]
C201.4	Apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.	[AP]
C201.5	Analyse between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.	[AN]
C201.6	Understand the harmony in nature and existence, and work out mutually on fulfilling participation in the nature.	[U]

Course Contents:

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education, Understanding Harmony in the Human Being - Harmony in Myself! 15 Hours

Purpose and motivation for the course. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfil the above human aspirations: understanding and living in harmony at various levels. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - happiness and physical Facility. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Health.

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship, Understanding Harmony in the Nature and Existence - Whole existence as Coexistence **15 Hours**

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and Competence. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Understanding the harmony in the Nature. Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

Implications of the above Holistic Understanding of Harmony on Professional Ethics **15 Hours**

Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations. Sum up.

Total Hours:	**45**

Text Books:	
1	Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
2	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
Reference Books:	
1	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
2	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
3	India Wins Freedom - Maulana Abdul Kalam Azad.
Web References:	
1	https://examupdates.in/professional-ethics-and-human-values/
2	http://hvpe1.blogspot.com/2016/06/notes-human-values-and-professional.html
3	https://www.yourmorals.org/schwartz.2006.basic%20human%20values.pdf
Online Resources:	
1	https://nptel.ac.in/courses/109/104/109104068/
2	https://medium.com/the-mission/the-12-important-life-skills-i-wish-id-learned-in-school-f4593b49445b
3	https://www.thebalancecareers.com/life-skills-list-and-examples-4147222

Assessment Methods & Levels (based on Bloom's Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C201.1	Understand	Group Discussion	5
C201.2	Understand	Book Review	5
C201.3 & 4	Apply	Role Play	5
C201.5 & 6	Apply	Formal Presentation	5

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	**Continuous Assessment**			
	CIA-I [10 marks]	**CIA-II [10 marks]**	**CIA-III [10 marks]**	**Term End Assessment [50 marks]**
Remember	20	20	20	20
Understand	40	40	40	40
Apply	40	40	40	40
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

Course Outcomes (CO)	**Programme Outcomes (PO)**												**Programme Specific Outcomes (PSO)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C201.1	2	2	2			3	3	3	2	2		2	1	1	1
C201.2	2	2	2			3	3	3	2	2		2	1	1	1
C201.3	2	2	2			3	3	3	2	2		2	1	1	1
C201.4	2	2	2			3	3	3	2	2		2	1	1	1
C201.5	2	2	2			3	3	3	2	2		2	1	1	1
C201.6	2	2	2			3	3	3	2	2		2	1	1	1

20CS201	C AND DATA STRUCTURES *(COMMON TO CSE / IT)*	3/0/0/3

Nature of Course:	F (Theory Programming)

Course Objectives:

1	To learn the features of C
2	To handle functions, pointers, structures, unions and files using C
3	To manipulate linear and non-linear data structures
4	To explore the applications of linear and non-linear data structures
5	To familiarize the concepts of hashing.

Course Outcomes:

Upon completion of the course, students shall have ability to:

C201.1	Develop C programs for any real-world technical application using basic programming constructs, arrays and strings	[AP]
C201.2	Apply advanced features of C in solving problems	[AP]
C201.3	Design applications using sequential and random access file processing	[AP]
C201.4	Demonstrate operations like insertion, deletion, searching, traversing etc. on linear and non-linear data structures	[AP]
C201.5	Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval.	[AP]
C201.6	Choose appropriate data structure for any real world data set.	[A]

Course Contents:

C PROGRAMMING **15 Hours**

Basic Features: Introduction - Data Types – Variables – Operations – Expressions and Statements – Conditional and Iterative Statements – Functions – Recursive Functions – Arrays – Single and Multi-Dimensional Arrays- Strings.

Advanced Features: Structures – Union – Enumerated Data Types – Pointers: Pointers to Variables, Arrays and Functions – File Handling – Storage classes - Preprocessor Directives.

LINEAR DATA STRUCTURES – LIST, STACK, QUEUE **15 Hours**

Abstract Data Types (ADTs) – List ADT – Array based implementation – Linked list implementation – Singly linked lists – Circularly linked lists – Doubly linked lists – Application of lists – Polynomial Manipulation. Stack ADT – Operations – Applications – Evaluating arithmetic expressions – Conversion of Infix to postfix expression – Queue ADT – Operations – Circular Queue – Priority Queue – Applications of queues.

NON-LINEAR DATA STRUCTURES **15 Hours**

Trees – Binary Trees – Tree Traversals – Expression Trees – Binary Search Tree – Hashing - Hash Functions – Separate Chaining – Open Addressing – Linear Probing– Quadratic Probing – Double Hashing – Rehashing.

Total Hours:	**45**

Text Books:

1	Yashavant Kanetkar, “Let us C”, 15th Edition, BPB Publications, 2017
2	Reema Thareja, “Programming in C”, 2nd Edition, Oxford University Press, 2016.
3	Pradip Dey and Manas Ghosh, “Programming in C”, 2nd Edition, Oxford University Press, 2011.

4	Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Pearson Education India, 3rd Edition 2013.
Reference Books:	
1	Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, 2nd Edition, University Press, 2008
2	Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, 1983.
3	Robert Kruse, C.L.Tondo, Bruce Leung, Shashi Mogalla , “Data Structures and Program Design in C”, 2nd Edition, Pearson Education, 2007
5	Jean-Paul Tremblay and Paul G. Sorenson, “An Introduction to Data Structures with Applications”, 2nd Edition, Tata McGraw-Hill, 1991.
6	Seymour Lipschutz, “Data Structures by Schaum series”, 2nd Edition, Tata McGraw Hill, 2013.
Web References:	
1	http://www.nptel.ac.in
2	https://visualgo.net/en
Online Resources:	
1	https://www.youtube.com/watch?v=-CpG3oATGIs
2	http://lcm.csa.iisc.ernet.in/dsa/dsa.html
3	http://ututbersity.com/?page_id=878
4	http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures
5	http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms

Assessment Methods & Levels (based on Blooms’Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom’s Level	Assessment Component	Marks
C201.1, C201.2, C201.3	Apply	Quiz	5
C201.4, C201.5	Apply	Programming Assignment	5
C201.6	Analyze	Mini Project	10

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Continuous Assessment (30)			End Semester Examination [50 marks]
	CIA-1 [10 marks]	CIA-2 [10 marks]	CIA-3 [10 marks]	
Remember	20	20	20	20
Understand	20	40	40	40
Apply	60	40	40	40
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

Formative Assessment	Summative Assessment		Total
	Continuous Assessment	End Semester Examination	
20	30	50	100

Course Outcomes (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C201.1	3	3	3	2	3							2	2	2	2
C201.2	3	3	3	2	3							2	2	2	2
C201.3	3	3	3	3	3							2	2	2	2
C201.4	3	3	3	2	3							2	2	3	3
C201.5	3	3	3	3	3							3	3	2	1
C201.6	3	3	3	3	3							2	3	3	2

20MA201	ENGINEERING MATHEMATICS II (COMMON TO MECH / MCT / CIVIL / ECE / EEE / CSE / IT / AIDS)	2/1/2/4

Nature of Course	J (Problem analytical)
Pre requisites	Concepts of Differentiation and Integration.

Course Objectives:

1.	To gain knowledge in integrals, which are needed in engineering applications.
2.	To develop logical thinking and analytical skills in evaluating multiple integrals.
3.	To acquaint with the concepts of vector calculus needed for problems in all engineering disciplines.
4.	To impart the knowledge of Laplace transform, to find solutions of initial value problems for linear ordinary differential equations.

Course Outcomes:

Upon completion of the course, students shall have ability to

C201.1	Determine the area and volume by applying the techniques of double and triple integrals.	[R]
C201.2	Finding the values of integrals through different numerical methods.	[U]
C201.3	Differentiate and integrate a vector-valued functions to solve real world applications.	[AP]
C201.4	Calculate grad, div, curl and use Gauss, Stokes and Greens theorem to simplify the calculations of integrals.	[AP]
C201.5	Apply Laplace transform techniques in system modelling, digital signal processing, process control, solving boundary value problems.	[AP]
C201.6	Apply Laplace transform methods for solving linear differential equations.	[AP]

Course Contents:

INTEGRAL CALCULUS **18 Hours**

Definite integrals: Evaluation of definite integrals using Bernoulli's formula –Multiple Integrals: Double integration in Cartesian coordinates – Area as double integral –Change of order of Integration – Triple integration in Cartesian co-ordinates –Volume as triple integral – Beta and Gamma functions – Relation between Beta and Gamma Functions – Evaluation of Integrals using Beta and Gamma Functions – Numerical integration: Trapezoidal rule and Simpson's rule for single and double integrals.

VECTOR CALCULUS **14 Hours**

Vector differential operator – Gradient of a scalar point function - Directional derivatives – Divergence and Curl of a vector point function – Irrotational and solenoidal vector fields – Simple problems – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (theorems statements only) – Simple applications involving cubes and rectangular parallelepipeds.

LAPLACE TRANSFORM **16 Hours**

Convergence of Laplace transform – Transform of some standard functions – Unit step function – Unit Impulse function – Properties – Initial and final value theorem – Inverse Laplace transform – Partial fraction method – Convolution theorem – Application of Laplace transform for solving second order ordinary differential equation.

Lab Components:

1. Double integrals evaluation in cartesian coordinates using MATLAB.
2. Triple integral calculations using MATLAB in cartesian and cylindrical coordinates.
3. Double integral evaluation in MATLAB by Trapezoidal rule.
4. Evaluation of gradient, curl and divergence in MATLAB.
5. Line integral over a vector field using MATLAB
6. Applying Green's theorem to solve integrals in MATLAB.
7. Relation between Laplace transform of function and its derivative using MATLAB.
8. Laplace transform of Dirac delta and Heaviside functions in MATLAB.
9. Solving Differential Equations in MATLAB using Laplace Transform.
10. Inverse Laplace Transform of symbolic expressions using MATLAB.

Total Hours: (48+12)	**60**

Text Books:	
1	G.B.Thomas and R.L.Finney, Calculus and Analytic Geometry, 14th Edition, Pearson, Reprint, 2018.
2	Kreyszig. E, "Advanced Engineering Mathematics" Tenth Edition, John Wiley and Sons (Asia) Limited, Singapore 2018.
3	Grewal. B.S, "Higher Engineering Mathematics", 43rd Edition, Khanna Publications, Delhi, 2014.
Reference Books:	
1	Veerarajan. T, "Engineering Mathematics II", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2018.
2	Glyn James, —Advanced Modern Engineering Mathematics, Pearson Education, 4th Edition, 2012.
3	N.P.Bali and Dr.Manish Goyal, "A Text book of Engineering Mathematics" 9th Edition, Laxmi publications Ltd, 2014.
Web References:	
1	http://nptel.ac.in/video.php?subjectId=122107037
2	http://nptel.ac.in/courses/122107036/
3	http://nptel.ac.in/video.php?subjectId=117102060
Online Resources:	
1	https://www.coursera.org/learn/pre-calculus
2	https://www.coursera.org/learn/linearalgebra1
3	https://alison.com/courses/Advanced-Mathematics-1
4	https://www.edx.org/course/algebra-lineal-mexicox-acf-0903-1x.

Assessment Methods & Levels (based on Blooms' Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	**Continuous Assessment**				**End Semester Examination (Theory) [40 marks]**
	Theory			**Practical& Project**	
	CIA-I [10 marks]	**CIA-II [10 marks]**	**CIA-III [10 marks]**	**Rubric based CIA [30 Marks]**	
Remember	20	20	20	20	20
Understand	30	30	30	30	30

Apply	50	50	50	50	50
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

Course Outcomes (CO)	**Programme Outcomes (PO)**												**Programme Specific Outcomes (PSO)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C201.1	2	1	2										3	2	1
C201.2	2	3	2										3	2	1
C201.3	3	3	2										3	2	1
C201.4	3	3	2										3	1	2
C201.5	3	3	2						2				3	2	1
C201.6	3	3	2						2				3	2	1

20PH104	PHYSICS *(COMMON TO CSE / IT / AI&DS)*	3/0/3/4.5

Nature of Course	: E (Theory skill based)
Prerequisites	: Nil

Course Objectives:

1.	To learn the fundamental concepts of physics and apply this knowledge to both scientific and engineering problems.
2.	To make the students enrich basic knowledge in various fields such as Laser, Optical fibers, Photonics, Superconductors and quantum mechanics of physics and apply the same in computing fields.

Course Outcomes:
Upon completion of the course, students shall have the ability to

C104.1	Recall and interpret the basic concepts of lasers and various types of optical fibers for articulating in engineering applications.	[R]
C104.2	Describe and conduct experiments in photonic materials.	[U]
C104.3	Acquire basic understanding and fundamental concepts of superconductors.	[R]
C104.4	Discuss the dual nature of radiation and matter.	[U]
C104.5	Solve Schrodinger's equations on finite and infinite potential well problems.	[AP]
C104.6	Apply quantum idea for understanding the working of quantum computing.	[AP]

Course Contents:

Laser and Fiber optics **15 Hours**

Laser: Characteristics of laser – Principle of spontaneous emission and stimulated emission – Einstein's theory of matter radiation interaction and A and B coefficients (derivation) – Population inversion – Pumping – Nd-YAG and CO_2 laser – Applications: Laser printer, Data storage and Bar code scanner. ***Fiber optics:*** Light propagation through fibers, acceptance angle, numerical aperture – Types of fibers: step index, graded index, single mode and multimode – Optical fibers for computing applications – PC to PC communication and fiber optics in computer networking.

Photonics and Superconductors **15 Hours**

Photonics: Introduction to photonic materials – Photonic crystals – Liquid crystal display (LCD) Light sources: Light emitting diode (LED) – Photo dependence resistor – Photo detectors: PIN, avalanche – Photo voltaic effect, Solar cell – Applications of photonic materials in computing – optical computing. ***Superconductors:*** Properties of Superconductors: effect of magnetic field, Meissner effect, effect of current,thermal properties, isotope effect, Josephson effects and its applications – Type–I and Type–II Superconductors – BCS theory – High T_C superconductors – Application of Superconductors: magnetic levitation, SQUID and cryotron.

Quantum Mechanics and Quantum computing **15 Hours**

Quantum Mechanics: Planck's quantum theory (derivation) – Matter waves, de-Broglie wavelength, Heisenberg's uncertainty principle – Schrödinger's wave equation: time independent and time dependent – Physical significance of wave function – Particle in a one-dimensional potential box – Electron microscope: SEM and TEM – Postulates of quantum mechanics. ***Quantum computing*****:** Introduction to quantum computing – qubits, entanglement, decoherence and quantum supermacy, differences in quantum and classical computation.

Lab Component		30 Hours
1	Particle size determination and measurement of d-spacing in CD using Laser.	[U]
2	Determination of wavelength, angle of divergence and coherence length of laser source.	[U]
3	Determination of numerical aperture and acceptance angle parameter of optical fiber using Laser source.	[U]
4	Characteristics curves of solar cell.	[U]
5	Characteristics curve of light dependent resistor (LDR).	[U]
6	Determination of bandgap of semiconductor.	[U]
7	Determination and verification of Stefan law.	[U]
8	Determination of Planck's constant using electroluminescence.	[U]
9	Determination of entangled photons using spectrometer.	[U]
10	Determination of wavelength of mercury spectrum – Spectrometer	[U]
	Life Skills Experiments	
1	How does a fuel (gas/liquid) pump nozzle shut off?	
2	How does a circuit breaker work?	
3	How to Check Earthing at Home?	
	Total Hours: (45+30)	**75**

Text Books:	
1	Rajendran, V "Engineering Physics" Mc Graw Hill Publications ltd, New Delhi, 2016.
2	David Halliday, Robert Resnick, Jearl Walker "Fundamentals of Physics", 11th Edition, Wiley, 2018.
3	Eleanor Rleffel and Wolfgang Polak, "Quantum computing a gentle introduction", 1st Edition, The MIT press, 2012.
Reference Books:	
1	William T. Silfvast "Laser Fundamentals" Cambridge University Press, 2012
2	Fedor Mitschke "Fiber Optics physics and Technology", 2nd Edition, Springer, 2017.
3	Chakrabarti P. "Optical Fiber Communication", McGraw Hill Education, 2015.
4	Kasap**,** Safa**,** Capper, "Handbook of Electronic and Photonic Materials" 2nd Edition, Springer, 2017.
5	Balkan**,** Naci, Erol**,** Ayşe, "Semiconductors for Optoelectronics", 1st Edition Springer, 2020.
6	Bhattacharya D. K. and Poonam Tandon, "Engineering Physics", Oxford University press, 2014
7	David J. Griffiths, "Introduction to Quantum Mechanics", 2nd Edition, Cambridge university press, 2017.
8	Chris Bernhardt, "Quantum Computing for Everyone" The MIT press, 2019

Web References/Online Resources

1	https://www.eatm.in/upload/srit__unit_i_laser.pdf
2	http://www.crectirupati.com/sites/default/files/lecture_notes/OFC%20NOTES.pdf
3	https://ocw.mit.edu/courses/materials-science-and-engineering/3-46-photonic-materials-and-devices-spring-2006/lecture-notes/
4	https://nptel.ac.in/courses/115/101/115101012/
5	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-763-applied-superconductivity-fall-2005/lecture-notes/
6	http://wcchew.ece.illinois.edu/chew/course/QMALL20121005.pdf
7	https://nptel.ac.in/courses/115/101/115101107/
8	https://www.technologyreview.com/2019/01/29/66141/what-is-quantum-computing/

9	https://www.quantum-inspire.com/kbase/what-is-a-qubit/
10	https://www.cl.cam.ac.uk/teaching/0910/QuantComp/notes.pdf

Assessment Methods & Levels (based on Blooms' Taxonomy)					
Summative assessment based on Continuous and End Semester Examination					
Bloom's Level	**Continuous Assessment**				**End Semester Examination (Theory) [40 marks]**
	Theory			**Practical**	
	CIA-I [10 marks]	**CIA-II [10 marks]**	**CIA-III [10 marks]**	**Rubric based CIA [30 Marks]**	
Remember	30	20	30	20	30
Understand	60	60	60	40	60
Apply	10	20	10	30	10
Analyse	-	-	-	10	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

Course Outcomes (CO)	**Programme Outcomes (PO)**												**Programme Specific Outcomes (PSO)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C104.1	2	1	1										2	1	2
C104.2	1	1	1										2	1	2
C104.3	2	1	2										2	1	2
C104.4	2	1	2										2	1	2
C104.5	3	2	3						1				2	1	2
C104.6	3	2	3						1				3	1	1

20EE111	**BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING** *(COMMON TO CSE / MECH / CIVIL / IT)*	3/0/2/4

Nature of Course: G (Theory analytical)

Course Objectives:

1.	To equip students with a basic understanding of Electrical circuits
2.	To learn the working principle of transformers
3.	To understand the DC and AC Machine working principles and to have a knowledge on selection of machine for specific types of applications.
4.	To give a comprehensive exposure to electrical installations.
5.	To equip students with an ability to understand basics of analog and digital electronics.

Course Outcomes:

Upon completion of the course, students shall have ability to

C111.1	Analyze the concepts in ac circuit and dc circuits.	[A]
C111.2	Understand the working principle of single phase and three phase transformers.	[U]
C111.3	Understand the working principle of DC and AC machines.	[U]
C111.4	Utilize the basic components for electrical installations.	[AP]
C111.5	Understand the basic concepts of Analog and Digital Electronics.	[U]

Course Contents:

DC Circuits and AC Circuits **15 Hours**

DC Circuits - Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current and voltage law, analysis of simple circuits with dc excitation, Mesh, Nodal Analysis Superposition, Thevenin's Theorem, Maximum power transfer theorem and Norton's Theorem. **AC Circuits** - Representation of sinusoidal waveforms, peak and rms values, Phasor representation, real power, reactive power, apparent power, power factor. Analysis of single phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel). Three phase balanced circuits, voltage and current relations in star and delta connections.

Electrical Machines and Installations **15 Hours**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections (Qualitative only). Construction and working principle of DC motor. Construction and working principle of Synchronous motor and three phase Induction motor. Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption.

Basics of Analog and Digital Electronics **15 Hours**

Semiconductor, PN junction diode, Zener diode, rectifier- Half wave, full wave and Bridge rectifier, Introduction to Number system, basic Boolean laws, reduction of Boolean expressions and implementation with logic gates.

Total Hours:	**45**

Lab Component

1.	Familiarization of Electrical Elements, Sources, Measuring Devices and Verification of ohm's law	C111.1	[R]
2.	Estimation of voltage and current by KVL and KCL in Electric Circuits	C111.1	[U]
3.	Determination of mesh current and node voltage by Mesh and Nodal Analysis	C111.1	[U]

4.	Application of Superposition theorems, thevenin's and maximum power transfer theorem in electrical circuits	C111.1	[AP]
5.	Measurement of three phase power	C111.2	[A]
6.	Demonstration of cut-out sections of machines: dc machine (Commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winding - slip ring arrangement) and single-phase induction machine	C111.3	[U]
7.	Load test on dc shunt motor.	C111.3	[AP]
8.	Demonstration of components of LT Switch Gears	C111.4	[U]
9.	Construction of bridge rectifier with and without filters	C111.5	[U]
10.	Verification of logic gates.	C111.5	[R]
			Total Hours: 30

Text Books:	
1	Fitzgerald. A.E., Charles KingselyJr, Stephen D.Umans, 'Electric Machinery', Tata McGraw Hill, 6th Edition 2015.
2	Vincent. Del. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 2nd Edition, 2015.
3	E. Hughes, "Electrical and Electronics Technology", Pearson, 10th Edition, 2011.
4	Donald. A, Neamen, Electronic Circuit Analysis and Design, 2nd Edition reprint, Tata Mc Graw Hill, 2013.
5	M. Morris Mano, 'Digital Logic and Computer Design', Prentice Hall of India, 6th Edition, 2017.
Reference Books:	
1	Charles A.Gross, Thaddeus A.Roppel, "Fundamentals of Electrical Engineering", CRC press, 2012.
2	D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 5th Edition 2012.
3	Theodore F. Bogart, Jeffery S. Beasley and Guilermo Rico, 'Electronic Devices and Circuits', Pearson Education, 6th Edition, 2019.
Web References:	
1	http://nptel.ac.in/course.php?disciplineId=108
2	https://ocw.mit.edu/courses/find-bytopic/#cat=engineering&subcat=electricalengineering&spec=electricpower
3	https://nptel.ac.in/video.php?subjectId=117103063
4	https://onionesquereality.wordpress.com/.../more-video- lectures-iit-open
5	https://nptel.iitg.ernet.in/Elec_Comm_Engg/.../Video-ECE.pdf
Online Resources:	
1	https://www.edx.org/course/electricity-magnetism-part-1-ricex-phys102-1x-1
2	https://www.mooc-list.com/course/fundamentals-electrical-engineering-coursera
3	https://nptel.ac.in/course.php

Summative assessment based on Continuous and End Semester Examination					
Bloom's Level	**Continuous Assessment**				**End Semester Examination (Theory) [40 marks]**
	Theory			**Rubrics Based Practical Assessment [30 Marks]**	
	CIA-I [10 Marks]	**CIA-II [10 Marks]**	**Term End Examination [10 Marks]**		
Remember	50	50	40	40	40
Understand	50	50	40	40	40
Apply		-	20	20	20
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

Course Outcomes (CO)	**Programme Outcomes (PO)**												**Programme Specific Outcomes (PSO)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C111.1	1	2	1										3	1	1
C111.2	2	2	2									1	3	1	1
C111.3	1	2	2						2				3	1	1
C111.4	2	1	1					1	1			1	3	1	2
C111.5	2	2	2									1	3	3	1

20ME103	ENGINEERING PRACTICES LABORATORY	0/0/3/1.5
Nature of Course	Practical application	
Pre-Requisites	Nil	

Course Objectives:

1.	To learn the use of basic hand tools and to know the need for safety in work place and to gain hands on experience in Carpentry, Sheet metal, Plumbing, Welding and Foundry.
2.	To learn about basic electrical devices, meters and electronics devices and to gain knowledge about the fundamentals of various electrical and electronic gadgets their working and trouble shooting.

Course Outcomes:
Upon completion of the course, students shall have ability to

C103.1	Identify and solve the basic engineering problems at home and in workplace.	[AP]
C103.2	Develop the surfaces and make simple components like tray and funnel.	[C]
C103.3	Make simple metal joints using welding equipment and wooden joints using carpentry tools.	[AP]
C103.4	Prepare pipe connections and sand moulds.	[AP]
C103.5	Understand the fundamentals of hot forging and injection moulding.	[U]
C103.6	Examine and troubleshoot electrical and electronic circuits.	[A]

Course Contents:

GROUP A (CIVIL & MECHANICAL)

Manufacturing Methods –Sheet metal operations - Welding - arc welding, gas welding, Study of TIG & MIG welding. Study of foundry, Demonstration of Smithy and Injection moulding - Carpentry work using power tools - Plumbing components and pipelines

List of Experiments:

S.No	List of Experiments	CO Mapping	RBT
1	Preparation of butt joints and lap joints using arc welding	C103.3	[AP]
2	Sheet metal Forming and Bending, Model making – Trays and funnels.	C103.2	[AP]
3	Preparation of wooden joints by sawing, planning and cutting.	C103.3	[AP]
4	Making basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings.	C103.4	[AP]
5	Demonstration of foundry operations like mould preparation for solid and split piece pattern.	C103.4	[U]
6	Demonstration of Smithy operations	C103.5	[AP]
7	Demonstration of assembly of pump / Demonstration of Injection moulding	C103.5	[AP]

GROUP B (ELECTRICAL AND ELECTRONICS ENGINEERING)

List of Experiments:

Basic Circuit Elements: Resistor, inductor, capacitor. Introduction to measuring equipments: Moving iron meter, moving coil meter, Wattmeter, Energy meter, CRO, Multi-meter. Digital logic circuits, PCB design, fuse, relay, circuit breaker, wire, Earthing, fan, fluorescent lamp, iron box, mixer grinder, study of FM radio and mobile phone.

S.No	List of Experiments	CO Mapping	RBT
1	Study and identification of electronic components with specification.	C103.6	[A]
2	Testing of CRO and Electronic components using Multimeter.	C103.6	[A]

3	Generation and measurement of signals using CRO.	C103.6	[A]
4	Familiarisation of digital basic gate IC's.	C103.6	[A]
5	Soldering practice-components devices and circuits- using general purpose PCB.	C103.6	[A]
6	Demonstration of meters and electrical components.	C103.6	[A]
7	Safety precautions with electrical components.	C103.6	[A]
8	Residential house wiring.	C103.6	[A]
9	Measurement of power and energy.	C103.6	[A]
10	Trouble shooting of electrical equipments.	C103.6	[A]
		Total Hours:	**45**

Reference Books:

1	Serope Kalpakjian and Steven R. Schmid, "Manufacturing Engineering and Technology", Pearson Education, Inc. 2009 (Second Indian Reprint).
2	Hajra Choudhury, "Elements of Workshop Technology", Vol. I & II, Media Promotors Pvt Ltd., 2014.
3	Suyambazhagan S, 'Engineering practices' PHI Learning private limited, New Delhi,2012.
4	D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
5	E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

Web References:

1	www.nptel.ac.in
2	www.sme.org
3	http://www.allaboutcircuits.com/education/

Tentative Assessment Methods & Levels (based on Bloom's Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Rubric based Continuous Assessment [60 marks]	End Semester Examination [40 marks]
Remember	10	10
Understand	10	10
Apply	40	40
Analyze	20	20
Evaluate	10	10
Create	10	10

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)

Course Outcomes (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C103.1	3	3	3		3		3		3	2			2	3	2
C103.2	3	3	3		3		3		3	2			2	3	1
C103.3	2	1	3	2	3			3	2			1	2	2	1
C103.4	3	3	3		3		3		3	2			2	1	1
C103.5	3	3	3		3		3		3	2			2	1	1
C103.6	3	3	3		3		3		3	2			2	3	3

20CS202	DATA STRUCTURES LABORATORY *(COMMON TO CSE / IT)*	0/0/3/1.5

Nature of Course:	D (Practical Programming)

Course Objectives:

1.	To write C programs using functions, pointers, structures and unions.
2.	To access files using C.
3.	To implement linear and tree data structures.
4.	To introduce concepts of hashing.

Course Outcomes:

Upon completion of the course, students shall have ability to:

C202.1	Develop C programs using basic programming constructs, arrays and strings	[AP]
C202.2	Apply advanced features of C in solving problems	[AP]
C202.3	Demonstrate the file operations on binary and text files	[AP]
C202.4	Write functions to implement linear and tree data structure operations in C and present the data flow neatly	[AP]
C202.5	Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval	[AP]
C202.6	Identify, implement and use appropriate linear data structures for accessing elements in the given data set and document the process	[A]

Course Contents:

1. Practice of C Programming using Branching and Iterative constructs.
2. Programs using Functions
3. Programs using arrays and strings.
4. Programs using Structures and Pointers.
5. Programs using Files.
6. Implementation of Singly, doubly and Circular Linked List.
7. Implementation of Stack using Arrays
8. Implementation of Stack using Linked List.
9. Implementation of Stack applications.
10. Implementation of Queue using Arrays
11. Implementation of Queue using Linked List.
12. Implementation of Priority Queue.
13. Implementation of Queue applications.
14. Implementation of Binary Search Tree.
15. Implementation of hashing techniques

Total Hours:	**45**

Text Books:

1	Yashavant Kanetkar, “Let us C”, 15th Edition, BPB Publications, 2017
2	Reema Thareja, “Programming in C”, 2nd Edition, Oxford University Press, 2016
3	Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Pearson Education India, 3rd Edition 2013.
4	Pradip Dey and Manas Ghosh, “Programming in C”, 2nd Edition, Oxford University Press, 2011.

Reference Books:

1	Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, 2nd Edition, University Press, 2008
2	Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, 1983.

3	Robert Kruse, C.L.Tondo, Bruce Leung, ShashiMogalla , “Data Structures and Program Design in C”, 2nd Edition, Pearson Education, 2007
5	Jean-Paul Tremblay and Paul G. Sorenson, “An Introduction to Data Structures with Applications”, 2nd Edition, Tata McGraw-Hill, 1991.
6	Seymour Lipschutz, “Data Structures by Schaum series”, 2nd Edition, Tata McGraw Hill, 2013.
Web References:	
1	http://www.nptel.ac.in
2	https://visualgo.net/en
Online Resources:	
1	http://lcm.csa.iisc.ernet.in/dsa/dsa.html
2	http://utubersity.com/?page_id=878
3	http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures
4	https://www.youtube.com/watch?v=-CpG3oATGIs

Assessment Methods & Levels (based on Blooms’Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Rubric based Continuous Assessment (60)	End Semester Examination (40)
Remember	-	-
Understand	-	-
Apply	70	60
Analyse	30	40
Evaluate	-	-
Create	-	-

Course Outcomes (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C202.1	3	3	3	2	3				2	2		3	2	2	2
C202.2	3	3	3	2	3				2	2		3	2	2	2
C202.3	3	3	3	3	3				2	2		3	2	2	2
C202.4	3	3	3	2	3				2	2		3	2	2	2
C202.5	3	3	3	3	3				2	2		3	3	2	2
C202.6	3	3	3	3	3				2	2		3	3	2	2

20MC102	ENVIRONMENTAL SCIENCES	2/0/0/0

Nature of Course	Theory Concept
Pre requisites	Basics in Environmental Studies

Course Objectives:

1	To learn the integrated themes on various natural resources.
2	To gain knowledge on the type of pollution and its control methods.
3	To have an awareness about the current environmental issues and the social problems.

Course Outcomes:

Upon completion of the course, students shall have ability to

C102.1	Recall and play an important role in transferring a healthy environment for future generation.	[R]
C102.2	Understand the importance of natural resources and conservation of biodiversity.	[U]
C102.3	Understand and analyze the impact of engineering solutions in a global and societal context.	[U]
C102.4	Apply the gained knowledge to overcome pollution problems.	[AP]
C102.5	Apply the gained knowledge in various environmental issues and sustainable development.	[AP]

Course Contents:

Module 1: Natural Resources **10 Hours**

Introduction-Forest resources: Use and abuse, case study-Major activities in forest-Water resources-over utilization of water, dams-benefits and problems. Mineral resources-Use and exploitation, environmental effects of mining- case study–Food resources- World food problems, case study. Energy resources -Renewable and non-renewable energy sources Land resources- Soil erosion and desertification – Role of an individual in conservation of natural resources.

Module 2: Environmental Pollutions **10 Hours**

Definition – causes, effects and control measures of: a. Air pollution-Acid rain - Green house effect-Global warming- Ozone layer depletion – case study- Bhopal gas tragedyb. Water pollution c. Solid waste management-Recycling of plastics-Pyrolysis method- causes, effects and control measures of municipal solid wastes d. Noise pollution. e. Nuclear hazards-case study-Chernobyl nuclear disaster-Role of an individual in prevention of pollution.

Module 3: Social issues and the Environment **10 Hours**

Sustainable development-water conservation, rain water harvesting, E-Waste Management – Environmental ethics: 12 Principles of green chemistry-Scheme of labelling of environmental friendly products (Eco mark) – Emission standards – ISO 14001 standard. HIV AIDS.

Total Hours:	**30**

Text Books:

1	Anubha Kaushik and C P Kaushik “Perspectives in Environmental Studies” 4th Edition, New age International (P) Limited, Publisher Reprint 2014. New Delhi
2	Rajagopalan, R, “Environmental Studies-From Crisis to Cure”, Oxford University Press 2015.

Reference Books:

1	Tyler Miller, Jr, “Environmental Science”, Brooks/Cole a part of Cengage Learning, 2014.
2	William Cunningham and Mary Cunningham, “Environmental Science”, 13th Edition, McGraw Hill,2015.

3	Gilbert M. Masters, “Introduction to Environmental Engineering and Science”, Third Edition, Pearson Education, 2014.
Web References:	
1	http://nptel.ac.in/courses/104103020/20
2	http://nptel.ac.in/courses/120108002
3	http://nptel.ac.in/courses/122106030
4	http://nptel.ac.in/courses/120108004/
5	http://nptel.ac.in/courses/122102006/20
Online Resources:	
1	https://www.edx.org/course/subject/environmental-studies
2	www.environmentalscience.org

Assessment Methods & Levels (based on Bloom’s Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:40)

Course Outcome	Bloom’s Level	Assessment Component	Marks
C102.1	Remember	Quiz	**5**
C102.2	Understand	Mini project based on environmental aspect	**15**
C102.3	Understand	Class Presentation	**10**
C102.4 C102.5	Apply	Group Assignment	**10**

Summative assessment based on Continuous Assessment

Revised Bloom’s Level	Term End Assessment [60 marks]
Remember	30
Understand	40
Apply	30
Analyse	-
Evaluate	-
Create	-

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C102.1						2	2						2		
C102.2						2	2						2		
C102.3						2	2							2	
C102.4						3	3						2		
C102.5						3	3						2		

20IT301	COMPUTER ARCHITECTURE *(COMMON TO CSE / IT)*	3/0/0/3
Nature of Course	C (Theory Concept)	
Pre requisites	Nil	
Course Objectives:		
1.	To study the concepts of the basic structure and operation of a digital computer.	
2.	To learn the working of different types of arithmetic operations.	
3.	To understand the different types of control and the concept of pipelining.	
4.	To learn the working of different types of memories.	
5.	To understand the different types of communication with I/O devices and standard I/O interfaces.	
Course Outcomes		
Upon completion of the course, students shall have ability to		
C301.1	Recall the design of the various units of digital computers that store and process information via instructions.	[R]
C301.2	Illustrate the functionality of all components and connectivity to the Central Processing Unit.	[U]
C301.3	Interpret the logic design of fixed-point add, subtract, multiply and divide hardware and instantiating the concepts of fast adders, high speed multiplier, booth multiplier and carry save addition techniques.	[U]
C301.4	Classify the hazards of pipelining technique and use in high performance processors.	[U]
C301.5	Use various memory components and memory mapping techniques including Cache and virtual memory for increasing the memory bandwidth and high performance.	[AP]
C301.6	Choose different ways of communication with I/O devices using various interconnection networks including bus structures.	[AP]

Course Contents:

Architecture Fundamentals and Memory Organization: 15 Hours

Organization of the Von Neumann Machine - Basic Operational Concepts of a Machine - Memory Locations and Addresses – Instruction Format - Instruction Sets, Addressing Modes and Assembly Language. Memory Organization**:** Basic Concepts, Semiconductor RAMs, ROMs, Cache memories, Performance Consideration, Virtual Memory and Memory Management requirements – Secondary storages. Case Study: DDR4 and Dual Inline Memory Module (DIMM)

Processor Design: 15 Hours

Arithmetic Unit: Addition and Subtraction of Signed Numbers – Design of Fast Adders – Multiplication of Signed Numbers, Fast Multiplication, Integer Division, Floating Point Numbers and Operations**.** Control Unit: Execution of a Complete Instruction - Hardwired Control and Micro Programmed Control. Pipelining: Basic Concepts, Data Hazards, Instruction Hazards, Influence on Instruction Sets, Data Path and Control Consideration and Superscalar Operation. Case study: Intel's x86 Core2 and i7 microarchitectures

Interfacing and Communication: 15 Hours

I/O fundamentals: Handshaking, Buffering; I/O techniques: Programmed I/O, Interrupt-Driven I/O, DMA, Buses, Bus Protocols, Local and Geographic Arbitration. Interrupt Structures, Vectored and Prioritized, Interrupt Overhead, Interrupts and Reentrant Code. Multicore Architecture: Multicore Processors, Centralized and Distributed Shared Memory Architecture, Parallel Computers.

Total Hours	**45**

Text Books:	
1.	Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, “Computer Organization and Embedded Systems”, McGraw- Hill, 6th Edition 2017.
2.	John P. Hayes, “Computer Architecture and Organization”, McGraw-Hill, 3rd Edition, 2017.
3.	William Stallings, “Computer Organization and Architecture Designing for Performance”, 10th Edition, Pearson Education 2016.
Reference Books:	
1.	David A. Patterson and John L. Hennessy, “Computer Organization and Design: The Hardware/Software Interface”, Elsevier, 5th Edition, 2013.
2.	John L. Hennessy and David A. Patterson, “Computer Architecture: A Quantitative Approach”, Morgan Kaufmann, 5th Edition, 2011.
3.	M. J. Flynn, “Computer Architecture: Pipelined and Parallel Processor Design”, Narosa Publishing House 2013.
Web References:	
1.	https://www.cs.cmu.edu/~fp/courses/15213-s07/lectures/27-multicore.pdf
2.	https://fdocuments.in/document/intel-core-i7-processor.html
3.	https://www.intel.com/content/dam/www/public/us/en/documents/manuals/64-ia-32-architectures-software-developer-instruction-set-reference-manual-325383.pdf
Online Resources:	
1.	https://www.coursera.org/learn/comparch
2.	https://www.eguardian.co.in/computer-architecture-mcqs/
3.	http://nptel.ac.in/courses/106102062/

Tentative Assessment Methods & Levels (based on Revised Bloom’s Taxonomy)

Formative assessment based on Capstone Model (Max. Marks: 20)

Course Outcome	Bloom’s Level	Assessment Component	Marks
C301.1	Remember	Assignment	10
C301.2, C301.3	Understand	Online Quiz	3
C301.4, C301.5	Understand, Apply	Online Quiz	3
C301.6	Apply	Case Study	4

Summative assessment based on Continuous and End Semester Examination

Revised Bloom’s Level	Continuous Assessment			End Semester Examination (Theory) [50 marks]
	Theory			
	CIA-1 [10 marks]	CIA-2 [10 marks]	CIA-3 [10 marks]	
Remember	20	20	10	10
Understand	80	40	40	40
Apply	-	40	50	50
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

Formative Assessment	Summative Assessment		Total
	Continuous Assessment	End Semester Examination	
20	30	50	100

Course Outcomes (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C301.1	2	3	1		1								1	2	2
C301.2	1	2	2		2								2	1	1
C301.3	3	3	3	3	3								3	3	1
C301.4	1	1	2		1								1	1	1
C301.5	2	1	2	2	1								2	1	2
C301.6		2	2		2								1	1	1

20MA302	MATHEMATICAL STRUCTURES *(COMMON TO CSE/ IT/ AI & DS)*	2/1/2/4

Nature of Course	J (Problem analytical)
Prerequisites	Higher secondary mathematics

Course Objectives:

1.	To study the concepts needed to test the logic of a program.
2.	To learn the working on class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.
3.	To use number theory in computer networks and security.
4.	To acquire thorough knowledge of fundamental notions from lattice theory and properties of lattices.

Course Outcomes:
Upon completion of the course, students shall have ability to

C302.1	Recall the basic concepts of logic, Sets, Relations, Functions and Number theory.	[R]
C302.2	Acquire critical thinking skills by understanding the logical structure of the language.	[U]
C302.3	Use the concepts of Discrete Mathematics in software development and hardware design.	[AP]
C302.4	Demonstrate the fundamental Concepts of sets, relations, mathematical functions and all of its properties.	[AP]
C302.5	Apply discrete mathematics in formal representation of various computing constructs and algebraic structures. Apply Euclid's algorithm and backwards substitution.	[AP]
C302.6	Apply integrated approach to number theory.	[AP]

Module 1: Propositional and Predicate Calculus **15 hours**

Propositional Calculus: Basic concepts – Propositions - Connectives– Truth tables – Tautologies and Contradictions –Contrapositive – Logical equivalences and Implications – Normal forms – Principal conjunctive and Disjunctive normal forms– Rules of inference – Validity of arguments – **Predicate Calculus**: Statement function – Variables – Free and bound variables – Quantifiers– Universe of discourse – Theory of inference – The rules of universal specification and generalization – Validity of arguments.

Module 2: Set Theory **15 hours**

Sets: Basic sets - Operations on Sets – Law on Sets - Cartesian product of sets – **Relations**: Types of relations and their properties– Relational matrix and graph of a relation – Equivalence relations – Partial ordering -**Functions:** Classification of functions–Composition of functions–Inverse function- **Counting**: Permutations and Combinations.

Module 3: Lattices and Number Theory **15 hours**

Lattices: Partially ordered sets - Hasse diagram - Lattices and their properties - **Number Theory:** Division algorithm -Base-b representations- Number patterns -Prime and composite numbers-GCD-Euclidean algorithm-Fundamental theorem of arithmetic-LCM-Wilson's Theorem-Fermat's Theorem-Tau and Sigma Function.

Total Hours:	**45**

Course Outcomes: (Laboratory) Upon the completion of the course, students shall have ability to	
C302.1	Construct mathematical arguments using logical connectives and quantifiers.
C302.2	Verify the correctness of an argument using propositional and predicate logic and truth tables.
C302.3	Understand the basic principles of sets and operations in sets.
C302.4	Demonstrate the ability to solve problems using counting techniques and combinatorics in the context of discrete probability.
C302.5	Evaluate the problems in Number Theory.
C302.6	Evaluate quotients and remainders from division Algorithm.

Laboratory Component:

S. No	List of Experiments	CO Mapping	RBT
1.	Generate the truth table for mathematical logic using suitable mathematical software.	C302.1	[AP]
2.	Assign the truth table actions to decisions using suitable mathematical software	C302.2	[AP]
3.	Examine the logical validity of the arguments using suitable mathematical software.	C302.2	[AP]
4.	Using logical operators to test truth values of statements in suitable mathematical software	C302.2	[AP]
5.	Verification of DeMorgan's law using suitable mathematical software	C302.3	[AP]
6.	Set operations using suitable mathematical software.	C302.3	[AP]
7.	Compute permutations functions using suitable mathematical software.	C302.4	[AP]
8.	Compute combinations functions using suitable mathematical software.	C302.4	[AP]
9.	Compute prime and composite numbers using suitable mathematical software.	C302.5	[AP]
10.	Compute Least common multiple of two integers using suitable mathematical software.	C302.5	[AP]
11.	Compute Greatest common divisor of two integers using suitable mathematical software.	C302.5	[AP]
12.	Compute Quotient and remainder of two integers by division algorithm using suitable mathematical software.	C302.6	[AP]

Text Books:

1	Tremblay J.P and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw–Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011
2	Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw – Hill Pub. Co. Ltd., New Delhi, 7th Edition, 2017.
3	Koshy. T, "Elementary Number Theory with Applications", Elsevier Publications, New Delhi, 2nd Edition, 2007.

Reference Books:

1	Ralph. P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", Fifth Edition, Pearson Education Asia, New Delhi, 5th Edition, 2019.
2	Bernard Kolman, Robert C. Busby, Sharan Cutler Ross, "Discrete Mathematical Structures", Pearson Education Pvt Ltd., 6th Edition, New Delhi, 2017.
3	Thomas Koshy, "Discrete Mathematics with Applications", Elsevier Publications, 2004.
4	David Houcque, "Introduction to MATLAB for Engineering Students", 2005.

Web References:	
1	https://nptel.ac.in/courses/111/107/111107058/
2	https://nptel.ac.in/courses/106/106/106106094/
3	https://nptel.ac.in/courses/106/106/106106183/
4	https://nptel.ac.in/courses/111/101/111101137/
Online Resources:	
1	http://discrete.openmathbooks.org/dmoi3.html
2	https://www.csie.ntu.edu.tw/~sylee/courses/dm/resources.htm
3	https://www.maa.org/press/ebooks/resources-for-teaching-discrete-mathematics

Assessment Methods & Levels (based on Blooms' Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment				End Semester Examination (Theory) [40 marks]
	Theory			Practical& Project	
	CIA-I [10 marks]	CIA-II [10 marks]	CIA-III [10 marks]	Rubric based CIA [30 Marks]	
Remember	20	20	20	20	20
Understand	30	30	30	30	30
Apply	50	50	50	50	50
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

Course Outcomes (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C302.1	1	1		1	1								2	1	1
C302.2	2	2		2	2								2	1	1
C302.3	3	3		3	3								2	2	1
C302.4	3	3		3	3								3	2	1
C302.5	3	3		3	3								3	2	1
C302.6	3	3		3	3								3	2	1

20EC311	DIGITAL LOGIC AND DESIGN *(COMMON TO CSE / IT)*	3/0/2/4
Nature of Course	G (Theory analytical)	
Pre requisites	Nil	

Course Objectives:

1.	To understand how computers operate at the most basic level.
2.	To gain familiarity to the principles of combinational logic and the design of combinational circuits.
3.	To understand the basics of sequential logic devices and the design of sequential circuits.
4.	To learn the process of modeling the combinational and sequential logic circuits using Verilog.
5.	To understand the concepts of programmable logic devices.

Course Outcomes

Upon completion of the course, students shall have ability to

C311.1	Identify and encode information in binary and to manipulate Boolean functions using Boolean algebra.	[U]
C311.2	Interpret and minimize Boolean functions and implement them using digital logic gates.	[U]
C311.3	Illustrate and design different combinational logic circuits.	[A]
C311.4	Analyze and design various sequential circuits.	[A]
C311.5	Construct Verilog models for digital logic circuits.	[AP]
C311.6	Implement digital logic circuits using programmable logic devices.	[AP]

Course Contents:

Introduction: **15 Hours**

Number Systems - Binary codes – Binary Arithmetic - Boolean algebra - Boolean functions –Minimization of Boolean Functions using Karnaugh Maps - Implementation of Logic Circuits using Gates (Two Level / Multi level Implementation).

Combinational Logic: **15 Hours**

Analysis and Design Procedures-Circuits for Arithmetic Operations- Multiplexer-Demultiplexer -Decoder-Encoders- and their use in Logic Synthesis-Verilog Modelling for Combinational Circuits.

Synchronous Sequential Logic & Programmable Logic devices: **15 Hours**

Latches-Flip flops - Analysis and Synthesis of Clocked Sequential Circuits – Registers - Shift Registers-Ripple Counters-Synchronous Counters-Special Counters- Verilog Modelling for Sequential circuits - Finite State Machines, PROM, PGA, PLA, PAL, PLS, FPGA.

Total Hours:	**45**

Laboratory Component:

S. No	List of Experiments
1.	Realization of Boolean Functions using Logic Gates.
2.	Analysis and Synthesis of Combinational Logic Circuits.
3.	Code Converter.
4.	Parity Generator and Checker.

5.	Two-bit magnitude comparator.
6.	Arithmetic Circuits.
7.	Multiplexer.
8.	Design and Implementation of Multiplier.
9.	Many game shows use a circuit to determine which of the contestants ring in first. Design a circuit to determine which of two contestants rings in first. It has two inputs S1and S0 which are connected to the contestants' buttons. The circuit has two outputs Z1 and Z0 which are connected to LEDs to indicate which contestant rang in first. There is also a reset button that is used by the game show host to asynchronously reset the flip flops to the initial state before each question. If contestant 0 rings in first, the circuit turns on LED 0. Once LED 0 is on, the circuit leaves it on regardless of the inputs until the circuit is asynchronously reset by the game show host. If contestant 1 rings in first, the circuit turns on LED 1 and leaves it on until the circuit is reset. If there is a tie, both LEDs are turned on. The circuit requires four states: reset, contestant 0 wins, contestant 1 wins, and tie. One way to map the states is to use state 00 for reset, state 01 for contestant 0 wins, state 10 for contestant 1 wins, and state 11 for a tie. With this mapping, the outputs are equal to the current state, which simplifies the output equations.
10.	Design and Implementation of Shift Registers.
11.	Design and Implementation of Synchronous Counters.
12.	Design a simplified traffic-light controller that switches traffic lights on a crossing where a north-south (NS) street intersects an east-west (EW) street. The input to the controller is the WALK button pushed by pedestrians who want to cross the street. The outputs are two signals NS and EW that control the traffic lights in the NS and EW directions. When NS or EW are 0, the red light is on, and when they are 1, the green light is on. When there are no pedestrians, NS=0, EW=1 for a minute, follow by NS=1 and EW=0 for 1 minutes, and soon, when WALK button is pushed, NS and EW both become 0 for a minute when the present minute expires. After that the NS and EW signals continue alerting. For this traffic-light controller a) Develop a state diagram. (Hint: can be done using 3 states) b) Draw the state transition table. c) Encode the states using minimum number of bits. d) Derive the logic schematic for a sequential circuit which implements the state transition table.
13.	Verilog modeling of Adders, Subtractors, Multiplexers, Decoders, and Flip Flops.
Total Hours:	**30**

Text Books:	
1.	M.Morris R.Mano, Michael D.Ciletti, “Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog”, 6th Edition, Pearson, 2018.
2.	C.H.Roth Jr., Larry L.Kinney, “Fundamentals of Logic Design”, 7th Edition, Cengage Learning, 2014.
Reference Books:	
1.	John F. Wakerly, “Digital Design: Principles and Practices”, 5th Edition, Pearson, 2018.
2.	Donald P Leach, Albert Paul Malvino, Goutam Saha, “Digital Principles and Application”,8th Edition, McGraw Hill education (India) Private Limited, 2015.
3.	Clive Woods, Brian Holdsworth, “Digital Logic Design”, 4th Edition, O’Reilly Media, 2002.
4.	Donald D. Givone, “Digital Principles and Design”, 7th Edition, McGraw-Hill, 2010.
Web References:	
1.	https://www.xilinx.com/support/documentation/university/Vivado-eaching /HDLDesign/2013x/Nexys4/Verilog/docs-pdf/Vivado_tutorial.pdf.

Online Resources:	
1.	https://www.edx.org/course/computation-structures-part-1-digital-mitx-6-004- 1x-0
2.	https://swayam.gov.in/course/1392-digital-circuits-and-systems
3.	http://www.nesoacademy.org/electronics-engineering/digital-electronics/digital
4.	http://www.digital.iitkgp.ernet.in/dec/index.php

Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Level	Continuous Assessment				End Semester Examination (Theory) [40 marks]
	Theory			Practical	
	CIA-1 [10 marks]	CIA-2 [10 marks]	CIA-3 [10 marks]	Rubric based CIA [30 Marks]	
Remember	-	-	-	-	-
Understand	50	10	20	-	10
Apply	50	50	40	30	50
Analyse	-	40	40	20	40
Evaluate	-	-	-	20	-
Create	-	-	-	30	-

Course Outcomes (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C311.1	3	3	3	3								2	3	2	1
C311.2	2	3	3	2	2							2	3	1	1
C311.3	3	3	3	2	3							2	3	3	1
C311.4	2	3	3	3	2								2	2	2
C311.5	2	2	3	1	2								3	3	2
C311.6	3	3	3	3	3							1	3	1	2

20IT302	SOFTWARE ENGINEERING AND MANAGEMENT *(COMMON TO CSE / IT / AI & DS)*	3/0/2/4
Nature of Course	H (Theory Technology)	
Pre requisites	Nil	
Course Objectives:		
1.	To discuss the essence of agile development methods.	
2.	Carry out all stages of an agile software process in a team, to produce working software.	
3.	Ability to understand and apply Scrum framework.	
4.	Use test driven development (TDD) to ensure software quality.	
Course Outcomes		
Upon completion of the course, students shall have ability to		
C302.1	Identify the driving forces and adopt Agile approaches to software development.	[R]
C302.2	Interpret the various Agile development practices.	[U]
C302.3	Demonstrate and develop the working model facilitated by unit tests using Test Driven Development.	[AP]
C302.4	Apply design principles and refactoring to achieve Agility.	[AP]
C302.5	Illustrate automated build tools, version control and continuous integration using JIRA and Jenkins.	[AP]
C302.6	Apply Risk based testing activities within an Agile project.	[AP]

Course Contents:

Traditional SDLC Models: **15 Hours**

Waterfall model, Incremental model, Iterative model, RAD model **Fundamentals of Agile:** The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Extreme Programming, Feature Driven development, Lean Software Development, Pair Programming, Agile Tools, Project Management – CMM.

Agile Scrum Framework: **15 Hours**

Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint Scrum Team, **Agile Testing:** The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), xUnit framework and tools for TDD, Testing user stories - acceptance tests and scenarios, Behavior-driven development (BDD), Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester.

Agile Software Design and Development: **15 Hours**

Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles, Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control. **Industry Trends:** Market scenario and adoption of Agile, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile projects on Cloud, Balancing Agility with Discipline, Agile rapid development technologies.

Case Study: DevOps, SAFe

Total Hours:	**45**

Laboratory Component:	
S. No	**List of Experiments**
1.	Draw basic UML diagrams (use case, Activity, class, interaction, State charts, Component and Deployment diagram)
2.	Develop DFD model (level-0, level-1)
3.	Understand given Business scenario and identify User Stories, Product Backlog and Sprint tasks.
4.	Do the estimation for identified user stories.
5.	Fill user stories, sprint schedule and sprint tasks in an Agile tool such as AgileFant/Jira.
6.	Write unit tests aligned to xUnit framework for TDD.
7.	Refactor a given design for next sprint requirements.
8.	Execute continuous integration using an automated tool such as Jenkins.
Total Hours:	**30**

Text Books:	
1.	Ken Schawber, Mike Beedle, “Agile Software Development with Scrum”, Pearson Education, 2nd Edition, 2014.
2.	Janet Gregory, Lisa Crispin, “Agile Testing Condensed: A Brief Introduction”, Addison Wesley, 2019.

Reference Books:	
1.	Robert C. Martin, “Agile Software Development, Principles, Patterns and Practices”, Prentice Hall, 2nd Edition, 2014.
2.	Alistair Cockburn, “Agile Software Development: The Cooperative Game (Agile Software Development Series)” 2nd Edition, Kindle Edition.
3.	Mike Cohn, “User Stories Applied: For Agile Software”, Addison Wesley, 2nd Edition, 2016.

Web References:	
1.	https://www.coursera.org/specializations/agile-development
2.	https://www.edx.org/learn/agile
3.	https://nptel.ac.in/courses/106/105/106105182/

Online Resources:	
1.	http://www.agilenutshell.com/
2.	https://www.atlassian.com/agile/scrum
3.	https://www.youtube.com/user/AgileMikeCohn
4.	https://www.youtube.com/channel/UCL1yMVRMh3vxitPiVaXfkoA

Tentative Assessment Methods & Levels (based on Revised Bloom’s Taxonomy

Summative assessment based on Continuous and End Semester Examination

Revised Bloom’s Level	Continuous Assessment				End Semester Examination (Theory) [40 marks]
	Theory			Practical	
	CIA-1 [10 marks]	CIA-2 [10 marks]	CIA-3 [10 marks]	Rubric based CIA [30 Marks]	
Remember	25	20	30	30	30
Understand	25	30	30	20	30
Apply	50	50	40	50	40
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

Course Outcomes (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C302.1	1	2	1	1								2	1	2	1
C302.2	3	3	3	3	2							2	3	3	2
C302.3	3	3	3	3								2	3	3	2
C302.4	3	3	3	3	3							2	3	3	2
C302.5	3	2	3	3	3							1	3	3	2
C302.6	1	2	1	1								2	1	2	1

20CS301	C++ AND ADVANCED DATA STRUCTURES *(COMMON TO CSE / IT)*	3/0/2/4
Nature of Course	F (Theory Programming)	
Pre requisites	C and Data Structures	
Course Objectives:		
1.	To learn object-oriented concepts using C++.	
2.	To understand various non-linear data structures-Tree, Graph.	
3.	To apply efficient data structures in solving real-world problems.	
Course Outcomes		
Upon completion of the course, students shall have ability to		
C301.1	Construct and apply C++ program to solve the given problems using basic programming constructs.	[R]
C301.2	Understand and Apply the object-oriented concepts for implementing data structures.	[AP]
C301.3	Represent and manipulate data using nonlinear data structures like trees and graphs to design algorithms for various applications.	[U]
C301.4	Illustrate and compare various data structures for solving real time problems.	[AP]

Course Contents:

Module 1: **15 Hours**

C++ PROGRAMMING: An overview of C++ - Data Types, Variables, Operators, Expressions and Statements-Functions and Arrays- C++ Class Overview- Class Definition, Objects, Class Members, Access Control, Constructors and destructors, parameter passing methods, Inline functions, static class members, this pointer, friend functions, dynamic memory allocation and deallocation (new and delete) - Inheritance basics, base and derived classes, inheritance types, runtime polymorphism using virtual functions, abstract classes - Generic Programming - Function and class templates.

Module 2: **15 Hours**

Search trees: Overview- Binary Search Trees, **AVL Trees:** Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, **Introduction to Red –Black and Splay Trees, B-Trees**, B-Tree of order m, B-Tree insertion, deletion and searching. Case study on AVL Tree Operations.

Module 3: **15 Hours**

Graphs: Definition – Representation of Graph – Types of graph –Breadth-first traversal – Depth-first traversal – Topological Sort – Dijkstra's Algorithm – Minimum Spanning Tree - Bi-connectivity – Cut vertex – Euler circuits – Applications of graphs. **Recent trends:** Pattern matching, Tries, Tree Map, Hash map. Case study on google page ranking algorithm.

Total Hours:	**45**

Laboratory Component:		
S. No	**List of Experiments**	
1.	Basic C++ programs.	
2.	Implementation of classes and objects.	
3.	Implementation of Inheritance and polymorphism.	
4.	Implementation of class and function templates.	
5.	Implementation of Search Trees: a) BST b) AVL trees c) Red-black Trees d) B-Trees	
6.	Represent a Graph ADT and perform BFS and DFS.	
7.	Perform topological sorting in graph.	
8.	Implement a Minimum Spanning tree Algorithm in graph.	
9.	Implement Tries and Pattern matching.	
	Total Hours:	**30**

Text Books:	
1.	Herbert Shildt, “The Complete Reference C++”, 4th Edition, TMH, 2017.
2.	Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson Education India, 3rd Edition, 2013.
3.	Debasis Samanta, “Classic Data Structures”, Prentice Hall of India, 2nd Edition, 2014.
Reference Books:	
1.	Bjarne Stroustrup, “The C++ programming language”, Addison Wesley, 4th Edition, 2013.
2.	Seymour Lipschutz, “Data Structures by Schaum Series”, 2nd Edition, Tata McGraw Hill, 2013.
3.	Narasimha Karumanchi, “Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles”, 5th Edition, Career Monk, 2016.
4.	Michael Goodrich, Roberto Tamassta, Michael H.Gold Wasser “Data structures and algorithms in Java”, 6th Edition, 2014.
Web References:	
1.	https://nptel.ac.in/
2.	https://visualgo.net/en
3.	https://www.codechef.com/
Online Resources:	
1.	https://www.coursera.org/learn/c-plus-plus-a
2.	https://www.coursera.org/learn/c-plus-plus-b
3.	https://www.coursera.org/specializations/data-structures-algorithms
4.	https://nptel.ac.in/courses/106/102/106102064/
5.	https://www.hackerrank.com/domains/data-structures

Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy					
Summative assessment based on Continuous and End Semester Examination					
Revised Bloom's Level	**Continuous Assessment**				**End Semester Examination (Theory) [40 marks]**
	Theory			**Practical**	
	CIA-1 [10 marks]	**CIA-2 [10 marks]**	**CIA-3 [10 marks]**	**Rubric based CIA [30 Marks]**	
Remember	40	20	10	10	20
Understand	30	30	30	30	30
Apply	30	50	60	60	50
Analyse					
Evaluate					
Create					

Course Outcomes (CO)	**Programme Outcomes (PO)**												**Programme Specific Outcomes (PSO)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C301.1	3	3	2	2	2				2			2	3	2	2
C301.2	3	3	2	2	2				2			2	3	2	2
C301.3	3	3	2	2	2				2			2	3	2	2
C301.4	3	3	2	2	2				2			2	3	2	2

20CS302	OPERATING SYSTEMS *(COMMON TO CSE / IT)*	3/0/2/4

Nature of Course	G - Theory Analytical
Pre requisites	Nil

Course Objectives:

1.	To describe the structure and functions of Operating System.
2.	To describe the mechanisms of Operating Systems to handle processes and threads.
3.	To explore the various scheduling policies and to provide solutions for critical section and deadlock problems.
4.	To identify the mechanisms involved in Memory management and its schemes.
5.	To analyze the File systems, Device Management and security issues.

Course Outcomes:

Upon completion of the course, students shall have ability to

C302.1	Identify the basic concepts and operations of operating systems.	[U]
C302.2	Illustrate the Process management concepts including scheduling, Inter process communication, deadlocks and multithreading in real world problems.	[AP]
C302.3	Apply concepts of memory management including Virtual Memory and Page Replacement to the issues that occur in Real time applications.	[AP]
C302.4	Analyze the concepts related to file system interface, implementation, disk management, protection and security mechanisms.	[A]
C302.5	Learning principles of Multicore operating systems	[U]

Course Contents

Introduction: **15 Hours**

Need for Operating Systems - Computer Systems - OS Operations - Abstract view of OS - Virtualization - Computing Environments - OS Services - OS Structures - System Calls - Building and Booting OS - Process - Threads - Multithreading.

Process and Memory Management: **15 Hours**

Process Scheduling - Process Co-ordination – Inter process communication - Synchronization - Semaphores - Monitors - Hardware Synchronization - Deadlocks - Methods for Handling Deadlocks. Memory Management Strategies - Contiguous and Non-Contiguous allocation - Virtual memory Management - Demand Paging - Page Placement and Replacement Policies.

File and Device Management: **15 Hours**

File-System Interface: File concept - Access methods - Directory Structure - Directory organization- File system mounting - File Sharing and Protection; File System Implementation: File System Structure- Directory implementation- Allocation Methods- Free Space Management; Mass Storage Structure - Disk Scheduling - Disk Management - I/O Systems - System Protection and Security.

Case Study: - Multicore systems: Basic System and Processor Architecture- Multi-core Processors - Moving to Multi-core Intel Architecture- Scalar Optimization & Usability- Parallel Optimization Using Threads.	
Total Hours:	**45**

Laboratory Component:

S. No	List of Experiments
1.	Analysis and Synthesis of Basic Linux Commands.
2.	Programs using Shell Programming.
3.	Implementation of Unix System Calls.
4.	Simulation and Analysis of Non-Preemptive and Preemptive CPU Scheduling Algorithms.
5.	i. Simulation of Producer – Consumer Problem using Semaphores. ii. Implementation of Dining Philosopher's Problem to demonstrate Process Synchronization.
6.	Simulation of Banker's Algorithm for Deadlock Avoidance.
7.	Analysis and Simulation of Memory Allocation and Management Techniques.
8.	Implementation of Page Replacement Techniques.
9.	Simulation of Disk Scheduling Algorithms.
10.	Implementation of File organization Techniques.
Total Hours:	**30**

Text Books:

1.	Abraham Silberschatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts" 10th Edition, John Wiley, 2018.
2.	D.M Dhamdhere, "Operating Systems"- A Concept based Approach, 3rd Edition, McGraw Hill, 2017.

Reference Books:

1.	Andrew S. Tanenbaum, Modern Operating Systems 5th Edition, Pearson Education, 2016.
2.	William Stallings, "Operating Systems – Internals and Design Principles", 8th Edition, Pearson Publications, 2014.

Web References:

1.	http://geeksforgeeks.org/Operating Systems
2.	https://www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/

Online Resources:

1.	https://www.coursera.org/learn/os-power-user
2.	https://nptel.ac.in/courses/106108101/
3.	https://learn.saylor.org/course/CS401

Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy					
Summative assessment based on Continuous and End Semester Examination					
Revised Bloom's Level	**Continuous Assessment**				**End Semester Examination (Theory) [40 Marks]**
	Theory			**Practical**	
	CIA – 1 [10 Marks]	**CIA – 2 [10 Marks]**	**CIA – 3 [10 Marks]**	**Rubric based CIA [30 Marks]**	
Remember	20	20	20	10	20
Understand	30	20	20	30	20
Apply	50	60	30	30	30
Analyze	-	-	30	30	30
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

Course Outcomes (CO)	**Programme Outcomes (PO)**												**Programme Specific Outcomes (PSO)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C302.1	2	2	2						2	2		2	2	2	2
C302.2	3	3	3						3	3		3	3	3	3
C302.3	3	3	3						3	3		3	3	3	3
C302.4	3	3	3						3	3		3	3	3	3
C302.5	3	3	3						3	3		3	3	3	3

20CS401	DATABASE MANAGEMENT SYSTEMS *(COMMON TO CSE / IT / AI&DS)*	3/0/0/3

Nature of Course	G (Theory Analytical)
Pre requisites	Nil

Course Objectives:

1	To distinguish the different types of data models and use ER diagram to conceptualize the database system.
2	To illustrate the implementation of relational database design concepts using SQL
3	To employ the normalisation concepts to improve the database design.
4	To explain the techniques for query evaluation and optimization.
5	To discuss the various concurrency control techniques and recovery schemes for transaction processing

Course Outcomes:

Upon completion of the course, students shall have ability to:

C401.1	Differentiate database system with file system and design ER diagram for the real-world scenarios.	[U]
C401.2	Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.	[AP]
C401.3	Apply different normal forms to retrieve the data efficiently by removing anomalies	[AP]
C401.4	Demonstrate the different storage structures and accessing techniques.	[U]
C401.5	Apply the techniques for query optimization and evaluation of algebraic expressions.	[AP]
C401.6	Examine the concepts of Transaction processing, concurrency locking protocols and understand the basics of NoSQL.	[A]

Course Contents:

Data Modeling and Relational Query Language **20 Hours**

Introduction– File systems vs Database systems- Users of database systems- Three level DBMS Architecture and Data Abstraction- Data Independence-Database system architecture –Introductions to data models –Hierarchical Model-Network model-Object oriented model- Entity–Relationship mode-Relational Model –Relational Algebra – Relational Calculus – Fundamental operations - SQL constructs - DDL,DML,TCL,DCL - Keys and Integrity constraints – Views – Joins - Writing optimized queries - Introduction to PL/SQL – Procedures – Functions – Triggers - Cursor.

Relational Database Design, Storage Techniques and Query Processing **15 Hours**

Introduction – Functional Dependency-Types of functional dependency-Closure- Undesirable Properties of Relations –Normal forms (1NF, 2NF 3NF & BCNF)- Desirable properties of Decompositions -Indexing and Index types – B+ Tree- Hashing – Static Hashing – Dynamic Hashing- Introduction to Query Processing – Steps in query processing – Query Optimization techniques - Issues in query optimization.

Transactions and Advanced concepts **10 Hours**

Transaction Concepts – Transaction model – ACID Properties – Serializability- Concurrent transactions - Concurrency control – Lock based protocols- Failure classification - Recovery schemes - Distributed databases - Introduction to NoSQL - NoSQL categories – MongoDB

Total Hours:	**45**

Text Books:	
1.	Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, 7th Edition, Tata McGraw Hill, March 2019.
2.	Gupta G K, “Database Management Systems”, Tata McGraw Hill Education Private Limited, New Delhi, 2011.
Reference Books:	
1.	Ramez Elmasri, Shamkat, B.Mavathe, “Database Systems”, 6th Edition, Pearson Education, 2013.
2.	Michael McLaughlin, “Oracle Database 12c PL/SQL Programming”, Tata McGraw Hill Education Private Limited, New Delhi, 2014.
3.	Gaurav Vaish, “Getting Started with NoSQL”, Packt Publishing, March 2013.
Web References:	
1.	http://www.sqlcourse.com/
2.	http://www.edureka.co/mongodb
3.	https://alison.com/courses/IT-Management-Software-and-Databases
Online Resources:	
1.	https://www.coursera.org/learn/database-management
2.	https://www.udemy.com/database-management-system/
3.	http://www.nptelvideos.in/2012/11/database-management-system.html

Assessment Methods & Levels (based on Bloom’s Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom’s Level	Assessment Component	Marks
C401.1, C401.5, C401.6	Apply	Quiz	5
C401.2, C401.3, C401.4	Apply	Assignment	10
C401.6	Analyze	Case Study	5

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Continuous Assessment (30)			End Semester Examination [50 marks]
	CIA-1 [10 marks]	CIA-2 [10 marks]	CIA-3 [10 marks]	
Remember	30	20	20	20
Understand	30	40	20	20
Apply	40	40	20	40
Analyse	-	-	40	20
Evaluate	-	-	-	-
Create	-	-	-	-

Formative Assessment	Summative Assessment		Total
	Continuous Assessment	End Semester Examination	
20	30	50	100

Course Outcomes (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C401.1	2	2	2								2	2	2	2	2
C401.2	2	2	2								2	2	2	2	2
C401.3	2	2	2								2	2	2	2	2
C401.4	2	3	3								2	2	2	3	2
C401.5	3	3	3								2	3	3	2	2
C401.6	3	3	2								3	3	2	3	2

20IT401	COMPUTATIONAL BIOLOGY *(COMMON TO CSE / IT)*	3/0/0/3
Nature of Course	D (Theory Application)	
Pre requisites	Nil	
Course Objectives:		
1.	To familiarize the students with the basic organization of organisms and subsequent building to a living being.	
2.	To gain insights from varied backgrounds of engineering, computer science, and the life sciences.	
3.	To provide basic knowledge on nature inspired computing techniques.	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C401.1	Define biological cell structure and its functions.	[R]
C401.2	Describe protein structure and its synthesis.	[U]
C401.3	Summarize different biological databases.	[U]
C401.4	Interpret different prediction strategies on biological data.	[AP]
C401.5	Demonstrate the application of evolutionary computing and artificial neuro and immune systems.	[AP]
C401.6	Apply swarm intelligence and ant colony optimization techniques.	[AP]

Course Contents:

Introduction Databases, Tools and Uses **15 Hours**

Introduction: Methods of Science-Living Organisms: Cells and Cell theory, Cell Structure and Function, Genetic information, protein synthesis, and protein structure, Cell metabolism – Homoeostasis - Cell growth, reproduction, and differentiation. Applications of Bioinformatics, importance of biological databases, Types of biological databases, analysis packages.

Biochemistry, Immune System, Predictive methods **15 Hours**

Biological Diversity-Chemistry of life: chemical bonds-Biochemistry and Human biology-Protein synthesis - Stem cells and Tissue engineering, Nervous system-Immune system-General principles of cell signaling. predictions Gene strategies, protein prediction strategies, molecular visualization tools.

Nature Inspired Computing Techniques **15 Hours**

Artificial neural networks :Biological motivation - Design principles, Scope of artificial neural networks, Current trends and open problems, Evolutionary computing: Biological motivation, Design principles, Scope of evolutionary computing , Current trends and open problems Swarm intelligence: biological motivation, basic ant colony optimization algorithm, basic particle swarm optimization algorithm, Scope of swarm intelligence, Current trends and open problems Artificial immune systems: Biological motivation, Design principles, Scope of artificial immune systems, Current trends and open problems.

Total Hours:	**45**

Text Books:

1.	S.C.Rastogi, Namita Mendiratta, Parag Rastogi, “Bioinformatics: Methods and Applications (Genomics, Proteomics and Drug Discovery)”, PHI Learning Pvt. Ltd, 2013.
2.	S. ThyagaRajan, N. Selvamurugan, M. P. Rajesh, R. A. Nazeer, Richard W. Thilagaraj, S. Barathi, and M. K. Jaganathan, “Biology for Engineers”, Tata McGraw-Hill, New Delhi, 2012.

3.	Leandro Nunes de Castro, "Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007.
Reference Books:	
1.	Andreas D Baxevanis B, F Francis, "Bioinformatics- A practical guide to analysis of Genes & Proteins", John Wiley, 3rd edition, 2009.
2.	C S V Murthy," Bioinformatics", Himalaya Publishing House, 1st Edition, 2016.
3.	David W. Mount, "Bioinformatics sequence and genome analysis", Cold spring harbor laboratory press, 2004.
4.	S. Ignacimuthu, S.J., "Basic Bioinformatics", Narosa Publishing House, 2013.
5.	Jeremy M. Berg, John L. Tymoczko and Lubert Stryer, "Biochemistry," W.H. Freeman and Co. Ltd., 6th Edition, 2006.
6.	Robert Weaver, "Molecular Biology," McGraw-Hill, 5th Edition, 2012.
7.	Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, 2008.
Web References:	
1.	https://www.coursera.org/specializations/bioinformatics
2.	https://nptel.ac.in/courses/102/106/102106068/
Online Resources:	
1.	https://ocw.mit.edu/courses/health-sciences-and-technology/hst-508-genomics-and-computational-biology-fall-2002
2.	https://dspace.mit.edu/bitstream/handle/1721.1/103560/6-047-fall-2008/contents/lecture-notes/index.htm
3.	https://www.cs.helsinki.fi/bioinformatiikka/mbi/courses/08-09/itb/lectures/itb0809-slides-p1-431.pdf
4.	https://nptel.ac.in/courses/121/106/121106008/
5.	https://courses.cs.washington.edu/courses/cse466/05sp/pdfs/lectures/10-EvolutionaryComputation.pdf

Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Level	Continuous Assessment			End Semester Examination (Theory) [50 marks]
	Theory			
	CIA-1 [10 marks]	CIA-2 [10 marks]	CIA-3 [10 marks]	
Remember	50	30	20	30
Understand	50	50	40	30
Apply		20	40	40
Analyse				
Evaluate				
Create				

Assessment Methods & Levels based on Bloom's Taxonomy

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
C401.1	Remember	Online quiz	5
C401.2, C403.3	Understand	Case Study	5
C401.4, C401.5, C401.6	Apply	Assignment on Tools and Packages	10

Formative Assessment	Summative Assessment		Total
	Continuous Assessment	End Semester Examination	
20	30	50	100

Course Outcomes (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C401.1	3	3	3	3	1	1	1	1			1	1	2	2	2
C401.2	3	3	3	3	1	1	1	1			1	1	2	2	2
C401.3	3	3	3	3	1	1	1	1			1	1	2	2	2
C401.4	3	3	3	3	1	1	1	1			1	1	2	2	2
C401.5	3	3	3	3	1	1	1	1			1	1	3	2	2
C401.6	3	3	3	3	1	1	1	1			1	1	3	2	2

20IT402	DESIGN AND ANALYSIS OF ALGORITHMS *(COMMON TO CSE / IT)*	3/0/0/3
Nature of Course	F (Theory Programming)	
Pre requisites	C++ and Advanced Data Structures	

Course Objectives:

1.	To understand the techniques for analyzing the computer algorithms.
2.	To learn the paradigms for designing the algorithms.
3.	To analyze the efficiency of various algorithm design techniques / paradigms for the same problem.
4.	To understand the limitations of algorithmic power.

Course Outcomes

Upon completion of the course, students shall have ability to

C402.1	Recognize the general principles and good algorithm design techniques for developing efficient algorithms.	[R]
C402.2	Estimate the time and space complexities of algorithms.	[U]
C402.3	Apply the mathematical preliminaries to analysis and design stages of different types of algorithms.	[AP]
C402.4	Analyze efficient algorithms for various problems.	[AN]
C402.5	Distinguish the time and space complexities of different types of algorithms.	[AN]
C402.6	Differentiate between different data structures and pick an appropriate data structure for a design situation.	[AN]

Course Contents:

Fundamentals of Algorithm Analysis: 15 Hours

Notion of an Algorithm – Importance & role of algorithms in computing – General steps in Algorithmic problem solving – Analysis of Algorithm efficiency: Analysis Framework or Parameters, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis for Non- Recursive and Recursive Algorithms, Empirical Analysis of Algorithm. Brute Force Approach: Selection Sort - Bubble Sort - Sequential Search - String Matching - Boyer Moore algorithm.

Advanced Design Paradigms: 15 Hours

Decrease and Conquer Technique: Insertion sort - Topological sort. Divide and Conquer Technique: Merge sort - Quick sort - Binary search - Strassen's Matrix Multiplication. Dynamic Programming: Knapsack Problem and Memory functions - Optimal Binary Search Trees - Warshall's and Floyd's Algorithms- Matrix chain multiplication problem. Greedy Technique: Prims Algorithms - Kruskal's Algorithm - Dijkstra's Algorithm - Huffman Trees and Codes – Sparse Matrix - Bloom Filter.

Limitations and Coping with the Limitations of Algorithm Power: 15 Hours

Lower - Bound Arguments -P, NP and NP-Complete Problems. Backtracking: n-Queen Problem - Hamiltonian Circuit Problem - Subset Sum Problem. Branch and Bound Technique: Assignment Problem - Knapsack Problem - Travelling Salesman Problem. Approximation Algorithms: Vertex-cover problem - Travelling Salesman Problem.

Total Hours:	**45**

Text Books:

1.	Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Publications, 3rd Edition, 2012.
2.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", MIT Press, 3rd Edition, 2009.

Reference Books:	
1.	Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, “Computer Algorithms/ C++”, 2nd Edition, Universities Press, 2019.
2.	Sara Baase and Allen Van Gelder, “Computer Algorithms: Introduction to Design and Analysis”, Pearson Publications, 3rd Edition, 2008.

Web References:	
1.	https://www.cs.usfca.edu/~galles/visualization/Algorithms.html
2.	https://www.coursera.org/learn/introduction-to-algorithms
3.	https://timroughgarden.org/videos.html

Online Resources:	
1.	https://onlinecourses.nptel.ac.in/noc19_cs47/preview
2.	https://www.csa.iisc.ac.in/~barman/daa18/E0225.html
3.	https://freevideolectures.com/course/2281/design-and-analysis-of-algorithms

Tentative Assessment Methods & Levels (based on Revised Bloom’s Taxonomy)

Formative assessment based on Capstone Model (Max. Marks: 20)

Course Outcome	Bloom’s Level	Assessment Component	Marks
C402.1, C402.2	Remember, Understand	Quiz	10
C402.3	Apply	Quiz	
C402.4, C402.5	Analyze	Tutorial	10
C402.6	Analyze	Tutorial	

Summative assessment based on Continuous and End Semester Examination

Revised Bloom’s Level	Continuous Assessment Theory			End Semester Examination (Theory) [50 marks]
	CIA-1 [10 marks]	CIA-2 [10 marks]	CIA-3 [10 marks]	
Remember	50		10	10
Understand	50		10	10
Apply	-	50	40	40
Analyse	-	50	40	40
Evaluate	-	-	-	-
Create	-	-	-	-

Formative Assessment	Summative Assessment		Total
	Continuous Assessment	End Semester Examination	
20	30	50	100

Course Outcomes (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C402.1	3	2	2		2						2	1	3	2	1
C402.2	3	2	3		2							1	3	2	1
C402.3	3	3	3		2						1	1	3	2	1
C402.4	3	2	3		2							1	3	2	2
C402.5	3	2	2	1	2							2	3	2	2
C402.6	3	2	2									1	3	2	2

20MA404	RANDOM VARIABLES AND STATISTICS *(COMMON TO CSE / IT / AI & DS)*	2/1/2/4

Nature of Course	J (Problem analytical)
Pre requisites	Concepts of basic differentiation and Integration

Course Objectives:

1	To study the basic probability concepts
2	To understand and have a well – founded knowledge of standard distributions which can be used to describe real life phenomena
3	To acquire skills in handling situations involving more than one random variable
4	To learn the concept of testing hypothesis using statistical analysis
5	To apply the Analysis of variance classifications in one way and two way

Course Outcomes:

Upon completion of the course, students shall have ability to

C404.1	Recall the concepts of basic probability	[R]
C404.2	Understand how to handle situations involving random variable	[U]
C404.3	Applying different pattern of standard distributions in real life problems.	[AP]
C404.4	Use distribution in cluster analysis of similar binary variables	[AP]
C404.5	Derive the logic and attain the knowledge of hypothesis testing.	[AP]
C404.6	Apply the analytical comparisons using ANOVA.	[AP]

Course Contents:

Probability and Random Variables **15 hours**

Probability: Probability concepts - Addition and Multiplication law of probability – Conditional probability - Total probability theorem - Bayes theorem – **Random Variables:** One dimensional random variable - Discrete random variables -Probability mass function - Continuous random variables - Probability density function- Moment generating Function.

Standard Distributions **15 hours**

Standard distributions: Discrete distributions - Binomial – Poisson – Geometric – Continuous distributions - Uniform – Exponential - Normal distributions –**Two dimensional random variables**: Joint distributions - Marginal and conditional distributions – Covariance – Correlation- Regression- Applications of two dimensional random variables in Machine learning.

Statistics **15 hours**

Mean, median, mode and standard deviation for raw, discrete and continuous data - Testing of Hypothesis: Large sample - Z test -Test of significance - Proportions - Small sample test – t test and F test for single mean – difference of means and variance - Chi-square test for goodness of fit and independence of attributes. **Analysis of variance**: One way and two way classifications.

Total Hours:	**45**

Course Outcomes: (Laboratory)

Upon the completion of the course, students shall have ability to

C404.1	Understand the use of R for Big Data analytics.
C404.2	Demonstrate the Data frame from vectors.
C404.3	Analyze and interpret results from correlation and regression.

C404.4	Understand the basic concepts of distributions and find an appropriate distribution for analyzing data specific to an experiment.
C404.5	Explore the types of plots and to represent with the help of functions.
C404.6	Understand to perform the extensive hypothesis tests for one and two samples.

Laboratory Component:

S. No	List of Experiments	CO Mapping	RBT
1.	To perform importing and exporting data using suitable Mathematical software.	C404.1	[AP]
2.	To perform with Vectors and Matrices using suitable Mathematical software.	C404.2	[AP]
3.	To plot Data frames using suitable Mathematical software.	C404.2	[AP]
4.	To Compute Summary Statistics, plotting and visualizing data using Tabulation and Graphical Representations using suitable Mathematical software.	C404.5	[AP]
5.	To solve correlation and simple linear regression model to real dataset using suitable Mathematical software.	C404.3	[AP]
6.	To Fit the following probability distribution: Binomial distribution using suitable Mathematical software.	C404.4	[AP]
7.	To Fit the following probability distribution: Poisson distribution using suitable Mathematical software.	C404.4	[AP]
8.	To Fit the following probability distribution: Normal distribution using suitable Mathematical software.	C404.4	[AP]
9.	To test of hypothesis for One sample mean and proportion from real-time problems using suitable Mathematical software.	C404.6	[AP]
10.	To test of hypothesis for Two sample mean and proportion from real time problems using suitable Mathematical software.	C404.6	[AP]
11.	To perform the t test for independent and dependent samples using suitable Mathematical software.	C404.6	[AP]
12.	To perform Chi-square test for goodness of fit test and Contingency test to real dataset using suitable Mathematical software.	C404.6	[AP]

Text Books:

1.	Gupta, S.C., &Kapoor, V.K., “Fundamentals of Mathematical Statistics”, Sultan Chand & sons, 2000, Reprint 2014.
2.	Peebles Jr. P.Z., “Probability Random Variables and Random Signal Principles”, Tata McGraw-Hill Publishers, Fourth Edition, New Delhi, 2016 (Chapters 6, 7 and 8).
3.	Palaniammal, S., “Probability and Random Processes”, Prentice hall of India, New Delhi, 2014.

Reference Books:

1.	Ross, S., “A First Course in Probability”, Ninth edition, Pearson Education, Delhi, 2014.
2.	Henry Stark and John W. Woods “Probability and Random Processes with Applications to Signal Processing”, Third Edition, 2001.
3.	Richard A. Johnson, Irwin Miller, John Freund, “Miller & Freund's Probability and Statistics for Engineers”, Ninth Edition, 2016.
4.	R for Everyone: Advanced Analytics and Graphics, Jared P. Lander.
5.	Hands-on Programming with R, Garrett Grolemund.

Web References:	
1.	http://nptel.ac.in/courses/111104079/
2.	http://nptel.ac.in/video.php/subjectId=117105085
3.	http://nptel.ac.in/syllabus/111105041/
4.	http://freevideolectures.com/Course/3028/Econometric-Modelling/22#
5.	http://nptel.ac.in/courses/111104079/
Online Resources:	
1.	www.edx.org/Probability
2.	https://ocw.mit.edu/courses/.../18-440-probability-and-random-variables-spring-2014/
3.	https://onlinecourses.nptel.ac.in/noc15_ec07/

Assessment Methods & Levels (based on Blooms' Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment				End Semester Examination (Theory) [40 marks]
	Theory			Practical& Project	
	CIA-I [10 marks]	CIA-II [10 marks]	CIA-III [10 marks]	Rubric based CIA [30 Marks]	
Remember	20	20	20	20	20
Understand	30	30	30	30	30
Apply	50	50	50	50	50
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

Course Outcomes (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C404.1	1	1			3								1		
C404.2	2	2			3								1		
C404.3	3	3			3										
C404.4	3	3			3								1		
C404.5	3	3			3										
C404.6	3	3			3								1		

20EC411	FUNDAMENTALS OF DATA AND MOBILE COMMUNICATIONS	3/0/2/4

Nature of Course	H (Theory Technology)

Course Objectives:

1.	To understand the key modules of digital communication systems with emphasis on digital modulation techniques.
2.	To introduce the principles of basics of source and channel coding/decoding and Spread Spectrum Modulation.
3.	To enable the students to understand the mobile radio communication principles, types and to study the recent trends adopted in cellular and wireless systems and standards.

Course Outcomes:
Upon completion of the course, students shall have ability to

C411.1	Review the knowledge of basic communication systems and its principles.	[U]
C411.2	Analyze the digital communication system with spread spectrum modulation.	[A]
C411.3	Apply the error control codes like Linear Block codes, Hamming codes, Cyclic codes, Convolutional codes, Vitterbi Decoder.	[AP]
C411.4	Describe the cellular concept and capacity improvement Techniques.	[U]
C411.5	Understand the latest trends in wireless communication.	[U]

Course Contents:

Base band transmission: **15 Hours**
Basics of communication systems, Need for modulation, Sampling theorem, Pulse code modulation (PCM), Delta Modulation, Data transmission using analog carrier (BFSK, BPSK, QPSK). Comparison of various digital Communication system

Error control coding: **15 Hours**
Channel Coding theorem – Linear Block codes – Hamming codes – Cyclic codes – Convolutional codes – Vitterbi Decoder

Introduction to Wireless Communication: **15 Hours**
Cellular concept, System design fundamentals, Coverage and Capacity improvement in Cellular system. Multiple access techniques: FDMA, TDMA and CDMA, OFDM. Latest trends: GSM 4G(LTE), WLAN technology, IEEE 802.11- Wi-Fi and HiperLAN, RFID technology.

Total Hours: 45

Lab Component:

S. No.	List of Experiments
1.	Simulation of Amplitude modulation and Frequency modulation
2.	Simulation of Amplitude Shift Keying
3.	Simulation of Frequency Shift Keying
4.	Simulation of Phase Shift Keying
5.	Simulation of Binary Frequency Shift keying
6.	Simulation of Binary Phase Shift keying

7.	Simulation of Quadrature Phase Shift keying
8.	Line Coding Techniques
9.	Error Control Coding
	Total Hours: 30
Text Books:	
1.	S. Haykin, “Digital Communications”, John Wiley, 2nd Edition, 2014
2.	T.S. Rappaport, “Wireless Communication Principles”, 2nd Edition, Pearson, 2010.
3.	A.F.Molisch, “Wireless Communications”, Wiley, 2nd Edition, 2010.
4.	Jochen Schiller, “Mobile Communications”, Addison Wesley, 2nd Edition, 2011.
Reference Books:	
1.	P.Muthu Chidambaranathan, “Wireless Communications”, PHI, 2010
2.	A.Goldsmith, “Wireless Communications”, Cambridge University Press, 2005.
3.	J.G.Proakis, “Digital Communication” , Tata McGraw – Hill, 4th Edition, 2014.
4.	R.E.Zimer, R.L.Peterson, “Introduction to Digital Communication”, PHI, 3rd Edition, 2001.
5.	Holger Karl and Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley, 3rd Edition, 2005.
6.	B.Sklar, “Digital Communications: Fundamentals & Applications”, Pearson Education, 2nd Edition, 2001
Web References:	
1.	https://ieeexplore.ieee.org/document/8246822
2.	https://nptel.ac.in/courses/117102059/
3.	https://ocw.mit.edu/courses/aeronautics-and-astronautics/16-36-communication-systems-engineering-spring-2009/lecture-notes/
Online Resources:	
1.	https://ce.uci.edu/areas/engineering/networks/
2.	http://scpd.stanford.edu/search/publicCourseSearchDetails.do?method=load&courseId=12075
3.	https://www.edx.org/course/system-view-communications-signals-hkustx-elec1200-1x-1
4.	https://www.udemy.com/introduction-to-wireless-communications/

Summative assessment based on Continuous and End Semester Examination					
Bloom’s Level	**Continuous Assessment**				**End Semester Examination [40 marks]**
	CIA-I [10 marks]	**CIA-II [10 marks]**	**CIA-III [10 marks]**	**PRACTICAL RUBRIC BASED CIA(30)**	
Remember	-	-	-	-	-
Understand	50	30	50	30	40
Apply	30	30	40	30	30
Analyse	20	40	10	30	30
Evaluate	-	-	-	10	-
Create	-	-	-	-	-

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)															
Course Articulation Matrix															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C411.1	3	3	3	3								2	3	1	2
C411.2	3	3	3	3								2	3	1	2
C411.3	2	3	3	2								2	3	1	1
C411.4	3	3	3	2	3							2	3	3	1
C411.5	2	2	3	1	2								2	2	2

20IT403	WEB AND JAVA PROGRAMMING	3/0/2/4
Nature of Course	F (Theory Programming)	
Pre requisites	Nil	

Course Objectives:

1.	To learn the structure of the internet and the Web.
2.	To understand the basic concepts of Java like Inheritance, Interfaces, multithreading concepts.
3.	To know the fundamental concepts of I/O functionality to code basic file operations, Exception handling and Event handling.
4.	To study and explore the basics of client and server-side programming.

Course Outcomes:

Upon completion of the course, students shall have ability to

C403.1	Describe web concepts, protocols and client server architectures.	[U]
C403.2	Identify and reproduce the features of Object-oriented programming.	[R]
C403.3	Use and experiment exception handling, multithreading and event handling concepts.	[AP]
C403.4	Illustrate and develop a webpage using HTML, XML and Java Script.	[AP]
C403.5	Interpret process application with server-side java programming like Servlets, JSP.	[AP]
C403.6	Analyze web page development using AJAX framework and its interactions.	[AN]

Course Contents:

Basic Web Concepts: **15 Hours**

Overview of Internet - Internet Addressing - Web Browsers – Servers – Protocols - Web Application Architectures, Development – HTML – DHTML – XHTML - Scripting Languages -Databases - Search Engines - Web Services - Collective intelligence -TCP, UDP, HTTP, SMTP - Remote Method Invocation.

Client and Server-Side Programming: **15 Hours**

CSS - Java Script - Objects in Java Script – XML – DTD - XML Schema - Document Object Model - XML Parsers - AJAX Framework - AJAX with PHP - AJAX with Databases – JDBC -Handling Form Data – Validation - Querying databases - Session management.

Java Fundamentals: **15 Hours**

Overview of Java – Objects, Classes and Methods – Arrays – Constructors - Access Specifier - Static members - String Handling - Method Overloading - Method Overriding - Nested and Inner Classes - Inheritance Types – Interfaces - Final Classes and Methods - Abstract Classes – Packages - Exception Handling – Multithreading – Collections - The Stream Classes – Servlets - JSP.

Total Hours	**45**

Laboratory Component:

S. No	List of Experiments
1.	Client-Side Scripts for validating web form controls using DHTML.
2.	Programs using XML Schema.
3.	Programs using AJAX.
4.	Programs using Classes and Methods.
5.	Sort the strings in ascending order using constructors.
6.	Design a package to perform bank transactions.
7.	Programs using interface.
8.	Stack implementation using Exception handling.
9.	Programs using Multithreading.
10.	Library Management System using inheritance.
	Total Hours **30**

Text Books:

1.	Herbert Schildt, “Java: The Complete Reference”, 9th Edition, Mc-Graw Hill, 2014.
2.	Paul Deitel, “Internet & World Wide Web: How to Program”, Pearson, 5th Edition, 2012.
3.	Atul Kahate, “XML and Related Technologies”, Pearson India, 1st Edition, 2009.
4	Bryan Basham, Kathy Sierra, Bert Bates, “Head First Servlets and JSP”, O’Reilly Media, 2011.

Reference Books:

1.	Cay S. Horstmann, “Core Java, Volume I - Fundamentals”,11th Edition, Pearson, 2020.
2.	Cay S. Horstmann, “Core Java, Vol 2 - Advanced Features”, 11th Edition, Pearson, 2020.
3	Robert W. Sebesta, “Programming the World Wide Web”, Pearson, 8th Edition, 2014.

Web References:

1.	https://nptel.ac.in/courses/106/105/106105191
2.	https://www.codecademy.com/learn/learn-java
3.	https://www.coursera.org/specializations/java-programming

Online Resources:

1.	https://www.programiz.com/java-programming

Tentative Assessment Methods & Levels (based on Revised Bloom’s Taxonomy

Summative assessment based on Continuous and End Semester Examination

Revised Bloom’s Level	Continuous Assessment				End Semester Examination (Theory) [40 marks]
	Theory			Practical	
	CIA-1 [10 marks]	CIA-2 [10 marks]	CIA-3 [10 marks]	Rubric based CIA [30 Marks]	
Remember	30	30	20	-	20
Understand	40	30	30	30	30
Apply	30	30	50	70	40
Analyse		10			10
Evaluate					
Create					

Course Outcomes (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C403.1	3	3	3	3	3	3	1	1			1	1	3	3	3
C403.2	3	3	3	3	3	3	1	1			1	1	3	3	3
C403.3	3	3	3	3	3	3	1	1			1	1	3	3	3
C403.4	3	3	3	3	3	3	1	1			1	1	3	3	3
C403.5	3	3	3	3	3	3	1	1			1	1	3	3	3
C403.6	3	3	3	3	3	3	1	1			1	1	3	3	3

20CS405	DATABASE MANAGEMENT SYSTEMS LABORATORY *(COMMON TO CSE / IT / AI&DS)*	0/0/3/1.5

Nature of Course	M (Practical Application)
Pre requisites	Nil

Course Objectives:

1.	To learn the fundamentals of data models to conceptualize and depict a database system using ER diagram.
2.	To discuss the implementation of Relational database using structured query language
3.	To practice the procedural extensions such as Procedures, functions, triggers and cursors.
4.	To develop an application using front end and back-end tools.

Course Outcomes:
Upon completion of the course, students shall have ability to:

C405.1	Design an ER diagram for real world applications.	[AP]
C405.2	Interpret and query a database using SQL-DDL, DML Commands.	[AP]
C405.3	Employ PL/SQL blocks such as stored procedures, functions, triggers and cursors.	[AP]
C405.4	Implement and evaluate a real database application using front end and back end.	[AP]
C405.5	Create a document database using NoSQL.	[AP]

Course Contents:

1. Conceptual Database design using E-R DIAGRAM.
2. Implementation of SQL commands DDL, DML, DCL and TCL.
3. Queries to demonstrate implementation of Integrity Constraints.
4. Practice of Inbuilt functions.
5. Implementation of Simple queries.
6. Implementation of Nested queries.
7. Implementation of Join and Set operators.
8. Implementation of virtual tables using Views.
9. Practice of named PL/SQL blocks (Procedure, Function).
10. Implementation of Triggers using PL/SQL.
11. Implementation of cursors using PL/SQL.
12. Application Development using front end tools and database connectivity.
13. Study of MongoDB.
14. Document Database creation using MongoDB.
15. Study of Cloud Storage.

Total Hours:	**45**

Text Books:	
1	Gupta G K, “Database Management Systems”, Tata McGraw Hill Education Private Limited, New Delhi, 2011.
2	Peter rob, Carlos Coronel, “Database Systems – Design, Implementation and Management”, 9th Edition, Thomson Learning, 2009.
3	Michael McLaughlin, “Oracle Database 12c PL/SQL Programming”, Tata McGraw Hill Education Private Limited, New Delhi, 2014.
4	Gaurav Vaish, “Getting Started with NoSQL”, Packt Publishing, March 2013.
Reference Books:	
1	Jonathan Gennick, SQL Pocket Guide, 3rd Edition, O'Reilly Media, Inc., Nov 2010.
2	Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, 4th Edition, Pearson / Addision wesley, 2007.
3	Rosenzweig ,”Oracle PL/SQL”, Pearson Education India; 5th Edition, 2015.
Web References:	
1	www.tutorialspoint.com/dbms/
2	https://www.javatpoint.com/dbms-tutorial
3	https://www.w3schools.com/sql/
Online Resources:	
1	https://nptel.ac.in/courses/106/106/106106093/
2	https://www.coursera.org/learn/intro-sql

Assessment Methods & Levels (based on Blooms’ Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	**Rubric based Continuous Assessment (60)**	**End Semester Examination (40)**
Remember	20	20
Understand	20	20
Apply	60	60
Analyse	-	-
Evaluate	-	-
Create	-	-

Course Outcomes (CO)	**Programme Outcomes (PO)**												**Programme Specific Outcomes (PSO)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C405.1	3	3	3		3			2	3	2		3	2	3	3
C405.2	3	3	3		3			2	3	2		3	2	3	3
C405.3	3	3	3		3			2	3	2		3	2	3	3
C405.4	3	3	3		3			2	3	2		3	2	3	3
C405.5	3	3	3		3			2	3	2		3	2	3	3

20MC103	SOFT SKILLS	2/0/0/0
Nature of Course:	Theory Concept	
Pre requisites:	Technical Communication Skills	

Course Objectives:

1.	To develop the students competency level and their capabilities.
2.	To teach the students to be effective in workplace and social environments.
3.	To create self confidence among the students and to resolve stress and conflict within themselves.
4.	To help the students to enhance their career skills by increasing their productivity and performances.
5.	To concentrate more on conversation skills, presentation skills, verbal ability, critical and creative thinking.

Course Outcomes:
Upon completion of the course, students shall have ability to

C103.1	Remember the principles of soft skills required for their profession.	[R]
C103.2	Understand the importance of Interpersonal communication Skills among individuals, groups and cultures.	[U]
C103.3	Apply verbal and non-verbal communication skills in corporate environment.	[AP]
C103.4	Analyse and apply creativity skills, critical thinking skills and problem solving skills.	[AN]
C103.5	Articulate oral and written messages in an appropriate and persuasive manner to suit specific purposes, audiences and contexts at work place.	[AP]
C103.6	Apply good teamwork skills and Leadership Skills	[AP]

Course Contents:

Module 1: Professional Communication Skills **10 Hours**

Introduction to the Soft Skills, Performance Evaluation 1 – Significance of Soft Skills - Understanding the basic Communication Principles –Listening Skills- Listening Exercises- Speaking Skills- How to start and Sustain a Conversation- Speaking in Groups- Understanding self and Personal Branding, attitude, types of attitude, Positive Attitude, Self Confidence and Self-Motivation - Personal Application/Action Taken. Advanced Writing Skills-Principles of Business Writing- E mails- Writing Reports- Types of Reports- Strategies for Report Writing- Personal Application/Action Taken. Verbal Ability- Analogy- Classification- Odd One Out- Idioms and Phrases- Sentence Correction- Empathy and its importance in career -Personal Application/Action Taken.

Module 2: Interpersonal Communication **10 Hours**

Nonverbal Communication- Individual, Groups and Cultures- Body Language- Attire and Etiquettes- Interpersonal Skills- dealing with diverse People- Networking- Emotional Intelligence and its importance. Personal Application/Action Taken. Developing Creativity- Critical Thinking and Problem Solving Skills- Making the Right Choice- Never Give Up- Begin to Grow- Personal Application/Action Taken. Interviews- Facing Job Interviews - Planning and Preparing- Effective Resume along with Covering Letter- Planning and Preparing- Personal Application/Action Taken. Self-Discipline - Self Presentation - Personal Application/Action Taken.

Module 3: Teamwork and Leadership Skills **10 Hours**

Industry Expectations- Universal Hiring Rule- Personal Application/Action Taken. Importance of Human Values-Importance of Team Work- Developing Key Traits in Motivation, Persuasion, Negotiation and Leadership Skills- Being an Effective Team Player- Personal Application/Action Taken. Planning- Prioritization - Delegation- Conflict Management- Decision and its necessity in crucial situations- Group Discussion- Personal Application/Action Taken. Essential Skills in working Strategies- Presentation and Interaction Skills- What to Present and How- Being Assertive- Multimedia Presentation-Making Effective Presentations. Interview Skills- Do's and Don'ts - Body Language – Answering the Common Questions of Interview- Performance Evaluation 2- Mock Interview

Total Hours:	**30**

Text Books:	
1.	Penrose, "Business Communication for managers: An advanced approach", Cengage learning.
2.	H.E. Sales, "Professional Communication in Engineering", Palgrave Macmillan 2009.
3.	W. P. Scott, Bertil Billing, "Communication for Professional Engineers", Thomas Telford, 1998.
Reference Books:	
1.	Peter Davson-Galle, "Reason and Professional Ethics", Ashgate Publishing, Ltd., 2009.
2.	William B. Gudykunst, "Cross Cultural and Inter Cultural Communication", Sage Publications India Pvt Ltd, New Delhi, 2003.
3.	Joep Cornelissen, "Corporate Communications: Theory and Practice", Sage Publications India Pvt Ltd, New Delhi, 2004.
Web References:	
1	https://onlinecourses.nptel.ac.in/noc16_hs15/preview
2	https://www.getinternship.switchidea.com/NTAT/syllabus/Interpersonal-Communication.
3	https://smude.edu.in/smude/programs/bca/soft-skills.html
Online Resources:	
1	https://swayam.gov.in/course/4047-developing-soft-skills-and-personality
2	https://www.clearias.com/interpersonal-skills-including-communication-skills-for-csat/
3	https://www.bizlibrary.com/soft-skills-training/

Assessment Methods & Levels (based on Revised Bloom's Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:40)			
Course Outcome	**Revised Bloom's Level**	**Assessment Component**	**Marks**
C103.1	Remember	Group Discussion	10
C103.2 & C103.3	Understand	Listening Skills	10
C103.4	Apply	Interview	10
C103.5 & C103.6	Apply	Formal Presentation	10

Summative assessment based on Continuous Assessment	
Revised Bloom's Level	**Term End Assessment [60 marks]**
Remember	30
Understand	40
Apply	20
Analyse	10
Evaluate	-
Create	-

Course Outcome (CO)	**Programme Outcomes (PO)**												**Programme Specific Outcomes (PSO)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C103.1						1	1	2	2	3	2	2			1
C103.2							1	1	3	3	2	2			1
C103.3									2	3	2	2			1
C103.4						1	1	1	2	3	3	2			1
C103.5						1	1		2	3	2	2			1
C103.6							1	2	3	3	2	2			1

20MC105	GENERAL APTITUDE	2/0/0/0
Nature of Course	Problem analytical	
Pre requisites	Basic Mathematical calculations	

Course Objectives:

1	To ensure that students learn to think critically about mathematical models for relationships between different quantities and use those models effectively to solve problems and reach conclusions about them.
2	To impart skills that enable students to effectively use and interpret data, formulas, and graphs in the workplace.
3	To instills confidence in facing technical aptitude questions interviewed by recruiters.

Course Outcomes:
Upon completion of the course, students shall have ability to

C105.1	To teach the basics of Quantitative Techniques in a graded manner.	[R]
C105.2	Understand the verbal and non-verbal nature of problems in reality and know the shortcut methods of solving it.	[U]
C105.3	Solve problems using their general mental ability.	[AP]
C105.4	To give intense focus on improving and increasing the ability of solving real problems.	[AP]
C105.5	Think critically about mathematical models for relating different quantities to reach conclusion.	[AP]
C105.6	Enable effective use of data interpretation, formulas, graphs and assumptions.	[AP]

Course Contents:

Module 1: Number Theory and Statistics **14 Hours**

Number Systems– HCF and LCM of Numbers – Decimal Fractions – Simplification – Square Root and Cube Root of a number – Surds and Indices – Problems on numbers – Percentage – Ratio and Proportion – Divisibility – Mixtures – Averages- Polynomials – Solving Equations and Inequalities – Discard's rule of signs – Problems on ages – Chain rule – Time and Work – Time and Distance – Problems on Trains – Problems on Boats and Streams- Measures of central tendency – Mean, Median and Mode – Variance and Standard deviation Logarithms – Profit and Loss – Simple Interest – Compound Interest.

Module 2: Logic and Decision Making **8 Hours**

Analogy – Classification – Series completion – Coding and Decoding – Blood Relations – Puzzle Test – Direction Sense test – Logical Venn Diagrams - Number Ranking and Time Sequence Test – Decision Making – Assertion and Reason– Inserting the missing one – Logical Sequence of words – Syllogisms.

Module 3: Reasoning **8 Hours**

Logic – Statement and Arguments – Statements and Assumptions – Statements and Course of Action – Statements and Conclusions – Deriving conclusions from passages – Functions – Different kinds of functions – Miscellaneous sets- Series – Analogy – Classifications – Analytical Reasoning – Problems on Cubes and Dice – Mirror Images – Water Images – Rule Detection.

Total Hours:	**30**

Text Books:

1	Aggarwal R. S, "Quantitative Aptitude" Revised Edition, S. Chand Publication.
2	Abhijit Guha, "Quantitative Aptitude" 5th Edition, McGraw Hill Education.

Reference Books:	
1	Edgar Thorpe “Mental Ability & Quantitative Aptitude” 3rd Edition, McGraw Hill Education.
Web References:	
1	https://www.wiziq.com/tutorial/815468-quantitative-aptitude-reasoning-data-interpretation-video-lectures
2	https://learningpundits.com/contest?referrer=harsh.cse15@nituk.ac.in
3	https://nptel.ac.in/courses/114106041/8
4	https://nptel.ac.in/courses/111103020/2
Online Resources:	
1	http://aptitudetraining.in/home/index.php
2	https://www.udemy.com/vedicmaths/
3	https://www.youtube.com/channel/UCtmn-DsF4BhPug-ff9LiDAA?disable_polymer=true

Tentative Assessment Methods & Levels (based on Revised Bloom’s Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:40)

Course Outcome	Revised Bloom’s Level	Assessment Component	Marks
C105.1	Remember	Classroom or Online Quiz	10
C105.2 & C105.3	Understand	Formal presentation	10
C105.4, C105.5 & C105.6	Apply	Formal interview tests	20

Summative assessment based on Continuous Assessment

Bloom’s Level	Term End Assessment [60 marks]
Remember	20
Understand	40
Apply	40
Analyse	-
Evaluate	-
Create	-

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C105.1	3	3	1												
C105.2	3	2	1												
C105.3	3	3	1												
C105.4	3	2	1										2		
C105.5	3	3	1										2		
C105.6	3	2	1										2		

20MC106	LIFE SKILLS AND ETHICS	2/0/0/0
Nature of Course	Theory Concept	
Pre requisites	Nil	

Course Objectives:

1	To develop communication competence in prospective engineers.
2	To enable them to convey thoughts and ideas with clarity and focus.
3	To develop report writing skills.
4	To equip them to face interview & Group Discussion.
5	To inculcate critical thinking process.
6	To prepare them on problem solving skills.
7	To provide symbolic, verbal, and graphical interpretations of statements in a problem description.

Course Outcomes:

Upon completion of the course, students shall have ability to

C106.1	Define and Identify different life skills required in personal and professional life.	[U]
C106.2	Develop an awareness of the self and apply well-defined techniques to cope with emotions and stress.	[AP]
C106.3	Explain the basic mechanics of effective communication and demonstrate these through presentations.	[AN]
C106.4	Use appropriate thinking and problem solving techniques to solve new problems.	[AP]
C106.5	Understand the basics of teamwork and leadership	[U]

Course Contents:

Communication Skill:
Introduction to Communication, The Process of Communication, Barriers to Communication, Listening Skills, Writing Skills, Technical Writing, Letter Writing, Job Application, Report Writing, Non-verbal Communication and Body Language, Interview Skills, Group Discussion, Presentation Skills, Technology-based Communication.

Critical Thinking & Problem Solving:
Creativity, Lateral thinking, Critical thinking, Multiple Intelligence, Problem Solving, Six thinking hats Mind Mapping & Analytical Thinking. Teamwork: Groups, Teams, Group Vs Teams, Team formation process, Stages of Group, Group Dynamics, Managing Team Performance & Team Conflicts.

Ethics, Moral & Professional Values:
Human Values, Civic Rights, Engineering Ethics, Engineering as Social Experimentation, Environmental Ethics, Global Issues, Code of Ethics like ASME, ASCE, IEEE. **Leadership Skills:** Leadership, Levels of Leadership, Making of a leader, Types of leadership, Transactions Vs Transformational Leadership, VUCA Leaders, DART Leadership, Leadership Grid & leadership Formulation

Total Hours:	**30**

Reference Books:

1	Barun K. Mitra, “Personality Development & Soft Skills”, First Edition, Oxford Publishers, 2011.
2	Kalyana, “Soft Skill for Managers”, 1st Edition, Wiley Publishing Ltd, 2015.
3	Larry James, “The First Book of Life Skills”, 1st Edition, Embassy Books, 2016
4	Shalini Verma, “Development of Life Skills and Professional Practice”, 1st Edition, Sultan Chand (G/L) & Company, 2014
5	John C. Maxwell, “The 5 Levels of Leadership”, Centre Street, A division of Hachette Book Group Inc, 2014.

Web References:	
1	https://www.coursera.org/courses?query=ethics

Assessment Methods & Levels (based on Bloom's Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:40)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C106.1	Remember	Quiz	**5**
C106.2	Understand	Assignment	**15**
C106.3	Understand	Presentation	**10**
C106.4 C106.5	Apply	Group Discussion	**10**

Summative assessment based on Continuous Assessment	
Revised Bloom's Level	**Term End Assessment [60 marks]**
Remember	30
Understand	40
Apply	20
Analyse	10
Evaluate	-
Create	-

Course Outcome (CO)	**Programme Outcomes (PO)**												**Programme Specific Outcomes (PSO)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C106.1								1	2	1		2	1		
C106.2								1	2	1		2	1		
C106.3								2	2	3		1	1		
C106.4								1	1	1		1	3		
C106.5								1	3	2		2	1		

20MC107	STRESS MANAGEMENT	2/0/0/0
Nature of Course	Theory Concept	
Pre requisites	Nil	

Course Objectives:

1	Understand the basic principles of stress management
2	Recognize your stress triggers and how to manage them
3	Develop proactive responses to stressful situations
4	Use coping tips for managing stress both on and off the job
5	Learn to manage stress through diet, sleep and other lifestyle factors
6	Develop a long term action plan to minimize and better manage stress
7	Understand the basic principles of stress management

Course Outcomes:

Upon completion of the course, students shall have ability to

C107.1	Understand the basic principles of stress management	[U]
C107.2	Apply the concept of recognizing your stress triggers and find was to manage them.	[AP]
C107.3	Develop proactive responses to stressful situations	[AN]
C107.4	Develop a long term action plan to minimize and better manage stress	[AP]

Course Contents:

Scientific Foundations of Stress:
What is stress? – Sources of Stress – Types of Stress – Personality Factors and stress – Stress and the college student. Stress Psychophysiology: Stress and nervous system – Hypothalamic – Pituitary – Adrenal (HPA) Axis – Effect of Stress on Immune system – Health risk associated with chronic stress – Stress and Major Psychiatric disorders.

Developing Resilience to Stress:
Understanding you stress level – Role of personality pattern, Self-esteem, Locus of control – Role of Thoughts Beliefs and Emotions – I & II – Life situation Intrapersonal: (Assertiveness, Time Management).

Strategies for Relieving Stress:
Developing cognitive coping skills – Autogenic training, imagery and progressive relaxation – Other relaxation techniques – Exercise and Health – DIY strategies stress management.

Total Hours:	**30**

Reference Books:

1	Jonathan C. Smith, “Stress Management: A Comprehensive Handbook of Techniques and Strategies”, 1st Edition, Springer Publishing Company, 2011.
2	Bob Stahl, Elisha Goldstein, Jon Kabat-Zinn, “A Mindfulness–based Stress Reduction Workbook”, 2nd Edition, New Harbinger Publications, 2019.
3	Ryan M. Niemiec, “The Strengths-based Workbook for Stress Relief”, 1st Edition, New Harbinger Publications, 2019.

Web References:

1	https://thiswayup.org.au/courses/coping-with-stress-course/
2	https://www.classcentral.com/course/swayam-stress-management-14309

Assessment Methods & Levels (based on Bloom's Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:40)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C107.1	Remember	Quiz	**10**
C107.2	Understand	Group Discussion	**10**
C107.3	Understand	Class Presentation	**10**
C107.4	Apply	Assignment	**10**

Summative assessment based on Continuous Assessment	
Revised Bloom's Level	**Term End Assessment [60 marks]**
Remember	30
Understand	40
Apply	20
Analyse	10
Evaluate	-
Create	-

Course Outcome (CO)	**Programme Outcomes (PO)**												**Programme Specific Outcomes (PSO)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C107.1								1	3			1	1		
C107.2								1	2	1		1	1		
C107.3								1	3	1		2	2		
C107.4								1	3	1		3	2		

20MC108	CONSTITUTION OF INDIA	2/0/0/0

Nature of Course : Theory

Pre Requisites : Nil

Course Objectives:

1	To familiarize with basic information about Indian constitution
2	To understand the fundamental rights and duties as citizens of India

Course Outcomes:

Upon completion of the course, students shall have ability to

C108.1	Explain the objectives of the Constitution of India and its formation	[U]
C108.2	Recall state and central policies (Union and State Executive), fundamental Rights and their duties.	[R]
C108.3	Make use of legal directions in developing solutions to societal issues	[AP]
C108.4	Utilized for competitive exams that requires knowledge of Indian Constitution	[AP]

Course Contents:

Module 1 **10 Hours**

Historical perspective, The making of the Constitution, The Role of the Constituent Assembly - Preamble and Salient features of the Constitution of India. Fundamental Rights, Directive Principles of State Policy, Fundamental Duties, Citizenship Article 5-11.

Module 2 **10 Hours**

Federal structure, Powers of the Union and the states, Centre-State Relations, Union Executive – President, Prime Minister, Union Cabinet, Parliament, Supreme Court of India, State Executives – Governor, Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts, Elections, Electoral Process, and Election Commission of India, Election Laws. Powers and Functions of Municipalities and Panchayat

Module 3 **10 Hours**

Amendments - Methods, Emergency Provisions, National Emergency, President Rule, Financial Emergency, Provisions for SC & ST, OBC, women, children and backward classes, Right to Property, Freedom of Trade and Commerce. Agricultural Law

Total Hours:	**30**

Text Books:

1	Dr. D. D. Basu, “Introduction to the Constitution of India”, LexisNexis, New Delhi, 22nd Edition, 2016.
2	“Bare act-constitution of India”, The universal Publications, LexisNexis 2020, New Delhi, India.

Reference Books:

1	Subhash. C. Kashyap, “Our Constitution: An Introduction to India’s Constitution and Constitutional Law”, National Book Trust, India, 5th Edition, 2019.
2	M. Laxmikanth, “Constitution of India”, Cengage Learning India, 1st Edition 2018.

Web References:

1	https://unacademy.com/course/the-indian-constitution/NSKQ8XXQ
2	https://unacademy.com/goal/upsc-civil-services-examination-ias-preparation/KSCGY

Assessment Methods & Levels (based on Blooms’ Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:40)

Course Outcome	Bloom’s Level	Assessment Component	Marks
C108.1	Remember	Test	10
C108.4	Understand	Quiz	10
C108.3	Apply	Presentation	10
C108.2	Apply	Group Assignment	10

Summative assessment based on Continuous Assessment	
Revised Bloom's Level	**Term End Assessment [60 marks]**
Remember	30
Understand	40
Apply	30
Analyse	-
Evaluate	-
Create	-

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C108.1						3	1	1	1			1	1	1	
C108.2						3	1	1	1			1	1	2	
C108.3						3	2	2	1			1	1	2	
C108.4						3	1	1	1			2	1	1	

20MC109	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	2/0/0/0
Nature of Course : Theory		
Pre Requisites : Nil		

Course Objectives:

1	To make understand the contribution of Indian mind in various fields.
2	To cultivate critical appreciation of the thought content and provide insights relevant for promoting cognitive ability, health, good governance, aesthetic appreciation and right values.

Course Outcomes:
Upon completion of the course, students shall have ability to

C109.1	Relate classical Indian traditions with contemporary traditions and culture.	[R]
C109.2	Outline the thoughts of Indians in different disciplines.	[U]
C109.3	Apply the knowledge to the present context.	[AP]
C109.4	Develop a better appreciation and understanding of Indian traditions.	[AP]

Course Contents:

Indian Ethics: Individual and Social – Society state and Polity (Survey) - Education systems – Agriculture (Survey) – Early & Classical Architecture – Medieval & Colonial Architecture.

Astronomy in India – Martial Arts Traditions (Survey) - Indian Literatures - Indian Philosophical Systems - Indian Traditional Knowledge on Environmental Conservation

Ayurveda for Life, Health and Well-being - The Historical Evolution of Medical Tradition in Ancient India- Music in India - Classical & Folk

Total hours:	**30**

Text Books:

1	Kapil Kapoor and Michel Danino, “Knowledge Traditions and Practices of India”, Central Board of Secondary Education, 2017.
2	Yogesh Atal, “Indian Society: Continuity and Change”, Pearson Education India, 2016.

Reference Books:

1	Douglas Osto, “An Indian Tantric Tradition and Its Modern Global Revival”, Routledge publications, 2020.
2	Rao C.N. Shankar, “Sociology: Principles of Sociology with an Introduction to Social Thoughts”, S Chand Publisher, 2019.

Web References:

1	http://nopr.niscair.res.in/handle/123456789/43
2	https://nptel.ac.in/courses/109/104/109104102/

Assessment Methods & Levels (based on Blooms’ Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:40)

Course Outcome	Bloom’s Level	Assessment Component	Marks
C109.1	Remember	Quiz	10
C109.2	Understand	Group Assignment	10
C109.3	Apply	Presentation	10
C109.4	Create	Survey	10

Summative assessment based on Continuous Assessment	
Revised Bloom's Level	**Term End Assessment [60 marks]**
Remember	30
Understand	40
Apply	30
Analyse	-
Evaluate	-
Create	-

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C109.1						2	1	1	1			2	3	1	
C109.2						2	1	1	2			1	2	1	
C109.3						1	1	1	1			1	1	1	
C109.4						2	1	1	2			2	1	1	