CURRICULUM

(REGULATIONS 2019 V 21)

FOR

B.E. COMPUTER SCIENCE AND ENGINEERING

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

CHOICE BASED CREDIT SYSTEM

(Applicable to the students admitted from the Academic Year 2022-23 onwards)

EASWARI ENGINEERING COLLEGE
(Autonomous Institution)
BharathiSalai, Ramapuram, Chennai - 600 089

[A Unit of SRM Group of Educational Institutions, Approved by AICTE | Affiliated to Anna University, Chennai | NAAC Accredited 'A' Grade | 2(f) & 12(B) Status (UGC) | ISO 9001:2015 Certified | NBA Accredited Programmes | FIST Funded (DST) | SIRO Certified (DSIR)]

SEMESTER I								
S.No	Course Code	Course Title	Category	Hours / Week				CREDITS
				L	T	P	R	
THEORY								
1.	191LEH101T	Technical English	HS	3	-	-	-	3
2.	191MAB101T	Engineering Mathematics I	BS	3	2	-	-	4
3.	191PYB101T	Engineering Physics	BS	3	-	-	-	3
4.	191CYB101T	Engineering Chemistry	BS	3	-	-	-	3
5.	191GES101T	Engineering Graphics	ES	2	-	4	-	4
6.	191GES102T	Problem Solving through Python Programming	ES	3	-	-	-	3
LABORATORY								
7.	191GEB111L	Physics and Chemistry Laboratory	BS	-	-	4	-	2
8.	191GES111L	Python Programming Laboratory	ES	-	-	3	1	2
						TOTAL CREDITS		24
MANDATORY COURSE								
9.	191GEM101L	Induction Training[&]	MC	-	-	2	-	1[&]
10.	191GEM102T	தமிழர் மரபு / Heritage of Tamils	MC	1	-	-		1[^]

[^] Mandatory to register for the course and earn one credit

[&] Mandatory to attend Induction training programme and earn one credit.

SEMESTER II								
S.No	Course Code	Course Title	Category	Hours / Week				CREDITS
				L	T	P	R	
THEORY								
1.	191LEH201T	Professional Communication – BEC Certification	HS	3	-	-	-	3
2.	191MAB201T	Engineering Mathematics II	BS	3	2	-	-	4
3.	191PYB202T	Physics for Information Science	BS	3	-	-	-	3
4.	191GES201T	Basic Electrical and Electronics Engineering	ES	3	-	-	-	3
5.	191GES204T	Programming in C	ES	3	-	-	-	3
LABORATORY								
6.	191GES211L	Engineering Practices Laboratory	ES	-	-	4	-	2
7.	191GES213L	C Programming Laboratory	ES	-	-	3	1	2
MANDATORY COURSE								
8.	191CYM201T	Environmental Science[&&]	MC	3	-	-	-	3[&&]
9.	191GEM211L	NSS / NCC /YRC – Phase - I[*]	MC	-	-	2	-	1*
10.	191GEM202T	தமிழும் தொழில்நுட்பமும்/ Tamils and Technology	MC	1	-	-	-	1[^]
					TOTAL CREDITS	18	2	9	1	20

Mandatory to register for the course and earn one credit

Mandatory to register for the course and earn three credits

The student may opt for any one. They have to complete the respective Phase II and Phase III. Those who are not opting NSS/NCC/YRC have to opt for Foreign language / Indian constitution in the sixth semester.

SEMESTER III								
S.No	Course Code	Course Title	Category	Hours / Week				CREDITS
				L	T	P	R	
THEORY								
1.	191MAB302T	Discrete Mathematics	BS	3	2	-	-	4
2.	191CSC303T	Data Structures	ES	3	-	-	-	3
3.	191CAC302T	Object Oriented Programming Using Java	PC	3	-	-	-	3
4.	191CAC303T	Distributed Systems	PC	3	-	-	-	3
5.	191CAC304T	Artificial Intelligence	PC	3	-	-	-	3
LABORATORY								
6.	191CSC311L	Data Structure Laboratory in C	PC	-	-	4	-	2
7.	191CAC312L	Object Oriented Programming Laboratory	PC	-	-	3	1	2
8.	191CAC313L	Artificial Intelligence Laboratory	PC	-	-	4	0	2
HUMAN EXCELLENCE COURSE								
9.	191GEH311L	Yoga / Social Service – Phase – I **	HS	-	-	2	-	1
							TOTAL CREDITS	**23**
EMPLOYABILITY ENHANCEMENT COURSE								
10.	191CAA311I	Internship / Industrial Training#	EEC	-	-	-	-	1#
11	191CAA301I	Industry Supported Course (Optional) ##	EEC	-	-	-	-	1##
ONLINE COURSE								
12		Online Course (Optional) $	PE	-	-	-	-	3$

** Student may opt for any one. They have to complete the respective Phase II in semester V.

Mandatory to do Internship and earn minimum one credit between 3rd and 6th semester.

Students may earn credits in lieu of Professional elective - V in 8th semester. Please refer Clause 26.1.1 of B.E. Regulations 2019.

$ Online courses of three credits each can be considered in lieu of Professional Elective – IV and Professional Elective – VI. A student earned only three credits can drop only Professional Elective – VI. Please refer Clause14.9 of B.E. Regulations 2019.

SEMESTER IV								
S. No	Course Code	Course Title	Category	Hours / Week				CREDITS
				L	T	P	R	
THEORY								
1.	191MAB405T	Probability And Statistics	BS	3	2	-	-	4
2.	191CSC401T	Design and Analysis of Algorithms	PC	3	-	-	-	3
3.	191CSC402T	Operating Systems	PC	3	-	-	-	3
4.	191CSC403T	Database Management Systems	PC	3	-	-	-	3
5.	191CAC401T	Computer Organization and Architecture	PC	3	-	-	-	3
6.	191CAC402T	Computer Networks	PC	3	-	-	-	3
LABORATORY								
7.	191CSC412L	Database Management Systems Laboratory	PC	-	-	4	-	2
8.	191CAC411L	Computer Networks Laboratory	PC	-	-	3	1	2
			TOTAL CREDITS					**23**
MANDATORY COURSE								
9.	191GEM411L	NSS / NCC / YRC – Phase - II *	MC	-	-	2	-	1*
EMPLOYABILITY ENHANCEMENT COURSE								
10.	191CAA411I	Internship / Industrial Training#	EEC	-	-	-	-	1#
11.	191CAA401I	Industry Supported Course (Optional) ##	EEC	-	-	-	-	1##
ONLINE COURSE								
12.		Online Course (Optional) $	PE	3	-	-	-	3$

* Students have to complete the respective phase II.

\# Mandatory to do Internship and earn minimum one credit between 3rd and 6th semester.

Students may earn credits in lieu of Professional elective – V in 8th semester. Please refer Clause 26.1.1 of B.E. Regulations 2019.

$ Online courses of three credits each can be considered in lieu of Professional Elective – IV and Professional Elective – VI.

A student earned only three credits can drop only Professional Elective – VI. Please refer Clause14.9 of B.E. Regulations 2019

SEMESTER V								
S.No	Course Code	Course Title	Category	Hours / Week				CREDITS
				L	T	P	R	
THEORY								
1.	191CAC501T	Machine Learning	PC	3	2	-	-	3
2.	191CAC502T	Big Data Analytics	PC	3	-	-	-	3
3.	191CAC503T	Formal Automata and Compiler Design	PC	3	-	-	-	3
4.	191CAC504T	Professional Ethics	HS	3	-	-	-	3
5.		Professional Elective-I	PE	3	-	-	-	3
6.		Open Elective - I	OE	3	-	-	-	3
LABORATORY								
7.	191CAC511L	Machine Learning Laboratory	PC	-	-	3	1	2
8.	191CAC512L	Big Data Analytics Laboratory	PC	-	-	2	-	2
HUMAN EXCELLENCE COURSE								
9.	191GEH511L	Yoga / Social Service – Phase -II**	HS	-	-	2	-	1
							TOTAL CREDITS	**23**
EMPLOYABILITY ENHANCEMENT COURSE								
10.	191CAA511I	Internship / Industrial Training#	EEC	-	-	-	-	1#
11.	191CAA501I	Industry Supported Course (optional) ##	EEC	-	-	-	-	1##
ONLINE COURSE								
12.		Online Course (Optional) $	PE	3	-	-	-	3$

** Students have to complete the respective phase II.

Mandatory to do Internship and earn minimum one credit between 3rd and 6th semester.

Students may earn credits in lieu of Professional Elective - V in 8th semester. Please refer Clause 26.1.1 of B.E. Regulations 2019.

$ Online courses of three credits each can be considered in lieu of Professional Elective – IV and Professional Elective – VI. A student earned only three credits can drop only Professional Elective – VI. Please refer Clause 14.9 of B.E. Regulations 2019.

SEMESTER VI								
S.No	Course Code	Course Title	Category	Hours / Week				CREDITS
				L	T	P	R	
THEORY								
1.	191CAC601T	Natural Language Processing	PC	3	-	-	-	3
2.	191CAC602J	Web Technology	PC	3	-	-	-	4
3.	191CAC603T	Data Exploration and Visualization	PC	3	2	-	-	3
4.		Professional Elective – II	PE	3	-	-	-	3
5.		Open Elective - II	OE	3	-	-	-	3
LABORATORY								
6.	191LEH611L	Interpersonal Skills / Listening and Speaking	HS	-	-	2	-	1
7.	191CAC611L	Data Visualization Laboratory	PC	-	-	3	1	2
							TOTAL CREDITS	**19**
MANDATORY COURSE								
8.	191GEM611L	NSS / NCC / YRC – Phase - III*	MC	-	-	2	-	1*
9.	191GEM601T	Foreign Language / Indian Constitution &	MC	3	-	-	-	3&
EMPLOYABILITY ENHANCEMENT COURSE								
10.	191CAA611I	Internship / Industrial Training #	EEC	-	-	-	-	1#
11.	191CAA601I	Industry Supported Course (optional) ##	EEC	-	-	-	-	1##
ONLINE COURSE								
12.		Online Course (Optional) $	PE	3	-	-	-	3$

* Students have to complete the respective phase III.

& Students those who have not earned 3 credits through NSS / NCC / YRC must register for this course and earn 3 credits.

Mandatory to do Internship and earn minimum one credit between 3rd and 6th semester.

Students may earn credits in lieu of Professional Elective -V in 8th semester.Please refer Clause 26.1.1 of B.E. Regulations 2019.

$ Online courses of three credits each can be considered in lieu of Professional Elective – IV and Professional Elective – VI. A student earned onlythree credits can drop only Professional Elective – VI. Please refer Clause 14.9 of B.E. Regulations 2019.

SEMESTER VII								
S.No	Course Code	Course Title	Category	Hours / Week				CREDITS
				L	T	P	R	
THEORY								
1.	191CAC701T	Deep Learning	PC	3	-	-	-	3
2.		Professional Elective – III	PE	3	-	-	-	3
3.		Professional Elective – IV	PE	3	-	-	-	3
4.		Open Elective - III	OE	3	-	-	-	3
5.	191CAA701T	Comprehension@	PE	-	-	-	-	3@
LABORATORY								
7.	191CAC711L	Deep Learning Laboratory	PC	-	-	3	1	2
EMPLOYABILITY ENHANCEMENT COURSE								
8.	191CAP711J	Project Work / Startup - Phase - I	EEC	-	-	-	4	2
9.	191CAA711I	Internship / Industrial Training #	EEC	-	-	-	-	1
10.	191CAA701I	Industry Supported Course (optional) ##	EEC	-	-	-	-	1##
TOTAL CREDITS								20
ONLINE COURSE								
11.		Online Course (Optional) $	PE	-	-	-	-	3$

@ Students mayearn credits in lieu of Professional elective – III in 7th semester. Please refer clause 26.2 of B.E. Regulations 2019

Mandatory to earn at least one credit by doing internship between 3rd and 6th semester with one credit reflecting in this semester for CGPA calculation.

Students may earn credits in lieu of Professional Elective - V in 8th semester. Please refer Clause 26.1.1 of B.E. Regulations 2019.

$ Online courses of three credits each can be considered in lieu of Professional Elective – IV and Professional Elective – VI. A student earned onlythree credits can drop only Professional Elective – VI. Please refer Clause 14.9 of B.E. Regulations 2019.

SEMESTER VIII								
S.No	Course Code	Course Title	Category	Hours / Week				CREDITS
				L	T	P	R	
THEORY								
1.		Professional Elective - V	PE	3	-		-	3
2.		Professional Elective - VI	PE	3	-		-	3
EMPLOYABILITY ENHANCEMENT COURSE								
3.	191CAP811J	Project Work / Start up – Phase - II	EEC	-	-	-	20	10
TOTAL CREDITS				6	-	-	20	16

PROGRAMME TOTAL CREDITS = 165

LIST OF SUBJECTS

HUMANITIES & SOCIAL SCIENCE COURSES (HS)

S.No	Course Code	Course Title	Semester	Credits
1	191LEH101T	Technical English	I	3
2	191LEH201T	Professional Communication - English / Japanese / French	II	3
3	191GEH311L	Yoga / Social Service – Phase – I **	III	1
4	191GEH511L	Yoga / Social Service – Phase - II**	V	1
5	191LEH611L	Interpersonal Skills / Listening and Speaking	VI	1
6	191MBH721T	Professional Ethics	VII	3
TOTAL CREDITS				**12**

BASIC SCIENCE COURSES (BS)

S.No	Course Code	Course Title	Semester	Credits
1	191MAB101T	Engineering Mathematics I	I	4
2	191PYB101T	Engineering Physics	I	3
3	191CYB101T	Engineering Chemistry	I	3
4	191GEB111L	Physics and Chemistry Laboratory	I	2
5	191MAB201T	Engineering Mathematics II	II	4
6	191PYB202T	Physics for Information Science	II	3
7	191MAB302T	Discrete Mathematics	III	4
8	191MAB403T	Probability And Statistics	IV	4
TOTAL CREDITS				**27**

ENGINEERING SCIENCE COURSES (ES)

S.No	Course Code	Course Title	Semester	Credits
1	191GES101T	Engineering Graphics	I	4
2	191GES102T	Problem Solving through Python Programming	I	3
3	191GES111L	Python Programming Laboratory	I	2
4	191GES201T	Basic Electrical and Electronics Engineering	II	3
5	191GES204T	Programming in C	II	3
6	191GES211L	Engineering Practices Laboratory	II	2
7	191GES213L	C Programming Laboratory	II	2
TOTAL CREDITS				19

PROFESSIONAL CORE COURSES (PC)

S.No	Course Code	Course Title	Semester	Credits
1	191CSC303T	Data Structures	III	3
2	191CAC301T	Artificial Intelligence	III	3
3	191CAC302T	Object Oriented Programming Using Java	III	3
4	191CAC303T	Distributed Systems	III	3
5	191CSC311L	Data Structure Laboratory in C	III	2
6	191CAC311L	Artificial Intelligence Laboratory	III	2
7	191CAC312L	Object Oriented Programming Laboratory	III	2
8	191CSC401T	Design and Analysis of Algorithms	IV	3
9	191CSC402T	Operating Systems	IV	3
10	191CSC403T	Database Management Systems	IV	3
11	191CAC401T	Computer Organization and Architecture	IV	3
12	191CAC402T	Computer Networks	IV	3
13	191CSC412L	Database Management Systems Laboratory	IV	2
14	191CAC411L	Computer Networks Laboratory	IV	2
15	191CAC501T	Machine Learning	V	3
16	191CAC502T	Big Data Analytics	V	3
17	191CAC503T	Formal Automata and Compiler Design	V	3
18	191CAC511L	Machine Learning Laboratory	V	2
19	191CAC512L	Big Data Analytics Laboratory	V	2
20	191CAC601T	Natural Language Processing	VI	3
21	191CAC602J	Web Technology	VI	4
22	191CAC603T	Data Exploration and Visualization	VI	3
23	191CAC611L	Data Visualization Laboratory	VI	2
24	191CAC701T	Deep Learning	VII	3
25	191CAC711L	Deep Learning Laboratory	VII	2
TOTAL CREDITS				**67**

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.No	Course Code	Course Title	Semester	Credits
1		In plant Training / Internship	III to VII	1
2		Industry Supported Course (Optional)	III to VII	-
3	191ITP711J	Project Work / Start up – Phase - I	VII	2
4	191ITP811J	Project Work / Start up – Phase - II	VIII	10
TOTAL CREDITS				13

MANDATORY COURSES (MC)

S.No	Course Code	Course Title	Semester	Credits
1	191GEM101L	Induction Training[&]	I	1[&]
2	191CYM201T	Environmental Science[&&]	II	3[&&]
3	191GEM211L	NSS / NCC / YRC (Phase I)[*]	II	1[*]
4	191GEM411L	NSS / NCC / YRC (Phase II)[*]	IV	1[*]
5	191GEM611L	NSS / NCC / YRC (Phase III)[*]	VI	1[*]
6	191GEM601T	Foreign Language / Indian Constitution[&]	VI	3[&]
7	191GEM102T	தமிழர் மரபு / Heritage of Tamils	I	1^
8	191GEM202T	தமிழும் தொழில்நுட்பமும் / Tamils and Technology	II	1^

CREDIT DISTRIBUTION

SEMESTER	I	II	III	IV	V	VI	VII	VIII	CREDIT
Humanities and Social Sciences (HS)	3	3	1		4	1			**12**
Basic Sciences(BS)	12	7	4	4					**27**
Engineering Sciences (ES)	9	10	5	3					**27**
Professional Core (PC)			13	15	13	13	5		**59**
Professional Electives (PE)					3	3	6	6	**18**
Open Electives (OE)					3	3	3		**9**
Employability Enhancement Courses (EEC)							3	10	**13**
Total Credit	**24**	**20**	**23**	**22**	**23**	**20**	**17**	**16**	**165**

SEMESTER – I

191LEH101T	TECHNICAL ENGLISH (Common to all branches of Engineering and Technology)	Periods per week				Credits
		L	T	P	R	
		3	**0**	**0**	**0**	**3**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To develop the basic writing skills of the First year Engineering students.
2.	To help learners develop their listening skills, which will, enable them to listen to lectures and enhance their ability to comprehend by asking questions and seeking clarification.
3.	To help learners develop their speaking skills and help them to speak fluently.
4.	To inculcate reading habit and to develop effective reading skills.
5.	To help students improve their active and passive vocabulary.

UNIT	**TITLE**	**PERIODS**
I		**9**

Short comprehension passages – skimming, scanning, predicting and inference of the passage – Tips for effective writing –Hints development – Purpose of a good conversation – Tips for improving Conversation – Active and Passive listening – Types of listening – Barriers to listening – listening for specific purposes – Listening to lectures and note taking - Parts of Speech - Tenses – WH Questions – Yes/No questions – Prefixes and Suffixes – Word formation.

UNIT	**TITLE**	**PERIODS**
II		**9**

Longer Comprehension passages - Questions – multiple choice –short questions – open-ended questions – Sentence structure - Types of paragraph – Short narrative paragraphs– Comparison and contrast – argumentative paragraph – analytical paragraph – Techniques for writing precisely - Introducing your friend – Exchange information – Expressing opinion/ agreeing /disagreeing **-** Telephonic conversation - If Clause – Subject verb agreement – degrees of comparison – Pronouns - adverbs.

UNIT	**TITLE**	**PERIODS**
III		**9**

Short texts – Cloze passage guessing from context – Note making – Use of reference words – Discourse markers – Connectives – Jumbled sentences –Product description–Process description - Prepositions - Direct/Indirect speech – Connotations – One word substitution – Idiomatic expressions.

UNIT	**TITLE**	**PERIODS**
IV		**9**

Different types of texts – Newspapers/ magazines/short stories - Inference – Tips for effective writing – Letter writing – – Letter to the Editor - Speaking about oneself/ hometown – Review of books – listening to native speakers – American accent and neutral accent - Countable/Uncountable nouns – Articles – Synonyms and Antonyms – Phrasal verbs.

UNIT	TITLE	PERIODS
V		9
Reading for specific purpose – Short essays – developing an outline –Group discussion – Giving advice – Modalverbs – Instructions and Recommendations - Collocations.		

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Listen, Understand and Respond to others in different situations.
CO2:	Speak correctly and fluently in different situations using appropriate communication strategies.
CO3:	Read and Comprehend a range of texts adopting different reading skills.
CO4:	Write with clarity in simple, apt and flawless language with coherence and cohesion.
CO5:	Use their communicative competency with purpose and clarity in the context of Science and Technology.

TEXT BOOKS:	
1.	Sanjay Kumar, Pushp Lata. English Language and Communication Skills for Engineers, Oxford University Press 2018

REFERENCE BOOKS:	
1.	Bailey, Stephen. Academic Writing: A practical guide for students. New York: Rutledge, 2011.
2.	Dutt P. Kiranmai and Rajeevan Geeta. Basic Communication Skills, Foundation Books: 2013
3.	Means,L. Thomas and Elaine Langlois. English & Communication for Colleges. Cengage Learning USA: 2007

WEBSITES:	
1.	https://www.usingenglish.com, http://grammarbook.com

JOURNALS:	
1	National Council for Teachers of English https://www2.ncte.org/resources/journals/college-english/

EXTENSIVE READER:	
1.	Spencer Johnson, Who Moved My Cheese, Putnam Adult, 1998

191MAB101T	ENGINEERING MATHEMATICS – I	Periods per week	Credits

	(Common to all branches of Engineering and Technology)	L	T	P	R	
		3	**2**	**0**	**0**	**4**

PREREQUISITES:
NIL

UNIT	TITLE	PERIODS
I	**MATRICES**	**12**
Overview of system of Linear Equations - Eigen values and Eigen vectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigen vectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reductionof a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.		
UNIT	**TITLE**	**PERIODS**
II	**DIFFERENTIAL CALCULUS**	**12**
Limit of a function - Continuity - Derivatives – Differentiation Rules – Mean Value Theorem – Interval of increasingand decreasing functions – Maxima and Minima - Interval of concavity and convexity –Taylor's Series for one variable.		
UNIT	**TITLE**	**PERIODS**
III	**MULTIVARIABLE CALCULUS**	**12**
Limits and Continuity – Partial derivatives – Total derivative – Differentiation of implicit functions – Jacobian and properties Taylor's series for functions of two variables – Maxima, minima and saddle points - Method of Lagrange multipliers.		
UNIT	**TITLE**	**PERIODS**
IV	**INTEGRAL CALCULUS**	**12**
Definite Integrals and its properties –Fundamental theorem of Calculus - Techniques of integration for Indefinite Integrals using basic integration formulas – Integration by parts – Trigonometric Substitutions – Integration of Rationalfunctions by Partial Fractions.		
UNIT	**TITLE**	**PERIODS**
V	**MULTIPLE INTEGRATION**	**12**
Double integrals – Change the order of integration in double integrals - Change of variables (Cartesian to polar) - Applications: areas and volumes - Triple integrals (Cartesian, Cylindrical and Spherical coordinates).		

TOTAL PERIODS:	**60**

COURSE OUTCOMES:

The Course aims to equip the students with standard concepts and tools at an intermediate to advanced level thatwill serve them well towards tackling more advanced level of mathematics and applications that they would find usefulin their disciplines.

The students will learn:	
CO1:	Solve the given linear Homogeneous and Non-Homogeneous simultaneous equations by using rankmethod.
CO2:	Compute eigen values, eigen vectors of square matrices to convert quadratic form in to canonical form.
CO3:	Evaluate the extreme values of functions of single and multivariable functions by using derivatives and partial derivatives respectively.

CO4:	Evaluate single integral involving trigonometry, algebraic, exponential and logarithmic functions by using methods of substitution and integration by parts.

CO5:	Determine area enclosed by simple closed curves using double integrals and volume of solid by using triple integrals.

TEXT BOOKS:	
1.	Grewal B.S., - Higher Engineering Mathematics, Khanna Publishers, New Delhi, 43rd Ed., 2014.
2	Joel Hass, Christopher Heil and Maurice D.Weir —Thomas' Calculus‖, 14th Edition, Pearson.

REFERENCE BOOKS:	
1.	Bali N.P.and Manish Goyal — Engineering Mathematics‖ (For Semester I) Third Edition, University Science Press.
2.	Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons.
3.	Fritz John and Richard Courant, —Introduction to Calculus and Analysis‖ Springer.
4.	James Stewart, "Calculus: Early Transcendental", Cengage Learning, 7th Edition, New Delhi, 2015.
5	Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi.

191PYB101T	ENGINEERING PHYSICS (Common to all branches of Engineering and Technology)	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT	TITLE	PERIODS
I	PROPERTIES OF MATTER	9

Stress - Strain relationship, Hooke's law, Elastic moduli, Stress - Strain diagram for various engineering materials, Ductile and Brittle materials - Torsional pendulum – Beam, Expression for bending moment - Cantilever, Uniform and Non- uniform bending, Theory and Experimental determination of Young's modulus.

UNIT	TITLE	PERIODS
II	SOUND WAVES AND VIBRATIONS	9

Propagation, Intensity, Loudness of sound waves – Determination of absorption coefficient, Reverberation, Sabine's formula for reverberation time - Factors affecting acoustics of buildings and their remedies - Acoustic Quieting: Aspects, Methods, Quieting for Specific observers, Mufflers, Soundproofing - Ultrasonic waves and properties, Methods of Ultrasonic production, Applications of Ultrasonic in engineering and medicine.

UNIT	TITLE	PERIODS
III	THERMAL PHYSICS	9

Fundamentals of thermal energy – Expansion joints - Bimetallic strips - Thermal conductivity, conductions in solids, Differential equation of one dimensional heat flow- Forbe_s and Lee_s disc method - Conduction through compound media Thermal insulation – thermal shock resistance - Applications: Solar water heater- tempered glass- cryogenic materials.

UNIT	TITLE	PERIODS
IV	QUANTUM MECHANICS	9

Inadequacies of Classical Mechanics – Black body radiation- Planck's theory of radiation - Dual nature of electromagnetic radiation – De Broglie hypothesis for matter waves – Heisenberg's uncertainty principle – Schrodinger's time dependent and independent wave equation, significance of wave function - Born interpretation - Particle confinement in 1D box.

UNIT	TITLE	PERIODS
V	APPLIED OPTICS	9

Spontaneous and Stimulated emission - Einstein co-efficients (derivation) – Spatial and Temporal coherence – Schawlow- Townes condition for population inversion (Qualitative study) - Types of lasers – Nd:YAG, Semiconductor - Applications of Laser in science, engineering and medicine.

Principle and propagation of light in optical fibre, Derivation for Numerical aperture and Acceptance angle - Types and losses of optical fibre - Fibre Optical Communication (Block diagram) - Active and Passive sensors - Medical endoscope.

TOTAL PERIODS:	45

COURSE OUTCOMES:	
At the end of this course:	
CO1:	The students will gain knowledge on the basics of properties of matter and its applications,
CO2:	The students will acquire knowledge on the concepts of sound waves and vibrations.
CO3:	The students will have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion joints and solar water heaters,
CO4:	The students will get knowledge on advanced physics concepts of quantum theory,
CO5:	The students will acquire knowledge on the concepts of optical devices and their applications in fibre optics.

TEXT BOOKS:	
1.	Bhattacharya D.K & T.Poonam, Engineering Physics , Oxford University Press, 2015.
2.	Pandey B.K.& S.Chaturvedi, Engineering Physics, Cengage Learning India, 2012.
3.	Senthilkumar, G.Engineering Physics I, VRB Publishers, 2011.

REFERENCE BOOKS:	
1.	Aruldhas G, Quantum Mechanics, PHI Learning Pvt. Ltd.,New Delhi, 2011.
2.	Arthur Beiser,Concepts of Modern Physics, 6th edn.,McGraw Hill 2003.
3.	Gaur R.K & S.L.Gupta, Engineering Physics, Dhanpat Rai Publishers, 2012.
4.	Halliday D, R.Resnick & J.Walker, Principles of Physics, Wiley, 2015.
5.	Serway R.A & J.W.Jewett, Physics for Scientists and Engineers, Cengage Learning, 2010.
6.	Tipler P.A & G.Mosca, Physics for Scientists and Engineers with Modern Physics, W.H.Freeman, 2007.
7.	Zeemansky M.W and R.H.Dittman, Heat and Thermodynamics, 8th edn., Mc.Graw Hill, NewYork, 2017.

191CYB101T	ENGINEERING CHEMISTRY (Common to all branches of Engineering and Technology)	Periods per week				Credits
		L	T	P	R	
		3	**0**	**0**	**0**	**3**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
2.	To get the basic idea about the polymers and applications of polymers and polymer reinforced composites.
3.	It deals with the information about the types of fuels, calorific value calculations and manufacture of solid, liquid and gaseous fuels.
4.	It enable the students to gain information about Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells
5.	To impart knowledge about the nanomaterials synthesis, properties and applications

UNIT	**TITLE**	**PERIODS**
I	**WATER TREATMENT AND TECHNOLOGY**	**9**

Introduction – characteristics - alkalinity - types and determination – hardness – types only -boiler feed water-requirements-boiler troubles – scale & sludge -disadvantages (wastage of fuels, decrease in efficiency, boiler explosion) - softening of hard water - external treatment process - demineralization and zeolite, internal treatment - boiler compounds (phosphate, calgon, carbonate and colloidal conditioning methods) – desalination of brackish water –reverse osmosis.

UNIT	**TITLE**	**PERIODS**
II	**POLYMERS AND REINFORCED PLASTICS**	**9**

Introduction- classification of polymers - Natural and synthetic - Thermoplastic and Thermosetting, Functionality– Degree of polymerization, types - addition and condensation polymerization – free radical polymerization mechanism - Preparation, properties and uses of PVC, Nylon 6,6, Teflon and Epoxy resin. Plastics - Compounding of plastics – moulding methods –injection, extrusion and compression – FRP – carbon and glass – applications.

UNIT	**TITLE**	**PERIODS**
III	**FUELS AND COMBUSTION**	**9**

Classification - Coal – proximate and ultimate analysis, - carbonization -metallurgical coke –manufacture by Otto Hoffmann method – petroleum – refining - cracking –synthetic petrol by Bergius process - knocking in petrol and diesel engines- octane and cetanerating of fuels-synthesis – advantages and commercial application of power alcohol and biodiesel- Gaseous fuels- liquefied petroleum gases (LPG)- compressed natural gas (CNG)- Combustion of fuels: Introduction - calorific value–higher & Lower– theoretical calculation - Flue gas analysis by Orsat method.

UNIT	TITLE	PERIODS
IV	ENERGY SOURCES AND STORAGE DEVICES	9

Energy – Types – Non-renewable energy - Nuclear energy –fission and fusion reactions - differences between nuclear fissionand fusion - nuclear chain reactions - light water nuclear reactor for power generation – breeder reactor – renewable energy - solar energy conversion - solar cells - wind energy

Electrochemical cells – reversible and irreversible cells –Cell construction and representation - Batteries -types of batteries – characteristics – construction and working of primary battery (dry cell) - secondary battery (lead acidbattery and lithium-ion-battery) - fuel cells (H2-O2)

UNIT	TITLE	PERIODS
V	CONCEPTS OF NANO CHEMISTRY AND GREEN CHEMISTRY	9

Nano chemistry introduction – basics –general properties - distinction between nanoparticles, molecules and bulk materials–size-dependent properties. Synthesis: precipitation, thermolysis, hydrothermal, solvothermal, electro deposition, chemical vapour deposition, laser ablation - properties of nanoparticles – Types of Nanoparticles:nano cluster, nano rod, nanowire and nano tube – Carbon Nano Tube (Synthesis, properties and applications) – applications of nanoparticles. Green chemistry introduction - Principles – Applications

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	The knowledge gained on water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.
CO2:	The knowledge gained on water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.
CO3:	Students can get knowledge about various fuels and its applications based on its calorific value.
CO4:	It provides the students to understand about conventional and non-conventional energy sources and its applications
CO5:	It provides the students to gain knowledge about the recent trends in nano materials.

TEXT BOOKS:	
1.	Kannan P and Ravikrishnan A, —Engineering Chemistry‖, Sri Krishna, Hitech publishing Company Pvt. Ltd, 2014
2.	Jain P.C. and Monika Jain, —Engineering Chemistry‖ Dhanpat Rai, Publishing Company (P) Ltd.,New Delhi, 2015.

REFERENCE BOOKS:	
1.	Dara S.S &S.S Umare, —A Text book of Engineering Chemistry‖, S.Chand & Company Ltd., New Delhi, 2015.
2.	Palanna O.G, —Engineering Chemistry‖, McGraw Hill Education (India)Pvt. Ltd, Chennai,2017
3.	Vairam S ,P. Kalyani and Suba Ramesh., —Engineering Chemistry, Wiley India PVT, Ltd, New Delhi, 2013.

191GES101T	ENGINEERING GRAPHICS	Periods per week	Credits

	(Common to all branches of Engineering and Technology)	L	T	P	R	
		2	**0**	**4**	**0**	**4**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To develop students, graphic skills for communication of concepts, ideas and design of engineering products.
2.	To expose them to existing National standards related to technical drawings.
3.	To Familiarize with basic geometrical constructions and orthographic projections.
4.	To make the students to draw the different projections of the solids.
5.	To view the true shape and apparent shape of the sectioned solids and their developments.
6.	To get an idea about 3D views through isometric projections.

UNIT	**TITLE**	**PERIODS**
0	**CONCEPTS AND CONVENTIONS USED**	**2**
Principles of Engineering graphics and their significance - Use Of drawing Instruments-BIS conventions and specifications-Size, Layout and folding of drawing sheets-Lettering and Dimensioning.		
UNIT	**TITLE**	**PERIODS**
I	**PLANE CURVES, PROJECTION OF POINTS**	**17**
Conic Sections - Construction of Ellipse, Parabola & hyperbola by eccentricity method – Construction of cycloid – Introduction to Scales. Introduction of Orthographic projection - Principal planes - First angle projection - projection of points.		
UNIT	**TITLE**	**PERIODS**
II	**PROJECTION OF LINES AND PLANES**	**17**
Projection of straight lines inclined to both the principal planes by rotating line method. Projection of simple planes inclined to both the principal planes by rotating object method. Projection of simple solids like Prism, Pyramid, Cylinder and Cone when the axis is inclined to one of the principal planes by rotating object method.		
UNIT	**TITLE**	**PERIODS**
III	**PROJECTION OF SOLIDS**	**17**
Projection of simple solids like Prism, Pyramid, Cylinder & Cone when the axis is inclined to one of the principal planes by rotating object method.		
UNIT	**TITLE**	**PERIODS**
IV	**SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES**	**17**
Sectioning of simple solids (Prism, Pyramid, Cylinder & Cone) in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of surfaces of right regular and sectioned solids.		

UNIT	TITLE	PERIODS
V	**ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS**	**17**
Principles of Isometric projections-Isometric scale- Isometric Views of simple and truncated solids – combination of two solid objects in simple vertical positions. Conversion of Isometric views to Orthographic views of the objects.		
UNIT	**TITLE**	**PERIODS**
VI	**COMPUTER AIDED DRAFTING**	**3**
(Demonstration Only, Not for Exam**)** The Concepts of Computer Aided Drafting for Engineering drawing, Computer graphics & Geometrical modeling (2D Orthographic Views) and 3D drafting (Isometric Views) using AutoCAD.		

TOTAL PERIODS:	**90**

COURSE OUTCOMES:	
On successful completion of this course, the student will be able to:	
CO1:	Familiarize with the fundamentals and standards of Engineering graphics
CO2:	Perform basic geometrical constructions and principles of orthographic projections.
CO3:	Project orthographic projections of lines and plane surfaces.
CO4:	Draw projections of solids and development of surfaces.
CO5:	Visualize and to project isometric views and conversion of Isometric views to Orthographic views.
CO6:	Understand the basics of AUTO CAD and fundamentals of perspective projections.

TEXT BOOKS:	
1.	Natarajan K.V., —A text book of Engineering Graphics‖, Dhanalakshmi Publishers, Chennai, 2009.
2.	Jayapoovan T, —Engineering Graphics using AUTOCAD‖, Vikas Publishing ,7 th Edition.
3.	Venugopal K. and Prabhu Raja V., —Engineering Drawingwith AUTOCAD and building drawing‖, New Age International (P) Limited, 2018, 5th edition.

REFERENCE BOOKS:	
1.	Basant Agarwal and Agarwal C.M., —Engineering Drawing‖, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2.	Bhatt N.D. and Panchal V.M., —Engineering Drawing‖, Charotar Publishing House, 50th Edition, 2010.
3.	Dinesh Kumar S, K.Sivakumar and R.Ramadoss, — Engineering Graphics‖, Maruthi Publishers, Chennai,2019.
4.	Gopalakrishna K.R., —Engineering Drawing‖ (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
5.	Parthasarathy N S and Vela Murali, —Engineering Graphics‖, Oxford University, Press, New Delhi, 2015.
6.	Shah M.B., and Rana B.C., —Engineering Drawing‖, Pearson, 2nd Edition, 2009.

191GES102T	PROBLEM SOLVING THROUGH PYTHON PROGRAMMING (Common to all branches of Engineering and Technology)	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	The course on Python Programming is intended to enhance the computational and logical thinking of students. Upon completion of the course, the students would be able to master the principles of Python programming and demonstrate significant experience in problem solving.

UNIT	TITLE	PERIODS
I	ALGORITHMIC PROBLEM SOLVING	9
Algorithms, building blocks of algorithms (statements, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Case study: Towers of Hanoi, insertion sort, guess an integer number in a range.		
UNIT	TITLE	PERIODS
II	CONTROL FLOW STATEMENTS	9
Python interpreter, interactive mode and script mode; variables, expressions, statements; values and data types; Operators and Precedence of operators, comments; Conditionals: conditional, alternative, chained conditional, nested conditional; Iterations: while, for, break, continue.		
UNIT	TITLE	PERIODS
III	FUNCTIONS AND STRINGS	9
Modules and functions: function definition and use, flow of execution, parameters and arguments; Fruitful functions: return values, composition, recursion; Strings: string slices, immutability, Looping and counting, String methods.		
UNIT	TITLE	PERIODS
IV	LIST, TUPLE AND DICTIONARIES	9
Lists: list operations, list slices, list methods, traversing, mutability, aliasing, list arguments, list comprehension; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and functions, Looping and dictionaries, histogram.		
UNIT	TITLE	PERIODS
V	FILES, EXCEPTIONS	9
Files: text files, reading and writing files, format operator, filenames and paths; Exceptions: handling exceptions, multiple exception blocks, finally block; Case study: tkinter.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Develop solutions for simple problems using algorithmic problem solving approach.
CO2:	Create programs using simple python statements and expressions
CO3:	Apply the concepts of modularity and reusability through user defined functions.
CO4:	Solve problems using the concepts of sequential datastructures.
CO5:	Build python programs to handle large data using python file handling functions.
CO6:	Use exception handling in python application to handle errors.

TEXT BOOKS:	
1.	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist, Version 2.0.17 edition, Updated for Python 3,Shroff/O_ReillyPublishers, (http://greenteapress.com/wp/thinkpython/)
2.	Reema Thareja —Python Programming using Problem solving Approach‖, Oxford University Press.

REFERENCE BOOKS:	
1.	Paul Gries, Jennifer Campbell and Jason Montojo, —Practical Programming: An Introduction to Computer Science using Python 3‖, Second edition, Pragmatic Programmers, LLC, 2013.
2.	Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3.	Timothy A. Budd, —Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd. 2015.

191GEB111L	PHYSICS AND CHEMISTRY LABORATORY (Common to all branches of Engineering and Technology)	Periods per week				Credits
		L	T	P	R	
		0	0	4	0	2

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	The purpose of this course is to develop scientific temper in experimental techniques and to reinforce the physics concepts among the engineering students

INSTRUCTIONAL OBJECTIVES:	
1.	To gain knowledge in the scientific methods and learn the process of measuring different Physical variables
2.	Develop the skills in arranging and handling different measuring instruments
3.	Get familiar on experimental errors in various physical measurements and to plan/ suggest on how the contributions could be made of the same order, so as to minimize the errors.

ANY FIVE EXPERIMENTS:	
1.	Torsion Pendulum – Rigidity modulus of wire and moment of inertia of disc.
2.	Non Uniform Bending – Young‘s modulus determination.
3.	Spectrometer – Wave length of spectral lines using grating.
4.	Lee‘s Disc – Thermal Conductivity of bad conductor.
5.	Semiconductor Laser –Wavelength of laser light, Size of particle and Numerical aperture of optical fiber.
6.	Air Wedge – Measurement of thickness of thin wire.
7.	Determination of the Band gap of a semiconductor.
8.	Ultrasonic Interferometer - Velocity of sound and Compressibility of liquid.

TOTAL PERIODS:	30

TEXT BOOKS:	
1.	G.Rajkumar, Physics laboratory Practical, McGraw Hill publication, 2019.
2.	R.K.Shukla and Anchal Srivastava, Practical Physics, 1st Edition, New Age International (P) Ltd, New Delhi, 2006.
3.	Physics Laboratory Manual, Faculty Members, Department of Physics, Easwari Engineering College, Chennai.

REFERENCE BOOKS:	
1.	Chattopadhyay D, P.C.Rakshit and B.Saha, An Advanced Course in Practical Physics, 2nd ed., Books & Allied Ltd., Calcutta, 1990.
2.	Souires G L , Practical Physics, 4th Edition, Cambridge University, UK, 2001.

A. CHEMISTRY LABORATORY

COURSE OBJECTIVES:	
1.	To make the student to acquire practical skills in the determination of water quality parameters.
2.	To acquaint the students with the determination of molecular weight of polymer by using viscometer.

ANY FIVE EXPERIMENTS:	
1.	Determination of chloride content of water sample by Argentometric method
2.	Determination of strength of given HCl using pH meter
3.	Determination of strength of acid in a mixture using conductivity meter.
4.	Determination of permanent, total and temporary hardness of water sample.
5.	Estimation of Fe^{2+} by Potentiometric titration
6.	Determination of molecular weight of PVA using Ostwald viscometer
7.	Determination of alkalinity in water sample
8.	Estimation of Iron content in water sample using spectrophotometer (1,10 – Phenanthroline/thiocyanate method)
9.	Conductometric titrations of strong acid Vs strong base
10.	Determination of DO Content of water sample by Wrinkles method
11.	Determination of BOD and COD in water sample

TOTAL PERIODS:	30

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

REFERENCE BOOKS:	
1.	Dr. C. Ravichandran, —Engineering Chemistry Laboratory-II‖ Global publications, 2019.
2.	Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., —Vogel's Textbook of practical organic chemistry, LBS Singapore (1994).
3.	Jeffery G.H, Bassett J., Mendham J. and Denny R.C., —Vogel's Text book of quantitative analysis chemical analysis‖, ELBS 5th Edn. Longman, Singapore publishers, Singapore, 1996.
4.	Daniel R. Palleros, —Experimental organic chemistry‖ John Wiley & Sons, Inc.,New York (2001).

191GES111L	PYTHON PROGRAMMING LABORATORY (Common to all branches of Engineering and Technology)	Periods per week				Credits
		L	T	P	R	
		0	**0**	**3**	**1**	**2**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To write, test, and debug simple Python programs.
2.	To implement Python programs with conditionals and loops.
3.	Use functions for structuring Python programs.
4.	Represent compound data using Python lists, tuples, dictionaries.
5.	Read and write data from/to files in Python.

LIST OF PROGRAMS:	
1.	LCM of two numbers.
2.	Sum of squares of first n natural numbers
3.	Fibonacci series.
4.	Armstrong number
5.	Sum of Digits in a Number.
6.	First n prime number.
7.	Factorial of a number using recursion
8.	Count the number of vowels in a string
9.	Matrix multiplication.
10.	Simple calculator
11.	Linear search
12.	Selection sort
13.	Insertion sort
14.	Word count
15.	Mini Project (any ONE): Design GUI for
	• Airline reservation system
	• Feedback system
	• Employee management system
	• Student management system
	• Banking system

TOTAL PERIODS:	**60**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Illustrate the essentials of python language like libraries, syntax, data types.
CO2:	Create programs using control flow structures in python.
CO3:	Develop python program for defining functions and calling them.
CO4:	Utilize python lists, tuples, dictionaries for compound data type.
CO5:	Design python programs for file handling and exception handling.
CO6:	Create GUI application for user defined requirement.

LIST OF EQUIPMENTS:	
1.	HARDWARE:
	• Standalone desktops.
2.	SOFTWARE
	• Python IDE

SEMESTER – II

191LEH201T	PROFESSIONAL COMMUNICATION-BEC CERTIFICATION (Common to all branches of Engineering and Technology)	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To strengthen their listening skills which help them comprehend lectures and talks in their areas of specialization
2.	To develop their speaking skills to make technical presentations, participate in Group Discussions.
3.	To develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
4.	To foster their ability to write convincing job applications
5.	To equip with appropriate skills for writing effective reports.

UNIT	TITLE	PERIODS
I		9
Communication – Process of Communication – Different forms of communication – Communication flow- Barriers of communication - Purpose and Function expressions – Extended definitions – Cause and Effect expressions - Compound nouns- Homonyms/homophones		
UNIT	TITLE	PERIODS
II		9
Listening to technical talks - Body language pertaining to Presentation– countering stage fright – Preparing PPT for presentation – Interpreting charts/graphs/pie charts/ bar diagram/tabular column/ tree diagram – Words often confused – Active/ Passive/ Impersonal Passive Voice – Numerical adjectives.		
UNIT	TITLE	PERIODS
III		9
Etiquette of Group discussion – discussing GD topics - reading journals and paraphrasing – Report Writing – Accidentreport/– Industrial visit report – Words often Misspelt – Describing a process using sequence words – Words usedas different parts of speech		
UNIT	TITLE	PERIODS
IV		9
Small talk – review on films and books – email etiquette - Cover letter & Resume – Calling for quotations – Placingorder – Letter of complaint - escalation letter - Feasibility report - Project report – Abbreviations and Acronyms pertaining to Science and Technology – Types of Essays - Argumentative, Analytical, Descriptive & Expository.		
UNIT	TITLE	PERIODS
V		9
Writing Statements of Purpose-format, Sample – Modifiers, Redundancies-Direct indirect speech-Project Proposal – Minutes of Meeting - Verbal Analogies – Case studies relating to Goal Setting- Writing articles		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Learners can draft effective formal letters and emails.
CO2:	Listen and comprehend different technical/non-technical excerpts critically and infer the impliedmeaning.
CO3:	Write ungrammatically and help in organizing ideas logically on a topic using a wide range of vocabulary
CO4:	Read different genres of texts and evaluate them for content and structure.
CO5:	Be proactive in using the language confidently and effectively for personal and professional growth.

TEXT BOOKS:	
1.	Raymond Murphy, English Grammar in Use: Reference and Practice for Intermediate Students, Cambridge : CUP, 2004

REFERENCE BOOKS:	
1.	Ashraf Rizvi M 'Effective Technical Communication', Tata McGraw-Hill, New Delhi, 2005
2.	Golding S.R. 'Common Errors in English Language', Macmillan, 1978
3.	Richard Johnson - Sheehan, Technical Communication Today, Longman Publishing Group, 2011
4.	Stephen R. Covey, The Seven Habits of Highly Effective People, Free Press, 1989

WEBSITES:	
1.	https://owl.purdue.edu
2.	https:www.hellolingo.com

JOURNALS:	
1	IEEE/transactions on Professional Communication
2.	https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=47

EXTENSIVE READER:	
1.	Stephen R. Covey, The Seven Habits of Highly Effective People, Free Press, 1989

191MAB201T	ENGINEERING MATHEMATICS – II (Common to all branches of Engineering and Technology)	Periods per week				Credits
		L	T	P	R	
		3	2	0	0	4

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	The objective of this course is to familiarize the prospective engineers with techniques in ordinary differential equations, complex variables and complex integration.
2.	The Study of Laplace transform help to solve the differential equations that occur in various branches of engineering disciplines.
3.	Vector calculus can be widely used for modelling the various laws of physics.
4.	The various methods of complex analysis can be used for efficiently solving the problems that occur in various branches of engineering disciplines.

UNIT	TITLE	PERIODS
I	ORDINARY DIFFERENTIAL EQUATIONS	12

Basic concepts - Separable differential equations - Exact differential equations - Integrating factors - Linear differential equations – Second order linear differential equations with constant coefficients – Particular Integral using operator method and Method of variation of parameters – Homogenous equation of Eulers and Legendres type.

UNIT	TITLE	PERIODS
II	LAPLACE TRANSFORMS	12

Existence conditions – Transforms of elementary functions –Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Transform of periodic functions -Inverse transforms: Convolution theorem (Statement only) and Partial Fractions - Application to solution of linear second order ordinary differential equations with constant coefficients.

UNIT	TITLE VECTOR CALCULUS	PERIODS
III	VECTOR CALCULUS	12

Gradient and directional derivative – Divergence and curl – Irrotational and Solenoidal vector fields – Line integral – Surface integral - Area of a curved surface - Green's, Gauss divergence and Stokes' theorems in evaluating line, surface and volume integrals (Planar, Cylindrical and Spherical Surfaces).

UNIT	TITLE	PERIODS
IV	COMPLEX VARIABLES	12

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian form - Properties – Harmonicconjugates – Construction of analytic function – Conformal mapping – Mapping by function $w = z + c,\ cz,\ \frac{1}{z},\ z^2$ - Bilinear transformation.

UNIT	TITLE	PERIODS
V	COMPLEX INTEGRATION	12

Complex integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use ofcircular contour and semicircular contour (No poles on the real axis).

TOTAL PERIODS:	60

COURSE OUTCOMES:	
The Course aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.	
The students will learn :	
CO1:	Solve linear first and higher order ordinary differential equations (ODE).
CO2:	Solve ODEs by using Laplace transform technique.
CO3:	Use vector calculus to convert triple integrals into double and double integrals into single integral.
CO4:	Derive necessary condition for a given complex function to be analytic.
CO5:	Identify a suitable method of complex integration for evaluating certain indefinite integrals

TEXT BOOKS:	
1.	Grewal B.S., —Higher Engineering Mathematics‖, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2.	Joel Hass, Christopher Heil and Maurice D.Weir Thomas‘ Calculus , 14th Edition, Pearson.

REFERENCE BOOKS:	
1.	Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons.
2.	N.P.Bali and Manish Goyal — Engineering Mathematics‖(For Semester II) Third Edition, University Science Press .
3.	Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, NewDelhi.
4.	O‘Neil, P.V. —Advanced Engineering Mathematics‖, Cengage Learning India Pvt., Ltd, New Delhi, 2007 .
5.	James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015.

191PYB202T	PHYSICS FOR INFORMATION SCIENCE (Common to first year CSE and IT)	Periods per week				Credits
		L	T	P	R	
		3	**0**	**0**	**0**	**3**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To enrich the understanding of various types of materials and their applications in Engineering and Technology.

UNIT	**TITLE**	**PERIODS**
I	**CONDUCTING MATERIALS**	**9**
Conductors – Classical free electron theory of metals – Expression for Electrical and Thermal conductivity – Wiedemann – Franz law – Lorentz number – Drawbacks of classical theory – Quantum theory – Fermi distributionfunction – Effect of temperature on Fermi function – Density of energy states – Carrier concentrations in metals.		
UNIT	**TITLE**	**PERIODS**
II	**SEMICONDUCTING MATERIALS**	**9**
Direct and Indirect band gap semiconductors, Intrinsic Semiconductors - Carriers concentration in Intrinsic Semiconductor (derivation) - Extrinsic Semiconductors (Qualitative study) - Variation of Fermi level with temperature and impurity concentration in n and p type – Carrier transport: Velocity, Electric field relations, Drift and Diffusion transport – Hall effect and Devices – Zener and Avalanche Breakdown in p-n junctions - Ohmic contacts – Tunneldiode - Schottky diode. MOS capacitor - Power transistor.		
UNIT	**TITLE**	**PERIODS**
III	**MAGNETIC AND SUPERCONDUCTING MATERIALS**	**9**
Magnetism in materials – Magnetic field and Induction – Magnetization - Magnetic permeability and susceptibility – types of Magnetic materials – Ferromagnetism, origin and exchange interaction, Saturation magnetization, Curie temperature, Domain theory - Hard and Soft magnetic materials – Applications in Transducer, Hard disc, Magneto optical recording. Superconductivity: Type I and Type II superconductors, BCS theory of Superconductivity (Qualitative), High Tc Superconductors, Applications in SQUID, Cryotron and Magnetic levitation.		
UNIT	**TITLE**	**PERIODS**
IV	**OPTICAL AND MODERN ENGINEERING MATERIALS**	**9**
Classification of Optical materials - Photo Detectors – Principle and working of LED - OLED - LCD - Photo Conducting materials – Laser Diode – Optical Data Storage techniques. Modern Engineering Materials: Smart Materials - Shape Memory Alloys - Metallic Glasses.		
UNIT	**TITLE**	**PERIODS**
V	**NANO MATERIALS**	**9**
Background, Definition and Basic concepts of Nanotechnology, Size dependent property, Quantum size effect - Quantum dot, Wire and Well – Bucky balls - Graphene – Carbon nanotubes, Types, Applications- Potential uses of nanomaterials, carbon nano tube computers, nano sensors, actuators - Medical applications of Nanomaterials, NEMS.		

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
At the end of this course :	
CO1:	The students will acquire knowledge on basics of semiconductor physics and its applications in various devices
CO2:	The students will get knowledge on magnetic properties of materials and their applications in data storage devices,
CO3:	The students will have the necessary understanding on the functioning of optical materials foroptoelectronics,
CO4:	The students will understand the basics of carbon structures and their applications in electronics.

TEXT BOOKS:	
1.	Palanisamy .P.K Materials Science. SCITECH Publishers, 2011.
2.	Pillai, S.O, Solid State Physics. New Age International(P) Ltd., publishers, 2009
3.	Rajendran,V, Materials Science, McGraw Hill Education (India) Private Ltd., 2017

REFERENCE BOOKS:	
1.	Arthur Beiser,Concepts of Modern Physics, 6th edn.,McGraw Hill 2003.
2.	Kasap, S.O, Principles of Electronic Materials and Devices, McGraw-Hill education, 2007.
3.	Yoshinobu Aoyagi and Kotaro Kajikawa, Optical Properties of Advanced Materials, Springer, 2013.
4.	Charles P. Poole Jr., Frank J. Owens, Introduction to nano technology, Wiley, 2003.
5.	Pradeep, T, Nano: The Essentials, Mc Graw Hill Publishing Co. Ltd., 2007.

191GES201T	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Common to Auto., MECH, CSE & IT)	Periods per week				Credits
		L	T	P	R	
		3	**0**	**0**	**0**	**3**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand the Basic Fundamentals in Electrical Circuits.
2.	To study the construction, Principle of operation and performance of DC and AC Machines
3.	To understand the principles of PN Junction diode and BJT
4.	To Study the protection and safety measures in Electricity

UNIT	**TITLE**	**PERIODS**
I	**FUNDAMENTALS OF ELECTRICITY AND CIRCUITS**	**9**
Evolution of Electricity and Inventions- Electrical Quantities—Charge- Electric Potential, Voltage, Current, Power Energy, DC, AC, time period, Frequency, Phase, Flux density, RMS, Average, Peak, Phasor and Vector diagram. Electric circuit elements – Sources - Ohm‘s Law - Kirchhoff‘s Laws, Faradays Law, Lenz‘s Law- Wiring- House wiring and Industrial Wiring systems.		
UNIT	**TITLE**	**PERIODS**
II	**MEASURING INSTRUMENTS**	**9**
Principle of Operation Moving Coil and Moving Iron Types of Voltmeters and Ammeters - Multimeters –Measurements of resistance, inductance & capacitance-Power and Energy Measurements- Energy Efficient Equipment‘s and sample load (Domestic load) calculations.		
UNIT	**TITLE**	**PERIODS**
III	**ELECTRICAL MACHINES**	**9**
Construction - Principle of Operation - EMF Equation –Application of DC Generator, DC Motor – types and Characteristics Applications – Transformer-AC Machines – Construction, Operation and types of Single phase and three Phase Induction Motors.		
UNIT	**TITLE**	**PERIODS**
IV	**BASIC ELECTRONICS AND COMMUNICATION**	**9**
PN Junction Diode, Zener Diode – V-I Characteristics – Applications – Rectifier – Half Wave – Full Wave and Rectifiers – Transistors types – Transistor as an Amplifier — Junction Field Effect Transistor (JFET) operation andcharacteristics, SCR - characteristics and its applications- CRO-Principle of Cathode Ray Tube-regulated power Supply- Function Generators. Communication systems- types- Analog, Digital and Wireless.		
UNIT	**TITLE**	**PERIODS**
V	**PROTECTION, SAFETY AND INDIAN ELECTRICITY SCENARIO**	**9**
Hazards of Electricity-Shock, Burns, arc- blast, Thermal Radiation, Explosives, fires, effect of electricity on the human Body. Electrical safety practices, Protection devices. Electrical power- Generation resources- transmission and Distribution. Regulatory authorities- role of MNRE, MNRE, NTPC, TEDA, TANGEDCO.		

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Demonstrate knowledge on basics of electrical circuits, Construction and working principle of variouselectrical machines.
CO2:	Analyze the behaviour and performance of electrical circuits and machines.
CO3:	Apply knowledge on CRO and function generator.
CO4:	Describe electrical hazards and safety equipment.
CO5:	Analyze and apply various grounding and bonding techniques.
CO6:	Select appropriate safety method for low, medium and high voltage equipment.
CO7:	Participate in a safety team.
CO8:	Carry out proper maintenance of electrical equipment by understanding various standards.

TEXT BOOKS:	
1.	S.Hasan Saeed, D.K.Sharma, Non-Conventional Energy Resources, Katson Books, 3rd Edition, 2013
2.	John Cadick, Mary Capelli-Schellpfeffer, Dennis Neitzel, Al Winfield,‗Electrical Safety Handbook', McGraw-Hill Education, 4thEdition, 2012.
3.	D.P.Kothari and I.J. Nagarath –—Basic Electrical & Electronics Engineering‖, Mc.Grawhill publications, 1st Edition, 2014.
4.	Leonard S Bobrow, —Foundations of Electrical Engineering‖, Oxford University Press, 2013
5.	Vincent Del Toro, Electrical Engineering Fundamentals, Prentice Hall, 2006.

REFERENCE BOOKS:	
1.	Del Toro, —Electrical Engineering Fundamentals‖, Pearson Education, New Delhi, 2007 2. John Bird, —Electrical Circuit Theory and Technology‖, Elsevier, First Indian Edition, 2006.
2.	Maxwell Adams.J, ‗Electrical Safety- a guide to the causes and prevention of electric hazards', The Institution of Electric Engineers, IET 1994. 2. Ray A. Jones, Jane G. Jones, ‗Electrical Safety in the Workplace', Jones & Bartlett Learning, 2000.
3.	V.K.Mehta& Rohit Mehta, Principles of Electrical Engineering, S.Chand publications, 2nd Edition, 2003.
4.	Lawmans, Electricity act 2003, Act No. 36 of 2003, Kamal Publishers, New Delhi.

191GES204T	PROGRAMMING IN C	Periods per week				Credits
		L	T	P	R	
		3	**0**	**0**	**0**	**3**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Learn to think logically and write pseudo code or draw flow charts for problems.
2.	Be exposed to the syntax of C.
3.	To develop C Programs using basic programming constructs.
4.	Learn to use arrays and strings in C.
5.	To develop applications in C using functions , pointers and structures
6.	To do input/output and file handling in C

UNIT	**TITLE**	**PERIODS**
I	**C PROGRAMMING BASICS**	**9**
Introduction- Algorithm – Flow Charts – Pseudo Code - Structure of a C program – compilation and linking processes – Character set - Constants, Variables – Data Types – Expressions using operators in C – Managing Input and Outputoperations – Decision Making and Branching – Looping statements.		
UNIT	**TITLE**	**PERIODS**
II	**ARRAYS AND STRINGS**	**9**
Arrays: Initialization – Declaration – Accessing the array elements – Operations on array- One dimensional array -two dimensional arrays – Strings: String operations – String Arrays - Simple programs: sorting- searching – matrixoperations.		
UNIT	**TITLE**	**PERIODS**
III	**FUNCTIONS AND POINTERS**	**9**
Functions: Introduction - Function prototype - function definition - function call – Return statement - Recursion. Parameter passing: Pass by value - Pass by reference. Pointers: Pointer operators – Declaring the pointer variable - Pointer arithmetic Null pointer- Arrays and pointers – Array of pointers.		
UNIT	**TITLE**	**PERIODS**
IV	**STRUCTURES AND UNIONS**	**9**
Structures: Introduction - Need for structure data type –definition and declaration – Structure within structure – Structures and functions – Union: Definition and Declaration – Accessing the members of union - Programs usingStructures and Unions – Scope of variables - Storage classes - Preprocessor directives.		
UNIT	**TITLE**	**PERIODS**
V	**FILE HANDLING**	**9**
Introduction – Using files in C - File operation: Read data from files, writing data to files, detecting the end of file, Functions for selecting a record randomly – File pointer – Error handling - Types of file processing: Sequential access, Random access- Dynamic memory allocation.		

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Develop simple programs using basic C programming concepts.
CO2:	Apply arrays and strings for application development.
CO3:	Solve complex problems using functions and pointers.
CO4:	Organize heterogeneous data with structures and unions.
CO5:	Choose suitable file manipulation techniques for data processing.

TEXT BOOKS:	
1.	Reema Thareja, —Programming in C, Oxford University Press, Second Edition, 2016.
2.	Ajay Mittal — Programming in C, A practical Approach, Ltd., Pearson Education in South Asia, 2011.

REFERENCE BOOKS:	
1.	Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.
2.	Pradip Dey, Manas Ghosh, —Fundamentals of Computing and Programming in C, First Edition, Oxford University Press, 2009.
3.	Paul Deitel and Harvey Deitel, —C How to Program, Seventh edition, Pearson Publication
4.	Juneja, B. L and Anita Seth, —Programming in C, CENGAGE Learning India pvt. Ltd., 2011.
5.	Kernighan, B.W and Ritchie, D.M, —The C Programming language, Second Edition, Pearson Education, 2006.

191GES211L	ENGINEERING PRACTICES LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	**0**	**4**	**0**	**2**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To provide exposure to the students with the concepts involved in product realization by carrying out manufacturing shop exercises. Hands-on practice with manufacturing shop exercises and assembly leadingto realization of a new product in a group.

GROUP A (CIVIL & MECHANICAL)	
CIVIL & MECHANICAL ENGINEERING PRACTICE	
I. CIVIL ENGINEERING PRACTICE	
A. Plumbing Works:	
	Pipeline joints, its location and functions: Valves, Taps, Couplings, Unions, Reducers, Elbows in household fittings.
	Connection of two Galvanized Iron pipes
	Connection of PVC pipes
	Basic pipe connections involving the fitting like Valves, Taps and Bends
B. Carpentry works:	
	Joints in Roofs, Doors, Windows and Furniture.
	Cross Lap joint
	Mortise and Tenant joint
II	**MECHANICAL ENGINEERING PRACTICE**
A	**Welding**
	Arc welding of Butt joints, Tap joints and Tee joints.
	Gas welding practice
B	**Basic machining**
	Simple Turning and Taper turning
	Drilling practice
C	**Sheet metal work:**
	Rectangular tray making
	Funnel making

TOTAL PERIODS:	**30**

GROUP B (ELECTRICAL & ELECTRONICS)	
ELECTRICAL ENGINEERING PRACTICE	
	Residential house wiring using switches, fuse, indicator, lamp and energy meter.
	Fluorescent lamp wiring.
	Stair case wiring
	Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
	Measurement of energy using single phase energy meter.
	Measurement of resistance to earth of electrical equipment.
III	**ELECTRONICS ENGINEERING PRACTICE**
	Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter(peak- peak, RMS period, frequency) using CR.
	Logic gates AND, OR, EX-OR and NOT.
	Generation of Clock Signal.
	Soldering practice – Components Devices and Circuits – Using general purpose PCB.
	Measurement of ripple factor of HWR and FWR.

TOTAL PERIODS:	**30**

COURSE OUTCOMES:	
On successful completion of this course, the student will be able to:	
CO1:	Fabricate carpentry components and pipe connections including plumbing works.
CO2:	Use welding equipments to join the structures.
CO3:	Carry out the basic machining operations
CO4:	Make the models using sheet metal works
CO5:	Carry out basic home electrical works and Understand works of Home Appliances
CO6:	Measure the electrical quantities
CO7:	Elaborate on the Electronic components, Logic gates and soldering practice.

191GES213L	C PROGRAMMING LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	**0**	**3**	**1**	**2**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To develop programs in C using basic constructs.
2.	To develop applications in C using strings, pointers, functions, structures.
3.	To develop applications in C using file processing.

LIST OF EXPERIMENTS	
1.	Programs using only I/O functions.
2.	Programs to study operators and data types.
3.	Programs based on control structures (IF, SWITCH CASE).
4.	Programs using FOR and WHILE loops.
5.	Programs using single dimensional arrays.
6.	Programs using multi dimensional arrays.
7.	Programs on Sorting and Searching using arrays.
8.	Programs based on String manipulations.
9.	Programs based on User Defined Functions.
10.	Programs using Functions with Parameters.
11.	Programs using Storage Classes.
12.	Programs to introduce Pointers.
13.	Programs using Structures and Union.
14.	Programs using Array of Structures.
15.	Programs based on Files.

MINI PROJECT:		
1.	Create a —Railway reservation system / Airline reservation system with the following modules	
	• Booking	
	• Availability checking	
	• Cancellation	
	• Prepare chart	

TOTAL PERIODS:	**60**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Develop simple programs using basic constructs in C programming.
CO2:	Write programs in C using derived data types.
CO3:	Implement modular programming with functions.
CO4:	Build programs with storage classes and pointers for memory management.
CO5:	Construct programs with user defined data types.
CO6:	Design applications using file processing techniques.

LIST OF EQUIPMENTS:	
1.	HARDWARE:
	• Standalone desktops.
2.	SOFTWARE
	• C Compiler

191CYM201T	ENVIRONMENTAL SCIENCE	Periods per week				Credits
		L	T	P	R	
		3	**0**	**0**	**0**	**3**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To appreciate and acquire knowledge about nature, environmental education and biodiversity.
2.	To understand the interrelationship between living organism and environment, environment functions and its value.
3.	To assess the environmental pollution and its impact on the human world.
4.	To find and implement scientific, economic and political solutions to environmental problems.
5.	To gain knowledge about waste management and resource recovery for protecting the environment.

UNIT	**TITLE**	**PERIODS**
I	**ENVIRONMENT AND BIODIVERSITY**	**9**
Definition and scope of an environment – structure of an ecosystem –biotic and abiotic components– ecological succession – food chain, food web – Introduction to biodiversity definition, types – bio-geographical classification of India, India as a mega-diversity nation – values of biodiversity– endangered and endemic species of India hot-spots of biodiversity – threats to biodiversity – conservation of biodiversity		
UNIT	**TITLE**	**PERIODS**
II	**NATURAL RESOURCES AND ITS CONSERVATION**	**9**
Forest resources - Uses and over exploitation, Deforestation, causes and its effects - Water Resources – Uses and over utilization - Water conservation- Dams, benefits and their effects, Rain Water Harvesting, Watershed Management – Mineral resources - Uses and exploitation, Food resources- World food problems - Effects of modern agriculture – Energy resources - Ocean energy, Geothermal energy, Biomass energy		
UNIT	**TITLE**	**PERIODS**
III	**ENVIRONMENTAL DEGRADATION**	**9**
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Noise pollution (e) Thermal pollution – role of an individual in prevention of pollution – pollution case studies – disastermanagement: cyclone, flood, drought, earthquake and landslides - case studies		
UNIT	**TITLE**	**PERIODS**
IV	**SOCIAL ISSUES**	**9**
Population and Sustainability: Population explosion - Sustainable development – Equitable use of resources for sustainable lifestyles-urban problems related to energy - Role of information technology in environment and human health. Industrial effluent treatment: Removal of organic constituents-Biological oxidation process-Removal of inorganic constituents-Metal and radioactive wastes, zero liquid discharge solutions from textile industries		

UNIT	TITLE	PERIODS
V	WASTE MANAGEMENT AND RESOURCE RECOVERY	9
Introduction –Biodegradable, non-biodegradable waste, Municipal solid waste and its management - Special waste – E- waste and Scrap tires - Definition, causes, effects and its management - Resource recovery: a) Waste land reclamation b) Sewage treatment c) Recycling of Plastic, Glass and Paper wastes.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Environmental education initiates an awareness, deeper understanding and sensitivity to the environment and environmental challenges.
CO2:	Acquired knowledge about the principles of nature, environment and their protection
CO3:	Created an involvement to the public to implement environmental laws effectively.
CO4:	Environmental education allows an individual to explore and think about the modern lifestyle has lead to serious environmental disasters and should develop the skills to make responsible decisions.
CO5:	Acquired skills to behave eco-friendly.

TEXT BOOKS:	
1.	Benny Joseph, _Environmental Science and Engineering‘, Tata McGraw-Hill, New Delhi, 2006.
2.	Handbook of Solid Waste Management (McGraw-Hill Handbooks), George Tchobanoglous, Frank Kreith, Publisher: McGraw-Hill Education; 2 edition July, 2002

REFERENCE BOOKS:	
1.	R.K. Trivedi, _Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards‘, Vol. I and II, Enviro Media.
2.	Dharmendra S. Sengar, _Environmental law‘, Prentice hall of India PVT LTD,New Delhi, 2007.
3.	Rajagopalan, R, _Environmental Studies-From Crisis to Cure‘, Oxford University Press 2005.
4.	*Waste Management and Resource Recovery,* Charles R. Rhyner, Leander J.Schwartz, Robert B. Wenger, Mary G. Kohrell, CRC Press Published August 31, 1995.
5.	Industrial wastewater management, treatment and disposal, Water managementǁ Federation Alexandria Virgiia, Third Edition, 2008.

SEMESTER III

Course Code	Course Title	Periods per week				Credits
		L	T	P	R	
191MAB302T	DISCRETE MATHEMATICS	3	2	0	0	4

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To extend student's logical and mathematical maturity and ability to deal with abstraction.
2.	To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.
3.	To understand the basic concepts of Combinatorics and graph theory.
4.	To familiarize the applications of algebraic structures.
5.	To understand the concepts and significance of lattices and Boolean algebra which are widely used in Computer science and engineering

UNIT	TITLE	PERIODS
I	MATHEMATICAL LOGIC	12

Statements and Notations – Connectives – Normal forms – Theory of inference for the statement calculus – Predicate calculus–Inference theory of the predicate calculus

UNIT	TITLE	PERIODS
II	COMBINATORICS	12

Mathematical induction – Strong induction – The basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications.

UNIT	TITLE	PERIODS
III	GRAPHS	12

Graphs and graph models–Graph terminology and special types of graphs–Matrix representation of graphs and graph isomorphism– Connectivity– Euler and Hamilton paths and circuits(Definition and examples only)

UNIT	TITLE	PERIODS
IV	ALGEBRAIC STRUCTURES	12

Algebraic systems – Semi groups and Monoids (Definitions and examples) - Groups – Subgroups – Homomorphism's – Normal subgroup and co sets – Lagrange's theorem – Definitions and examples of Rings , Integral domains and Fields.

UNIT	TITLE	PERIODS
V	LATTICES AND BOOLEAN ALGEBRA	12

Partial ordering –Posets– Lattices as posets–Properties of lattices – Some special lattices–Boolean algebra.

TOTAL PERIODS:	60

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Have knowledge of the concepts needed to test the logic of a program.
CO2:	Be aware of the counting principles.
CO3:	Have an understanding in identifying structures on many levels.
CO4:	Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.
CO5:	Be aware of a class of functions which transform a finite set into another finite set which relates to input And output functions in computer science.

TEXT BOOKS:	
1.	Rosen,K.H.,"Discrete Mathematics and its Applications",7th Edition, Tata McGraw Hill Pub. Co.Ltd., New Delhi, Special Indian Edition, 2011.
2.	Tremblay,J.P.andManohar.R,"DiscreteMathematicalStructureswithApplicationstoComputerScience", Tata McGraw Hill Pub .Co. Ltd, New Delhi,30th Reprint,2011.

REFERENCE BOOKS:	
1.	Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction",4th Edition, Pearson Education Asia, Delhi, 2007.
2.	Lipschutz,S. and MarkLipson.,"Discrete Mathematics",Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi,3rd Edition,2010.
3.	Koshy,T. "Discrete Mathematics with Applications", Elsevier Publications,2006.

Course Code	Course Title	Periods per week				Credits
		L	T	P	R	
191CSC303T	DATA STRUCTURES	3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:	
1.	To understand the concepts of ADTs
2.	To Learn linear data structures– lists, stacks, and queues
3.	To Learn Non-linear data structures- Trees, BST and B Trees
4.	To Learn and apply Graphs structures
5.	To understand sorting, searching and hashing algorithms

UNIT	TITLE	PERIODS
I	LINEAR DATA STRUCTURES – LIST	9

Abstract Data Types(ADTs)–List ADT– array-based implementation linked list implementation — singly linked lists – circularly-linked lists- doubly-linked lists – applications of lists – Polynomial Manipulation –All operations(Insertion, Deletion, Merge, Traversal)

UNIT	TITLE	PERIODS
II	LINEARDATASTRUCTURES – STACKS,QUEUES	9

Stack ADT–Operations-Applications-Evaluating arithmetic expressions- Conversion of Infix to postfix expression – Evaluation of Postfix expression- Queue ADT –Operations-Circular Queue- deQueue – applications of queues

UNIT	TITLE	PERIODS
III	NON LINEAR DATA STRUCTURES – TREES	9

Tree ADT – tree traversals – Binary Tree ADT – expression trees – applications of trees – binary search tree ADT – AVL Trees – B Tree – Heap – Min Heap and Max Heap

UNIT	TITLE	PERIODS
IV	NON LINEAR DATA STRUCTURES – GRAPHS	9

Definition – Representation of Graph – Types of graph – Breadth - first traversal-Depth-first traversal–Topological Sorting – Shortest – Path algorithm - Dijkstra's algorithm - Minimum spanning tree – Prim's and Kruskal's Algorithms –Bi-connectivity – Cut Vertex – Applications of graphs

UNIT	TITLE	PERIODS
V	SEARCHING, SORTING AND HASHING TECHNIQUES	9

Searching- Linear Search - Binary Search. Sorting - Bubble sort - Selection sort - Insertion sort – Quick sort - Hashing- Hash Functions –Collision resolution – Open Addressing – Chaining – Extendible Hashing

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Implement abstract data types for linear data structures
CO2:	Apply the different linear data structures to problem solutions
CO3:	Apply the different non-linear data structures to problem solutions
CO4:	Apply graph structures to solve real world problems
CO5:	Critically analyze the various sorting algorithms

TEXT BOOKS:	
1.	Mark Allen Weiss,—Data Structures and Algorithm Analysis in C,2nd Edition, Pearson Education,2018
2.	Reema Thareja,—Data Structures Using C, Second Edition, Oxford University Press,2018

REFERENCE BOOKS:	
1.	Aho, Hopcroft and Ullman, —Data Structures and Algorithms‖,PearsonEducation,1983
2.	Ellis Horowitz,Sartaj Sahni,Susan Anderson-Freed, Fundamentals of Data Structures in C, Second Edition, University Press, 2008.
3.	Stephen G. Kochan, —Programming in C, 3rd edition, Pearson Education.
4.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein -- Introduction to Algorithms", Second Edition,McgrawHill,2002.

191CAC301T	ARTIFICIAL INTELLIGENCE	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Study the basic concepts of Artificial Intelligence
2.	Learn the methods of solving problems using Artificial Intelligence
3.	To understand various knowledge representation techniques
4.	To provide knowledge in Machine learning algorithms.
5.	Introduce the more advanced topics of AI like Expert system, agents and robotics and planning

UNIT	TITLE	PERIODS
I	INTRODUCTION TO AI	9
Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies Problem characteristics - Problem solving methods -Hill Climbing-Depth first and Breadth first, Constraints satisfaction Related algorithms, Measure of performance and analysis of search algorithms-Genetic Algorithms.		
UNIT	TITLE	PERIODS
II	KNOWLEDGE REPRESENTATION	9
Game playing – Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge-Prolog Programming.		
UNIT	TITLE	PERIODS
III	REASONING AND INFERENCE	9
Reasoning Systems for Categories-Reasoning with Default Information-Non monotonic reasoning-Fuzzy Logic-Fuzzy rules-fuzzy inference-Neural Networks-Neuro-fuzzy Inference- Bayes Rule and its Applications – Bayesian Networks –Hidden Markov Models-Dempster – Shafer theory		
UNIT	TITLE	PERIODS
IV	LEARNING	9
Forms of Learning- Supervised Learning-Learning Decision Trees –Regression and Classification with Linear Models - Artificial Neural Networks – Nonparametric Models - Support Vector Machines - Statistical Learning –Learning with Complete Data-Learning with Hidden Variables-The EM Algorithm–Reinforcement Learning.		
UNIT	TITLE	PERIODS
V	APPLICATIONS	9
AI Application - Expert systems –Natural Language Processing – Machine Translation – Speech Recognition – Robot-AI in healthcare.		

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Apply the fundamental concepts of artificial intelligence (AI) in problem solving
CO2:	Analyze the Knowledge representation techniques to deduce the AI solutions.
CO3:	Build Fuzzy Inference rules and Bayesian network to solve Uncertainty problems
CO4:	Create hybrid Machine learning techniques for real time applications.
CO5:	Design the real time applications using artificial intelligence (AI) concepts

TEXT BOOKS:	
1.	Stuart Russell and Peter Norvig "AI–A Modern Approach", 3rd Edition, Pearson Education 2015
2.	Kevin Night and Elaine Rich Nair B. ,"Artificial Intelligence(SIE)",Mc-GrawHill- 2008.

REFERENCE BOOKS:	
1.	Dan W. Patterson, "Introduction to AI and ES", Pearson Education,2007.
2.	Peter Jackson, "Introduction to Expert Systems",3rd Edition, Pearson Education,2007.
3.	Deepak Khemani "Artificial Intelligence", Tata McGraw Hill Education2013.

191CAC302T	OBJECT ORIENTED PROGRAMMING USING JAVA	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand Object Oriented Programming concepts and basic characteristics of Java
2.	To know the principles of packages, inheritance and interfaces
3.	To define exceptions and use I/O streams
4.	To develop a java application with threads and generics classes
5.	To design and build simple Graphical User Interfaces

UNIT	TITLE	PERIODS
I	INTRODUCTION TO OOP AND JAVA FUNDAMENTALS	9

Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment - Java Source File -Structure

– Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages - JavaDoc comments.

UNIT	TITLE	PERIODS
II	INHERITANCE AND INTERFACES	9

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes, Array Lists – Strings

UNIT	TITLE	PERIODS
III	EXCEPTION HANDLING AND I/O	9

Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files

UNIT	TITLE	PERIODS
IV	MULTITHREADING AND GENERIC PROGRAMMING	9

Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming – Generic classes

– generic methods – Bounded Types – Restrictions and Limitations.

UNIT	TITLE	PERIODS
V	EVENT DRIVEN PROGRAMMING	9
Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse events - AWT event hierarchy - Introduction to Swing – layout management - Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes.		

TOTALPERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Develop Java programs using OOP principles
CO2:	Develop Java programs with the concepts inheritance and interfaces
CO3:	Build Java applications using exceptions and I/O streams
CO4:	Develop Java applications with threads and generics classes
CO5:	Develop interactive Java programs using swings

TEXT BOOKS:	
1.	Java: The Complete Reference, Eleventh Edition, 12th Edition. by Herbert Schildt. Released December 2022. Publisher(s): McGraw-Hill. ISBN: 9781260440249.
2.	Cay S. Horstmann, Gary cornell, “Core Java Volume –I Fundamentals”, 9th Edition, Prentice Hall, 2013.

REFERENCE BOOKS:	
1.	PROGRAMMING IN JAVA REVISED 2ND EDITION , 1 January 2018 by Sachin Malhotra (Author), Saurabh Choudhary (Author)

191CAC303T	DISTRIBUTED SYSTEMS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand the foundations of distributed systems.
2.	To learn about inter process communication in distributed system.
3.	Introduce the idea of peer-to-peer services and file system.
4.	Understand in detail the system level and support required for distributed system.
5.	Understand the issues involved in studying process and resource management.

UNIT	TITLE	PERIODS
I	INTRODUCTION	9

Examples of Distributed Systems–Trends in Distributed Systems – Focus on resource sharing – Challenges. Case study: World Wide Web.

UNIT	TITLE	PERIODS
II	COMMUNICATION IN DISTRIBUTED SYSTEM	9

System Model – Inter process Communication - the API for internet protocols – External data representation and Multicast communication. Network virtualization: Overlay networks. Case study: MPI Remote Method Invocation And Objects: Remote Invocation – Introduction - Request-reply protocols - Remote procedure call - Remote method invocation. Case study: Java RMI - Group communication - Publish-subscribe systems - Message queues - Shared memory approaches - Distributed objects - Case study: Enterprise Java Beans -from objects to components.

UNIT	TITLE	PERIODS
III	PEER TO PEER SERVICES AND FILE SYSTEM	9

Peer-to-peer Systems – Introduction - Napster and its legacy - Peer-to-peer – Middleware - Routing overlays. Overlay case studies: Pastry, Tapestry- Distributed File Systems –Introduction - File service architecture – Andrew File system. File System: Features-File model -File accessing models - File sharing semantics Naming: Identifiers, Addresses, Name Resolution – Name Space Implementation – Name Caches – LDAP.

UNIT	TITLE	PERIODS
IV	SYNCHRONIZATION AND REPLICATION	9

Introduction - Clocks, events and process states - Synchronizing physical clocks- Logical time and logical clocks - Global states – Coordination and Agreement – Introduction - Distributed mutual exclusion – Elections – Transactions and Concurrency Control– Transactions -Nested transactions – Locks – Optimistic concurrency control - Timestamp ordering – Atomic Commit protocols -Distributed deadlocks – Replication – Case study – Coda.

UNIT	TITLE	PERIODS
V	PROCESS & RESOURCE MANAGEMENT	9
Process Management: Process Migration: Features, Mechanism - Threads: Models, Issues, Implementation. Resource Management: Introduction- Features of Scheduling Algorithms –Task Assignment Approach – Load Balancing Approach – Load Sharing Approach.		

TOTALPERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Discuss trends in Distributed Systems.
CO2:	Discuss Systems models and apply network virtualization.
CO3:	Understand peer to peer services and file system
CO4:	Understand various synchronization and replications.
CO5:	Design process and resource management systems.

TEXT BOOKS:	
1.	George Coulouris, Jean Dollimore and Tim Kindberg,“Distributed Systems Concepts and Design”,Fifth Edition, Pearson Education,2012.
2.	Grid Computing: A Practical Guide to Technology and Applications, A. Abbas, Firewall Media,

REFERENCE BOOKS:	
1.	Tanenbaum A.S.,Van SteenM.,“Distributed Systems: Principles and Paradigms”, Pearson Education, 2007
2.	Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.
3.	Liu M.L. ,“Distributed Computing, Principles and Applications”, Pearson Education,2004.

Course Code	Course Title	Periods per week				Credits
		L	T	P	R	
191CSC311L	**DATA STRUCTURES LABORATORY IN C**	**0**	**0**	**3**	**1**	**2**

COURSE OBJECTIVES:	
1.	To understand and implement Linear data structures using C
2.	To implement Non Linear data structures using C
3.	To Implement Graph and Traversal algorithms
4.	To implement Searching and Sorting algorithms
5.	To implement Hashing techniques

LIST OF EXPERIMENTS	
1.	Array implementation of List ADT
2.	Array implementation of Stacks
3.	Array implementation of Queues
4.	Linked list implementation of List ADT
5.	Linked list implementation of Stacks
6.	Linked list implementation of Queues
7.	Application of Stacks and Queues
8.	Implementation of Binary Search Trees and Traversal
9.	Implementation of AVL Trees
10.	Implementation of Heaps using Priority Queues
11.	Implementation of Graph and Traversal algorithms
12.	Implementation of Sorting Algorithms : Bubble sort & Quick sort
13.	Implementation of Linear search and Binary search
14.	Implementation of Hashing – any one collision resolution techniques

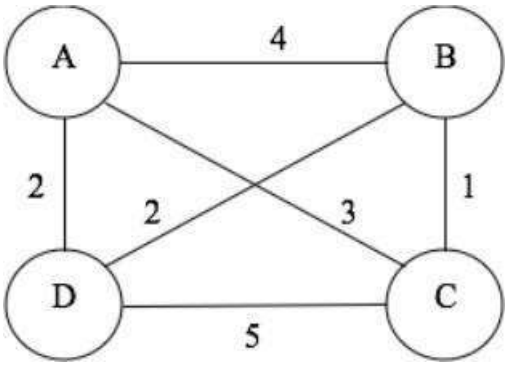
TOTAL PERIODS:	**60**

COURSE OUTCOMES:	
After completing this course the student must be able to :	
1.	Implement Python concepts.
2.	Develop the programs on stacks and Queues.
3.	Design and implementation of programs on BST.
4.	Design and implementation of programs on Graph Traversals.
5.	Apply Hashing techniques in real world applications.

Course Code	Course Title	Periods per week				Credits
		L	T	P	R	
191CAC311L	**ARTIFICIAL INTELLIGENCE LABORATORY**	**0**	**0**	**4**	**0**	**2**

COURSE OBJECTIVES:	
1.	Identify innovative research directions in Artificial Intelligence.
2.	Design a system capable of thinking for itself just like humans do.
3.	Computational study of structures and processes that support intelligent behavior.
4.	Introduction to the basic principles and applications of Artificial Intelligence.
5.	Learn the logic solving and problem solving ability.

S No:	**LIST OF PROGRAMS**
1.	Given a set of strings, return them in lexicographic order (dictionary / alphabetical order), where Lexicographic sorting of a set of keys can be accomplished with a simple Trie-Based Algorithm as follows – a) Insert all keys into a Trie b) Print all keys in the Trie by performing pre-order traversal on Trie to get output in lexicographically increasing order.
2.	Given an M x N matrix of characters, find all occurrences of a given string in the matrix. We are allowed to search the string in all eight possible directions, i.e, North, West, South, East, North-East, North-West, South East, South-West. Note that there should not be any cycles in the output path. For Example, consider the following matrix of characters, [D E M X B] [A O E P E] [D D C O D] [E B E D S] [C P Y E N] If the given input string is CODE, following are all its occurrences in the matrix: C(2, 2) O(1, 1) D(0, 0) E(0, 1) C(2, 2) O(1, 1) D(2, 0) E(3, 0) C(2, 2) O(1, 1) D(2, 1) E(1, 2) C(2, 2) O(1, 1) D(2, 1) E(3, 0) C(2, 2) O(1, 1) D(2, 1) E(3, 2) C(2, 2) O(2, 3) D(2, 4) E(1, 4) C(2, 2) O(2, 3) D(3, 3) E(3, 2)

3.	Create a game with Noughts and Crosses or Os and Xs, where the two players needs to take turns marking the spaces in a 3x3 grid with their own marks, if 3 consecutive marks(Horizontal, Vertical, Diagonal) are formed then the player who owns these moves “wins”.
4.	Using the Best-First Search algorithm to give a solution of the following Traveling Salesman Problem. Show the state space tree and the optimal tour and write a PYTHON program to implement it. 
5.	Write a program to create a Convolutional Neural Network for object detectionusingKeras and TensorFlow as a backend.Implement using Python i] Find the confusion matrix based on True Positive and True Negative values ii] Find theaccuracyof the test data by changing the hyperparameters.
6.	Write a program to teach a taxi to pick up and drop off passengers at the right locations with six possible action spaces of size 6i.e., south,north,east,west,pickup,dropoff, and state space of size 500 by enabling rewards and penalties using Reinforcement learning.Implement using Python.
7.	A hungry monkey is in a room, and he is near the door. The monkey is on the floor. Bananas have been hung from the center of the ceiling of the room. There is a block or a chair present in the room near the window. The monkey wants the banana, but cannot reach it. So, how can the monkey get the bananas. Implement using Python.
8.	You are given two jugs, a 4-gallon one and a 3-gallon one. Neither has any measuring mark on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 gallons of water into the 4- gallon jug. Implement using Python.
9.	Develop Mini Project 1 on any one of the problem statement: a) Identify Spam b) Making Product Recommendations c) Customer Segmentation d) Image & Video Recognition e) Fraudulent Transactions f) Demand Forecasting

	g) Virtual Personal Assistant h) Sentiment Analysis i) Customer Service Automation

TOTAL PERIODS	**60**

COURSE OUTCOMES:	
1.	To understand the concept of Artificial Intelligence.
2.	To apply various search algorithms of Artificial Intelligence.
3.	To apply knowledge representation and reasoning techniques.
4.	To understand and apply different types of machine learning and models.
5.	To understand the design principles of pattern recognition with estimation and apply classification technique.

Course Code	Course Title	Periods per week				Credits
		L	T	P	R	
191CAC312L	**OBJECT ORIENTED PROGRAMMING LABORATORY**	**0**	**0**	**4**	**0**	**2**

COURSE OBJECTIVES:	
1.	To write programs using abstract classes
2.	To write programs for solving real world problems using java collection frame work
3.	To write multithread programs
4.	To write GUI programs using swing controls in Java
5.	To introduce java compiler and eclipse platform

LIST OF EXPERIMENTS	
1.	Write a program that would print the information (name, year of joining, salary, address) of three employees by creating a class named 'Employee'. The output should be as follows: Name Year of joining Address Robert 1994 64C- WallsStreet Sam 2000 68D- WallsStreet John 1999 26B- WallsStreet
2.	Create a class named 'Member' having the following members: Data members 1 - Name 2 - Age 3 - Phone number 4 - Address 5 - Salary It also has a method named 'printSalary' which prints the salary of the members. Two classes 'Employee' and 'Manager' inherits the 'Member' class. The 'Employee' and 'Manager' classes have data members 'specialization' and 'department' respectively. Now, assign name, age, phone number, address and salary to an employee and a manager by making an object of both of these classes and print the same.
3.	All the banks operating in India are controlled by RBI. RBI has set a well-defined guideline (e.g. minimum interest rate, minimum balance allowed, maximum withdrawal limit etc) which all banks must follow. For example, suppose RBI has set minimum interest rate applicable to a saving bank account to be 4% annually; however, banks are free to use 4% interest rate or to set any rates above it. Write a JAVA program to implement bank functionality in the above scenario and demonstrate the dynamic polymorphism concept. Note: Create few classes namely Customer, Account, RBI (Base Class) and few derived classes (SBI, ICICI, PNB etc). Assume and implement required member variables and functions in each class.
4.	We have to calculate the percentage of marks obtained in three subjects (each out of 100) by student A and in four subjects (each out of 100) by student B. Create an abstract class 'Marks' with an abstract method 'getPercentage'. It is inherited by two other classes 'A' and 'B' each having a method with the same name which returns the percentage of the students. The constructor of student A takes the marks in three subjects as its parameters and the marks in four subjects as its parameters for student B. Create an object for each of the two classes and print the percentage of marks for both the students.

5.	Write a Java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
6.	Write Java Programs for Exception Handling to demonstrate A. Arithmetic Exception B. Null Pointer Exception C. String IndexOutOfBounds Exception D. File Not Found Exception E. Number Format Exception F. IOException
7.	Write a Java Program that loads names and phone numbers from a text file where the data is organized as one line per record and each filed in a record are separated by a tab (\t). It takes a name or phone number as input and prints the corresponding other value from the hash table
8.	Create a layout using JavaFX controls for login and register layouts. Store the registered users in a file and validate the username and password for login layout. Create a menu bar to swap between login, register and to print all values from the stored file. Use appropriate event handler modules/methods for interactive programming.
9.	Create any one of the mini project given below, Brick Breaker Game Simple Banking Application Library Management System ATM Simulation System Airline Reservation System A Text-Based Adventure Game Electricity billing system e-Healthcare management system Network packet sniffer Link Shortener

TOTAL PERIODS:	**60**

COURSE OUTCOMES:	
After completing this course the student must be able to :	
1.	Able to write programs for solving real world problems using java collection frame work
2.	Able to write programs using abstract classes
3.	Able to write multithread programs
4.	Able to write GUI programs using swing controls in Java
5.	Will have hands on experience with Java Programming

SEMESTER IV

191MAB405T	PROBABILITY AND STATISTICS	Periods per week				Credits
		L	T	P	R	
		3	2	0	0	4

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	This course aims at providing the required skill to apply the statistical tools in engineering problems.
2.	To introduce the basic concepts of probability and random variables.
3.	To introduce the basic concepts of two dimensional random variables.
4.	To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
5.	To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control.

UNIT	TITLE	PERIODS
I	PROBABILITY AND RANDOM VARIABLES	12
Probability – The axioms of probability – Conditional probability - Baye's theorem – Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.		
UNIT	TITLE	PERIODS
II	TWO-DIMENSIONAL RANDOM VARIABLES	12
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression.		
UNIT	TITLE	PERIODS
III	TESTING OF HYPOTHESIS	12
Sampling distributions - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean, variance - Contingency table (test for independent) - Goodness of fit.		
UNIT	TITLE	PERIODS
IV	DESIGN OF EXPERIMENTS	12
One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design.		
UNIT	TITLE	PERIODS
V	STATISTICAL QUALITY CONTROL	12
Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.		

TOTAL PERIODS:	60

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Use the probability distribution to study discrete and continuous random variables.
CO2:	Find the joint probability density function (PDF) of two new random variables by using the PDF of two given random variables and given transformation.
CO3:	Find the acceptability of null hypothesis by applying testing of hypothesis for small and large samples.
CO4:	Use the design of experiments in the field of agriculture.
CO5:	Monitor the correctness of the measurements and attributes of samples by using statistical quality control charts.

TEXT BOOKS:	
1.	Johnson,R.A.,Miller,I and Freund J.,"Miller and Freund‘s Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2.	Milton.J.S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill,4th Edition,2007.

REFERENCE BOOKS:	
1.	Devore. J. L "Probability and Statistics for Engineering and the Sciences”, Cengage Learning, New Delhi,8th Edition, 2014.
2.	Papoulis, A. and Unni Krishna pillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India,4th Edition, NewDelhi,2017.
3.	Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2014.
4.	Spiegel.M.R.,Schiller.J.and Srinivasan,R.A.,"Schaum‘s Outline of Theory And Problems of Probability and Statistics", Tata McGraw Hill Edition,2004.
5.	Walpole.R.E.,Myers.R.H., Myers.S.L.andYe. K., "Probability and Statistics For Engineers and Scientists", Pearson Education, Asia, 8th Edition, 2013.

191CSC401T	DESIGN AND ANALYSIS OF ALGORITHMS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand the concepts of algorithms and its efficiency
2.	To understand and apply the algorithm analysis techniques
3.	To critically analyze the efficiency of alternative algorithmic solutions for the same problem
4.	To understand different algorithm design techniques
5.	To understand the limitations of Algorithmic power

UNIT	TITLE	PERIODS
I	INTRODUCTION	9
Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithmic Efficiency –Asymptotic Notations and their properties. Analysis Framework - Mathematical analysis for Recursive and Non-recursive algorithms – Visualization		
UNIT	TITLE	PERIODS
II	BRUTE FORCE AND DIVIDE-AND-CONQUER	9
Brute Force – Computing a^n – String Matching - Closest-Pair and Convex-Hull Problems - Exhaustive Search - Travelling Salesman Problem - Knapsack Problem - Assignment problem. Divide and Conquer Methodology – Binary Search – Merge sort – Quick sort – Heap Sort - Multiplication of Large Integers.		
UNIT	TITLE	PERIODS
III	DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE	9
Dynamic programming – Principle of optimality - Coin changing problem, Computing a Binomial Coefficient – Floyd‘s algorithm – Multi stage graph - Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique – Container loading problem - Prim‘s algorithm and Kruskal's Algorithm – 0/1 Knapsack problem, Huffman Trees.		
UNIT	TITLE	PERIODS
IV	ITERATIVE IMPROVEMENT	9
The Simplex Method - The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs, Stable marriage Problem.		
UNIT	TITLE	PERIODS
V	COPING WITH THE LIMITATIONS OF ALGORITHM POWER	9
Lower - Bound Arguments - P, NP NP-Complete and NP Hard Problems. Backtracking – n-Queen’s problem - Hamiltonian Circuit Problem – Subset Sum Problem Branch and Bound – Assignment problem – Knapsack Problem – Travelling Salesman Problem - Approximation Algorithms for NP- Hard Problems – Travelling Salesman problem – Knapsack problem.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Analyze the algorithms by time and space complexity.
CO2:	Solve the problems using Brute force and Divide-and-Conquer method.
CO3:	Solve the problems using Dynamic Programming And Greedy technique.
CO4:	Build the solution for the problem using Iterative algorithmic design techniques.
CO5:	Design algorithms for the real-world problems.

TEXT BOOKS:	
1.	Anany Levitin, ”Introduction to the Design and Analysis of Algorithms”, Third Edition, Pearson Education,2017.
2.	Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algoritms / C++,Second Edition, University Press,2007.

REFERENCE BOOKS:	
1.	Alfred V. Aho, John E.Hopcroft and Jeffrey D.Ullman, ”Data Structures and Algorithms”, Pearson Education, Reprint 2006.
2.	Harsh Bhasin, ”Algorithms Design and Analysis”,Oxford university press,2016.
3.	Sridhar S ,”Design and Analysis of Algorithms”,Oxford university press,2014.
4.	Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, ”Introduction to Algorithms”, Third Edition,PHI Learning Private Limited,2012.

WEBSITES:	
1.	http://nptel.ac.in/

191CSC402T	OPERATING SYSTEMS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Study the basic concepts and functions of operating systems.
2.	Understand the structure and functions of OS.
3.	Learn about Processes, Threads and Scheduling algorithms.
4.	Understand the principles of concurrency and Deadlocks.
5.	Learn various memory management schemes.
6.	Study I/O management and File systems.
7.	Learn the basics of Linux system and perform administrative tasks on Linux Servers.

UNIT	TITLE	PERIODS
I	OPERATING SYSTEMS OVERVIEW	9
Computer System Overview-Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization. Operating system overview-objectives and functions, Evolution of Operating System - Computer System Organization - Operating System Structure and Operations - System Calls, System Programs, OS Generation and System Boot.		
UNIT	TITLE	PERIODS
II	PROCESS MANAGEMENT	9
Processes-Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication; Threads-Overview, Multicore Programming, Multithreading Models; Windows 7 – Thread and SMP Management. Process Synchronization – Critical Section Problem, Mutex Locks, Semaphores, Monitors; CPU Scheduling and Deadlocks.		
UNIT	TITLE	PERIODS
III	STORAGE MANAGEMENT	9
Main Memory-Contiguous Memory Allocation, Segmentation, Paging, 32 and 64 bit architecture Examples; Virtual Memory - Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS Examples.		
UNIT	TITLE	PERIODS
IV	I/O SYSTEMS	9
Mass Storage Structure- Overview, Disk Scheduling and Management; File System Storage-File Concepts, Directory and Disk Structure, Sharing and Protection; File System Implementation - File System Structure, Directory Structure, Allocation Methods, Free Space Management, I/O Systems.		
UNIT	TITLE	PERIODS
V	CASE STUDY	9
Linux System - Basic Concepts; System Administration - Requirements for Linux System Administrator, Setting up a LINUX Multifunction Server, Domain Name System, Setting Up Local Network Services; Virtualization - Basic Concepts, VMware on Linux Host OS.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Interpret the basics of operating systems
CO2:	Apply scheduling, synchronization, threading and deadlock concepts for process management
CO3:	Analyze various management scheme for memory allocation
CO4:	Implement file system management concepts.
CO5:	Build LINUX Multifunction Server

TEXT BOOKS:	
1.	**Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012.**

REFERENCE BOOKS:	
1.	Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Addison Wesley, 2014.
2.	Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education", 2012.
3.	Dhamdhere D. M., "Operating Systems: A Concept-Based Approach", Second Edition, Tata McGraw-Hill Education, 2007.
4.	William Stallings, "Operating Systems – Internals and Design Principles", 7th Edition, Prentice Hall, 2013

WEBSITES:	
1.	http://nptel.ac.in/

191CSC403T	DATABASE MANAGEMENT SYSTEMS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To learn the fundamentals of data models and to represent a database system using ER diagrams
2.	To study SQL and relational database design
3.	To understand the internal storage structures using different file and indexing techniques which will help in physical DB design
4.	To understand the fundamental concepts of transaction processing- concurrency control techniques and recovery procedures
5.	To have an introductory knowledge about the Storage and Query processing Techniques

UNIT	TITLE	PERIODS
I	RELATIONAL DATABASES	10
Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL		
UNIT	TITLE	PERIODS
II	DATABASE DESIGN	8
Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form		
UNIT	TITLE	PERIODS
III	TRANSACTIONS	9
Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery – Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery		
UNIT	TITLE	PERIODS
IV	IMPLEMENTATION TECHNIQUES	9
RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics and Cost Estimation.		
UNIT	TITLE	PERIODS
V	ADVANCED TOPICS	9
Distributed Databases: Architecture, Data Storage, Transaction Processing – Object-based Databases: Object Database Concepts, Object-Relational features, ODMG Object Model, ODL, OQL – XML Databases: XML Hierarchical Model, DTD, XML Schema, XQuery – Information Retrieval: IR Concepts, Retrieval Models, Queries in IR systems		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Design relational database model for real world applications
CO2:	Develop ER model into Relational model for real world scenario
CO3:	Apply normalization for effective database design
CO4:	Apply Transaction management strategies to achieve Consistency
CO5:	Analyse indexing strategies for File organisation and Query Optimization
CO6:	Appraise advanced databases over traditional databases

TEXT BOOKS:	
1.	Abraham Silberschatz, Henry F. Korth, S. Sudharshan, —Database System Concepts‖, Sixth Edition, Tata McGraw Hill, 2013
2.	Ramez Elmasri, Shamkant B. Navathe, —Fundamentals of Database Systems‖, Sixth Edition, Pearson Education, 2011

REFERENCE BOOKS:	
1.	Gupta G.K.,"Database Management Systems‖, Tata McGraw Hill, 2011
2.	Date C.J., Kannan A., Swamynathan S., —An Introduction to Database Systems‖, Eighth Edition, Pearson Education, 2006
3.	Raghu Ramakrishnan, —Database Management Systems‖, Fourth Edition, McGraw-Hill College Publications, 2015

191CAC401T	Computer Organization and Architecture	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand the basic structure of a digital computer.
2.	To discuss the operation of various components of computing systems.
3.	To study the different ways of communicating with I/O devices
4.	To enhance the processor operation by employing pipelining

UNIT	TITLE	PERIODS
I	BASIC STRUCTURE OF COMPUTERS	8
Functional Units - Basic Operational Concepts - Bus Structures - Software Performance - Memory Locations and Addresses - Memory Operations - Instruction and Instruction Sequencing - Addressing Modes - Assembly Language - Basic I/O Operations - Stacks and Queues.		
UNIT	TITLE	PERIODS
II	BASIC PROCESSING UNIT	8
Fundamental Concepts - Execution of a Complete Instruction - Multiple Bus Organization - Hardwired Control – Micro programmed Control – Microinstructions- Micro program Sequencing-Wide Branch Addressing.		
UNIT	TITLE	PERIODS
III	ARITHMETIC UNIT	11
Addition and Subtraction of Signed Numbers - Design of Fast Adders - Multiplication of Positive Numbers - Signed Operand Multiplication and Fast Multiplication - Integer Division - Floating Point Numbers and Operations.		
UNIT	TITLE	PERIODS
IV	MEMORY SYSTEM	9
Basic Concepts - Semiconductor RAM- Internal Organization of Memory Chips- Static Memories-ROM- Speed, Size and Cost - Cache Memories - Performance Considerations - Virtual Memory-Secondary storage devices.		
UNIT	TITLE	PERIODS
V	PIPELINING AND I/O ORGANIZATION	9
Pipelining - Basic Concepts - Data Hazards - Instruction Hazards -Superscalar operation- Out –of-Order Execution- Interrupts - Direct Memory.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Explain micro level operations of computer using the concepts of hardware and software coordination.
CO2:	Compare different types of memories and their performances.
CO3:	Apply the knowledge of binary arithmetic operations to understand the design of hardware components.
CO4:	Enumerate various control methodologies using programming and their effect on the hardware components.
CO5:	Describe the performance enhancement techniques for data handling and I/O handling.

TEXT BOOKS:	
1.	Carl Hamacher, ZvonkoVranesic and SafwatZaky, “Computer Organization”, 5th Edition McGraw-Hill, 2014.

REFERENCE BOOKS:	
1.	R.D.Dowsing, F.W.D.Woodhams and Ian Marshall, “Computers From Logic To Architecture”, Mcgraw Hill Publishing Company, UK, 2000.
2.	Ian East, “Computer Architecture And Organization”, Pitman Publishing, (A Division Of Longman Group UK Limited), Taylor & Francis E-Library, 2005.
3.	William Stallings, “Computer Organization and Architecture - Designing for Performance”, 9th Edition, Prentice Hall, 2012.
4.	David A.Patterson and John L.Hennessy, “Computer Organization and Design: The hardware / software interface”, 4th Edition, Morgan Kaufmann, 2010.
5.	John P.Hayes, “Computer Architecture and Organization”, 3rd Edition, McGraw Hill, 2017.
6.	V.P. Heuring, H.F. Jordan, “Computer Systems Design and Architecture”, Second Edition, Pearson Education, 2008.

191CAC402T	COMPUTER NETWORKS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	To understand the protocol layering and physical level communication.
2.	To analyze the performance of a network.
3.	To learn the functions of network layer and the various routing protocols
4.	To understand the functions of Transport layer and its operations.
5.	To familiarize the functions and protocols of Application layer.

UNIT	TITLE	PERIODS
I	**INTRODUCTION AND PHYSICAL LAYER**	9

Networks – Network Types – Internet Architecture - Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching

UNIT	TITLE	PERIODS
II	**DATA-LINK LAYER & MEDIA ACCESS**	9

Link layer Addressing - Services – Framing – Error Detection – Flow control – HDLC - Media access control – Ethernet (802.3) – Wireless LANs – IEEE 802.11 – Bluetooth.

UNIT	TITLE	PERIODS
III	**NETWORK LAYER**	9

Network Layer Services – Switch basics – Basic Internetworking (IP, CIDR, ARP, DHCP and ICMP) - IPV4 Addressing – IPV6 Protocol - Routing (RIP, OSPF, metrics) – Global Internet (Areas, BGP, IPv6), Multicast – addresses – multicast routing (DVMRP, PIM).

UNIT	TITLE	PERIODS
IV	**TRANSPORT LAYER**	9

Overview of Transport layer – UDP – Reliable byte stream (TCP) – Connection management – Flow control – Retransmission – TCP Congestion control – Congestion avoidance (DECbit, RED) – QoS – Application requirements.

UNIT	TITLE	PERIODS
V	**APPLICATION LAYER**	9

WWW and HTTP – FTP – Electronic Mail (SMTP, POP3, IMAP, MIME) –Telnet –SSH – DNS – SNMP.

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Outline the Protocol layering , its functions and various physical layer communication techniques.
CO2:	Discriminate among different Link Layer Services.
CO3:	Compare and contrast the various Routing algorithms.
CO4:	Classify and evaluate various transport layer protocols.
CO5:	Apply the appropriate protocol in networking applications.
TEXT BOOKS:	
1.	Behrouz and Forouzan,2017, Introduction to Data Communication and Networking,5th Edition, TMH.
2.	James F Kurose, Keith W Ross, "Computer Networking - A Top-Down Approach Featuring the Internet", 6 th Edition, Pearson Education, New Delhi,2017.

REFERENCE BOOKS:	
1.	Prakash C Gupta, "Data Communication and Computer Networks", Prentice Hall of India, New Delhi, 2014.
2.	Achyut S Godbole,"Data Communication and Networking",2nd Edition, Tata McGraw Hill Publishing Company, New Delhi,2011.
3.	NaderFMir,"Computer and Communication Networks", Pearson Prentice Hall, New Delhi,2014.
4.	Andrew S Tanenbaum, David J Wetherall,"Computer Networks",5th Edition, Prentice Hall of India/ Pearson Education, New Delhi, 2012.

191CSC412L	DATABASE MANAGEMENT SYSTEMS LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	0	3	1	2

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand data definitions and data manipulation commands
2.	To learn the use of nested and join queries
3.	To understand functions, procedures and procedural extensions of data bases
4.	To be familiar with the use of a front end tool
5.	To understand design and implementation of typical database applications

LIST OF EXPERIMENTS	
1.	Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements
2.	Database Querying – Simple queries, Nested queries, Sub queries and Joins
3.	Views, Sequences, Synonyms
4.	Database Programming: Implicit and Explicit Cursors
5.	Procedures and Functions
6.	Triggers
7.	Exception Handling
8.	Database Design using ER modelling, normalization and Implementation for any application
9.	Database Connectivity with Front End Tools
10.	Case Study using real life database applications

TOTAL PERIODS:	60

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Apply data definitions and manipulation commands
CO2:	Create Nested and Join Queries for given real world scenario
CO3:	Create Views, Sequences and Synonyms for tables
CO4:	Develop simple programs with Cursors, Functions, Procedures, Exception handling and triggers .
CO5:	Construct real time applications using Front end Tools with database connectivity

WEBSITES:	
1.	spoken-tutorial.org

191CAC411L	COMPUTER NETWORKS LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	0	3	1	2

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To learn and use network commands.
2.	To learn socket programming.
3.	To implement and analyze various network protocols.
4.	To learn and use simulation tools.
5.	To use simulation tools to analyze the performance of various network protocols.

LIST OF EXPERIMENTS	
1.	Learn to use various networking commands and examine.
2.	Write a program to implement socket programming.
3.	Write a HTTP web client program to download a web page using TCP / UDP sockets.
4.	Write a program to implement DNS using TCP / UDP sockets.
5.	Write a program to implement Echo client and echo server and chat application using Transport layer protocol.
6.	Implementation of File Transfer using TCP / UDP.
7.	Study of Network simulator (NS)
8.	Simulation of Congestion / flow control Algorithms using NS.
9.	Performance of TCP and UDP using Simulation tool.
10.	Simulation of Distance Vector and Link state Routing algorithm.
11.	Implementation of IPv4 and IPv6
12.	Implementation of SMTP
13.	Implementation of error correction code (like CRC).

TOTAL PERIODS:	**60**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Apply networking commands for various operating systems.
CO2:	Implement various protocols using TCP / UDP sockets.
CO3:	Implement Cyclic Redundancy Check for error detection and correction.
CO4:	Analyze the performance of various network protocols using simulation tools.
CO5:	Evaluate the various routing algorithms for finding optimal path

SEMESTER IV

191MAB405T	PROBABILITY AND STATISTICS	Periods per week				Credits
		L	T	P	R	
		4	0	0	0	4

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	This course aims at providing the required skill to apply the statistical tools in engineering problems.
2.	To introduce the basic concepts of probability and random variables.
3.	To introduce the basic concepts of two dimensional random variables.
4.	To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
5.	To introduce the basic concepts of classifications of design of experiments which plays very Important roles in the field of agriculture and statistical quality control.

UNIT	TITLE	PERIODS
I	PROBABILITY AND RANDOM VARIABLES	12
Probability–The axioms of probability–Conditional probability–Baye's theorem-Discrete and continuous Random variables–Moments–Moment generating functions-Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.		
UNIT	TITLE	PERIODS
II	TWO-DIMENSIONAL RANDOM VARIABLES	12
Joint distributions –Marginal and conditional distributions–Covariance–Correlation and linear regression – Transformation of random variables–Central limit theorem(for independent and identically distributed random variables).		
UNIT	TITLE	PERIODS
III	TESTING OF HYPOTHESIS	12
Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of Means-Tests based on t Chi-square and F distributions for mean, Variance and proportion-Contingency table(test for independent)-Goodness of fit.		
UNIT	TITLE	PERIODS
IV	DESIGN OF EXPERIMENTS	12
One way and Two way classifications –Completely randomized design –Randomized block design –Latin square design.		
UNIT	TITLE	PERIODS
V	STATISTICAL QUALITY CONTROL	12
Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits – Acceptance sampling.		

TOTAL PERIODS:	60

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Understand the fundamental knowledge of the concepts of probability and have knowledge of Standard distributions which can describe real life phenomenon.
CO2:	Understand the basic concepts of one and two dimensional random variables and apply in Engineering applications.
CO3:	Apply the concept of testing of hypothesis for small and large samples in real life problems.
CO4:	Apply the basic concepts of classifications of design of experiments in the field of agriculture And statistical quality control.
CO5:	Have the notion of sampling distributions and statistical techniques used in engineering and Management problems.

TEXT BOOKS:	
1.	Johnson,R.A.,Miller,I and Freund J.,"Miller and Freund‘s Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2.	Milton.J.S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill,4th Edition,2007.

REFERENCE BOOKS:	
1.	Devore. J. L "Probability and Statistics for Engineering and the Sciences”, Cengage Learning, New Delhi,8th Edition, 2014.
2.	Papoulis, A. and Unni Krishna pillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India,4th Edition, NewDelhi,2017.
3.	Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2014.
4.	Spiegel.M.R.,Schiller.J.and Srinivasan,R.A.,"Schaum‘s Outline of Theory And Problems of Probability and Statistics", Tata McGraw Hill Edition,2004.
5.	Walpole.R.E.,Myers.R.H., Myers.S.L.andYe. K., "Probability and Statistics For Engineers and Scientists", Pearson Education, Asia, 8th Edition, 2013.

191CSC401T	DESIGN AND ANALYSIS OF ALGORITHMS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand the concepts of algorithms and its efficiency
2.	To understand and apply the algorithm analysis techniques
3.	To critically analyze the efficiency of alternative algorithmic solutions for the same problem
4.	To understand different algorithm design techniques
5.	To understand the limitations of Algorithmic power

UNIT	TITLE	PERIODS
I	INTRODUCTION	9
Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithmic Efficiency –Asymptotic Notations and their properties. Analysis Framework - Mathematical analysis for Recursive and Non-recursive algorithms – Visualization		
UNIT	TITLE	PERIODS
II	BRUTE FORCE AND DIVIDE-AND-CONQUER	9
Brute Force – Computing a^n – String Matching - Closest-Pair and Convex-Hull Problems - Exhaustive Search - Travelling Salesman Problem - Knapsack Problem - Assignment problem. Divide and Conquer Methodology – Binary Search – Merge sort – Quick sort – Heap Sort - Multiplication of Large Integers.		
UNIT	TITLE	PERIODS
III	DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE	9
Dynamic programming – Principle of optimality - Coin changing problem, Computing a Binomial Coefficient – Floyd‘s algorithm – Multi stage graph - Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique – Container loading problem - Prim‘s algorithm and Kruskal's Algorithm – 0/1 Knapsack problem, Huffman Trees.		
UNIT	TITLE	PERIODS
IV	ITERATIVE IMPROVEMENT	9
The Simplex Method - The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs, Stable marriage Problem.		
UNIT	TITLE	PERIODS
V	COPING WITH THE LIMITATIONS OF ALGORITHM POWER	9
Lower - Bound Arguments - P, NP NP-Complete and NP Hard Problems. Backtracking – n-Queen’s problem - Hamiltonian Circuit Problem – Subset Sum Problem Branch and Bound – Assignment problem – Knapsack Problem – Travelling Salesman Problem - Approximation Algorithms for NP- Hard Problems – Travelling Salesman problem – Knapsack problem.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Analyze the algorithms by time and space complexity.
CO2:	Solve the problems using Brute force and Divide-and-Conquer method.
CO3:	Solve the problems using Dynamic Programming And Greedy technique.
CO4:	Build the solution for the problem using Iterative algorithmic design techniques.
CO5:	Design algorithms for the real-world problems.

TEXT BOOKS:	
1.	AnanyLevitin, ”Introduction to the Design and Analysis of Algorithms”, Third Edition, Pearson Education,2017.
2.	Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algoritms / C++,Second Edition, University Press,2007.

REFERENCE BOOKS:	
1.	Alfred V. Aho, John E.Hopcroft and Jeffrey D.Ullman, ”Data Structures and Algorithms”, Pearson Education, Reprint 2006.
2.	Harsh Bhasin, ”Algorithms Design and Analysis”,Oxford university press,2016.
3.	Sridhar S ,”Design and Analysis of Algorithms”,Oxford university press,2014.
4.	Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, ”Introduction to Algorithms”, Third Edition,PHI Learning Private Limited,2012.

WEBSITES:	
1.	http://nptel.ac.in/

191CSC402T	OPERATING SYSTEMS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Study the basic concepts and functions of operating systems.
2.	Understand the structure and functions of OS.
3.	Learn about Processes, Threads and Scheduling algorithms.
4.	Understand the principles of concurrency and Deadlocks.
5.	Learn various memory management schemes.
6.	Study I/O management and File systems.
7.	Learn the basics of Linux system and perform administrative tasks on Linux Servers.

UNIT	TITLE	PERIODS
I	OPERATING SYSTEMS OVERVIEW	9
Computer System Overview-Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization. Operating system overview-objectives and functions, Evolution of Operating System - Computer System Organization - Operating System Structure and Operations - System Calls, System Programs, OS Generation and System Boot.		
UNIT	TITLE	PERIODS
II	PROCESS MANAGEMENT	9
Processes-Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication; Threads-Overview, Multicore Programming, Multithreading Models; Windows 7 – Thread and SMP Management. Process Synchronization – Critical Section Problem, Mutex Locks, Semaphores, Monitors; CPU Scheduling and Deadlocks.		
UNIT	TITLE	PERIODS
III	STORAGE MANAGEMENT	9
Main Memory-Contiguous Memory Allocation, Segmentation, Paging, 32 and 64 bit architecture Examples; Virtual Memory - Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS Examples.		
UNIT	TITLE	PERIODS
IV	I/O SYSTEMS	9
Mass Storage Structure- Overview, Disk Scheduling and Management; File System Storage-File Concepts, Directory and Disk Structure, Sharing and Protection; File System Implementation - File System Structure, Directory Structure, Allocation Methods, Free Space Management, I/O Systems.		
UNIT	TITLE	PERIODS
V	CASE STUDY	9
Linux System - Basic Concepts; System Administration - Requirements for Linux System Administrator, Setting up a LINUX Multifunction Server, Domain Name System, Setting Up Local Network Services; Virtualization - Basic Concepts, VMware on Linux Host OS.		

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	erpret the basics of operating systems
CO2:	ply scheduling, synchronization, threading and deadlock concepts for process management
CO3:	alyze various management scheme for memory allocation
CO4:	plement file system management concepts.
CO5:	Build LINUX Multifunction Server

TEXT BOOKS:	
1.	**Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012.**

REFERENCE BOOKS:	
1.	Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Addison Wesley, 2014.
2.	Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education", 2012.
3.	Dhamdhere D. M., "Operating Systems: A Concept-Based Approach", Second Edition, Tata McGraw-Hill Education, 2007.
4.	William Stallings, "Operating Systems – Internals and Design Principles", 7th Edition, Prentice Hall, 2013

WEBSITES:	
1.	http://nptel.ac.in/

191CSC403T	DATABASE MANAGEMENT SYSTEMS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To learn the fundamentals of data models and to represent a database system using ER diagrams
2.	To study SQL and relational database design
3.	To understand the internal storage structures using different file and indexing techniques which will help in physical DB design
4.	To understand the fundamental concepts of transaction processing- concurrency control techniques and recovery procedures
5.	To have an introductory knowledge about the Storage and Query processing Techniques

UNIT	TITLE	PERIODS
I	RELATIONAL DATABASES	10
Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL		
UNIT	TITLE	PERIODS
II	DATABASE DESIGN	8
Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form		
UNIT	TITLE	PERIODS
III	TRANSACTIONS	9
Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery – Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery		
UNIT	TITLE	PERIODS
IV	IMPLEMENTATION TECHNIQUES	9
RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics and Cost Estimation.		
UNIT	TITLE	PERIODS
V	ADVANCED TOPICS	9
Distributed Databases: Architecture, Data Storage, Transaction Processing – Object-based Databases: Object Database Concepts, Object-Relational features, ODMG Object Model, ODL, OQL – XML Databases: XML Hierarchical Model, DTD, XML Schema, XQuery – Information Retrieval: IR Concepts, Retrieval Models, Queries in IR systems		

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Design relational database model for real world applications
CO2:	Develop ER model into Relational model for real world scenario
CO3:	Apply normalization for effective database design
CO4:	Apply Transaction management strategies to achieve Consistency
CO5:	Analyse indexing strategies for File organisation and Query Optimization
CO6:	Appraise advanced databases over traditional databases

TEXT BOOKS:	
1.	Abraham Silberschatz, Henry F. Korth, S. Sudharshan, —Database System Concepts‖, Sixth Edition, Tata McGraw Hill, 2013
2.	Ramez Elmasri, Shamkant B. Navathe, —Fundamentals of Database Systems‖, Sixth Edition, Pearson Education, 2011

REFERENCE BOOKS:	
1.	Gupta G.K.,"Database Management Systems‖, Tata McGraw Hill, 2011
2.	Date C.J., Kannan A., Swamynathan S., —An Introduction to Database Systems‖, Eighth Edition, Pearson Education, 2006
3.	Raghu Ramakrishnan, —Database Management Systems‖, Fourth Edition, McGraw-Hill College Publications, 2015

191CAC401T	Computer Organization and Architecture	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand the basic structure of a digital computer.
2.	To discuss the operation of various components of computing systems.
3.	To study the different ways of communicating with I/O devices
4.	To enhance the processor operation by employing pipelining

UNIT	TITLE	PERIODS
I	BASIC STRUCTURE OF COMPUTERS	8
Functional Units - Basic Operational Concepts - Bus Structures - Software Performance - Memory Locations and Addresses - Memory Operations - Instruction and Instruction Sequencing - Addressing Modes - Assembly Language - Basic I/O Operations - Stacks and Queues.		
UNIT	TITLE	PERIODS
II	BASIC PROCESSING UNIT	8
Fundamental Concepts - Execution of a Complete Instruction - Multiple Bus Organization - Hardwired Control – Micro programmed Control – Microinstructions- Micro program Sequencing-Wide Branch Addressing.		
UNIT	TITLE	PERIODS
III	ARITHMETIC UNIT	11
Addition and Subtraction of Signed Numbers - Design of Fast Adders - Multiplication of Positive Numbers - Signed Operand Multiplication and Fast Multiplication - Integer Division - Floating Point Numbers and Operations.		
UNIT	TITLE	PERIODS
IV	MEMORY SYSTEM	9
Basic Concepts - Semiconductor RAM- Internal Organization of Memory Chips- Static Memories-ROM- Speed, Size and Cost - Cache Memories - Performance Considerations - Virtual Memory-Secondary storage devices.		
UNIT	TITLE	PERIODS
V	PIPELINING AND I/O ORGANIZATION	9
Pipelining - Basic Concepts - Data Hazards - Instruction Hazards -Superscalar operation- Out –of-Order Execution- Interrupts - Direct Memory.		

	TOTAL PERIODS:	45
COURSE OUTCOMES:		
Upon completion of this course, student will be able to:		
CO1:	Explain micro level operations of computer using the concepts of hardware and software coordination.	
CO2:	Compare different types of memories and their performances.	
CO3:	Apply the knowledge of binary arithmetic operations to understand the design of hardware components.	

CO4:	Enumerate various control methodologies using programming and their effect on the hardware components.
CO5:	Describe the performance enhancement techniques for data handling and I/O handling.

TEXT BOOKS:	
1.	Carl Hamacher, ZvonkoVranesic and SafwatZaky, “Computer Organization”, 5th Edition McGraw-Hill, 2014.

REFERENCE BOOKS:	
1.	R.D.Dowsing, F.W.D.Woodhams and Ian Marshall, “Computers From Logic To Architecture”, Mcgraw Hill Publishing Company, UK, 2000.
2.	Ian East, “Computer Architecture And Organization”, Pitman Publishing, (A Division Of Longman Group UK Limited), Taylor & Francis E-Library, 2005.
3.	William Stallings, “Computer Organization and Architecture - Designing for Performance”, 9th Edition, Prentice Hall, 2012.
4.	David A.Patterson and John L.Hennessy, “Computer Organization and Design: The hardware / software interface”, 4th Edition, Morgan Kaufmann, 2010.
5.	John P.Hayes, “Computer Architecture and Organization”, 3rd Edition, McGraw Hill, 2017.
6.	V.P. Heuring, H.F. Jordan, “Computer Systems Design and Architecture”, Second Edition, Pearson Education, 2008.

191CAC402T	COMPUTER NETWORKS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand the protocol layering and physical level communication.
2.	To analyze the performance of a network.
3.	To learn the functions of network layer and the various routing protocols
4.	To understand the functions of Transport layer and its operations.
5.	To familiarize the functions and protocols of Application layer.

UNIT	TITLE	PERIODS
I	INTRODUCTION AND PHYSICAL LAYER	9
Networks – Network Types – Internet Architecture - Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching		
UNIT	TITLE	PERIODS
II	DATA-LINK LAYER & MEDIA ACCESS	9
Link layer Addressing - Services – Framing – Error Detection – Flow control – HDLC - Media access control – Ethernet (802.3) – Wireless LANs – IEEE 802.11 – Bluetooth.		
UNIT	TITLE	PERIODS
III	NETWORK LAYER	9
Network Layer Services – Switch basics – Basic Internetworking (IP, CIDR, ARP, DHCP and ICMP) - IPV4 Addressing – IPV6 Protocol - Routing (RIP, OSPF, metrics) – Global Internet (Areas, BGP, IPv6), Multicast – addresses – multicast routing (DVMRP, PIM).		
UNIT	TITLE	PERIODS
IV	TRANSPORT LAYER	9
Overview of Transport layer – UDP – Reliable byte stream (TCP) – Connection management – Flow control – Retransmission – TCP Congestion control – Congestion avoidance (DECbit, RED) – QoS – Application requirements.		
UNIT	TITLE	PERIODS
V	APPLICATION LAYER	9
WWW and HTTP – FTP – Electronic Mail (SMTP, POP3, IMAP, MIME) –Telnet –SSH – DNS – SNMP.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Outline the Protocol layering , its functions and various physical layer communication techniques.
CO2:	Discriminate among different Link Layer Services.
CO3:	Compare and contrast the various Routing algorithms.
CO4:	Classify and evaluate various transport layer protocols.
CO5:	Apply the appropriate protocol in networking applications.

TEXT BOOKS:	
1.	Behrouz and Forouzan,2017, Introduction to Data Communication and Networking,5th Edition, TMH.
2.	James F Kurose, Keith W Ross, "Computer Networking - A Top-Down Approach Featuring the Internet", 6 th Edition, Pearson Education, New Delhi,2017.

REFERENCE BOOKS:	
1.	Prakash C Gupta, "Data Communication and Computer Networks", Prentice Hall of India, New Delhi, 2014.
2.	Achyut S Godbole,"Data Communication and Networking",2nd Edition, Tata McGraw Hill Publishing Company, New Delhi,2011.
3.	NaderFMir,"Computer and Communication Networks", Pearson Prentice Hall, New Delhi,2014.
4.	Andrew S Tanenbaum, David J Wetherall,"Computer Networks",5th Edition, Prentice Hall of India/ Pearson Education, New Delhi, 2012.

191CSC412L	DATABASE MANAGEMENT SYSTEMS LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	0	3	1	2

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand data definitions and data manipulation commands
2.	To learn the use of nested and join queries
3.	To understand functions, procedures and procedural extensions of data bases
4.	To be familiar with the use of a front end tool
5.	To understand design and implementation of typical database applications

LIST OF EXPERIMENTS	
1.	Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements
2.	Database Querying – Simple queries, Nested queries, Sub queries and Joins
3.	Views, Sequences, Synonyms
4.	Database Programming: Implicit and Explicit Cursors
5.	Procedures and Functions
6.	Triggers
7.	Exception Handling
8.	Database Design using ER modelling, normalization and Implementation for any application
9.	Database Connectivity with Front End Tools
10.	Case Study using real life database applications

TOTAL PERIODS:	60

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Apply data definitions and manipulation commands
CO2:	Create Nested and Join Queries for given real world scenario
CO3:	Create Views, Sequences and Synonyms for tables
CO4:	Develop simple programs with Cursors, Functions, Procedures, Exception handling and triggers .
CO5:	Construct real time applications using Front end Tools with database connectivity

WEBSITES:	
1.	spoken-tutorial.org

191CAC411L	COMPUTER NETWORKS LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	0	3	1	2

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To learn and use network commands.
2.	To learn socket programming.
3.	To implement and analyze various network protocols.
4.	To learn and use simulation tools.
5.	To use simulation tools to analyze the performance of various network protocols.

LIST OF EXPERIMENTS	
1.	Learn to use various networking commands and examine.
2.	Write a program to implement socket programming.
3.	Write a HTTP web client program to download a web page using TCP / UDP sockets.
4.	Write a program to implement DNS using TCP / UDP sockets.
5.	Write a program to implement Echo client and echo server and chat application using Transport layer protocol.
6.	Implementation of File Transfer using TCP / UDP.
7.	Study of Network simulator (NS)
8.	Simulation of Congestion / flow control Algorithms using NS.
9.	Performance of TCP and UDP using Simulation tool.
10.	Simulation of Distance Vector and Link state Routing algorithm.
11.	Implementation of IPv4 and IPv6
12.	Implementation of SMTP
13.	Implementation of error correction code (like CRC).

TOTAL PERIODS:	60

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Apply networking commands for various operating systems.
CO2:	Implement various protocols using TCP / UDP sockets.
CO3:	Implement Cyclic Redundancy Check for error detection and correction.
CO4:	Analyze the performance of various network protocols using simulation tools.
CO5:	Evaluate the various routing algorithms for finding optimal path

SEMESTER V

191CAC501T	MACHINE LEARNING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand the need for machine learning for various problem solving
2.	To study the various supervised, semi-supervised and unsupervised learning algorithms in machine Learning
3.	To understand the latest trends in machine learning
4.	To design appropriate machine learning algorithms for problem solving

UNIT	TITLE	PERIODS
I	INTRODUCTION	9
Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias –Decision Tree learning–Representation–Algorithm –Heuristic Space Search.		
UNIT	TITLE	PERIODS
II	LINEAR REGRESSION AND NEURAL NETWORKS	9
Linear Regression – Least-Squares method - Bias-Variance Decomposition –Logistic Regression - Neural Network Representation–Problems–Perceptron –Multilayer Networks and Back Propagation Algorithms		
UNIT	TITLE	PERIODS
III	BAYESIAN AND COMPUTATIONAL LEARNING	9
Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning–Sample Complexity –Finite and Infinite Hypothesis Spaces–Mistake Bound Model.		
UNIT	TITLE	PERIODS
IV	INSTANCE BASED LEARNING	9
K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning – Support Vector Machines–Random Forest Algorithm–Generative and Discriminative models.		
UNIT	TITLE	PERIODS
V	CASE STUDY	9
Curse of Dimensionality – Dimensionality Reduction – Principal Component Analysis - Learning Sets of Rules – Sequential Covering Algorithm – First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Explanation Base Learning–FOCL Algorithm–Reinforcement Learning		

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Differentiate between supervised, unsupervised, semi-supervised machine learning approaches
CO2:	Discuss the decision tree algorithm and identity and overcome the problem of over fitting
CO3:	Discuss and apply the back propagation algorithm and genetic algorithms to various problems
CO4:	Apply the Bayesian concepts to machine learning
CO5:	Analyze and suggest appropriate machine learning approaches for various types of problems

TEXT BOOKS:	
1.	Tom M.Mitchell,—Machine Learning‖, McGraw-Hill Education (India)PrivateLimited,2013.

REFERENCE BOOKS:	
1.	Ethem Alpaydin,—Introduction to Machine Learning (Adaptive Computation and Machine Learning)‖, The MIT Press 2004.
2.	Stephen Marsland,—Machine Learning: An Algorithmic Perspective ,CRC Press,2009.

191CAC502T	BIG DATA ANALYTICS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To know the fundamental concepts of big data and analytics.
2.	To explore tools and practices for working with big data
3.	To learn about stream computing.
4.	To know the fundamental concepts of big data and analytics.
5.	To explore tools and practices for working with big data

UNIT	TITLE	PERIODS
I	INTRODUCTION TO BIG DATA	9

Evolution of Big data - Best Practices for Big data Analytics - Big data characteristics - Validating - The Promotion of the Value of Big Data - Big Data Use Cases- Characteristics of Big Data Applications - Perception and Quantification of Value-Understanding Big Data Storage –A General Overview of High Performance Architecture-HDFS-Map Reduce and YARN –Map Reduce Programming Model

UNIT	TITLE	PERIODS
II	CLUSTERING AND CLASSIFICATION	9

Advanced Analytical Theory and Methods: Overview of Clustering - K-means - Use Cases - Overview of the Method - Determining the Number of Clusters - Diagnostics - Reasons to Choose and Cautions .- Classification: Decision Trees- Overview of a Decision Tree –The General Algorithm-Decision Tree Algorithms-Evaluating a Decision Tree-Decision Trees in R-Naïve Bayes- Bayes 'Theorem-Naïve Bayes Classifier.

UNIT	TITLE	PERIODS
III	ASSOCIATION AND RECOMMENDATION SYSTEM	9

Advanced Analytical Theory and Methods: Association Rules - Overview - Apriori Algorithm - Evaluation of Candidate Rules - Applications of Association Rules - Finding Association & finding similarity – Recommendation System: Collaborative Recommendation-Content Based Recommendation-Knowledge Based Recommendation-Hybrid Recommendation Approaches.

UNIT	TITLE	PERIODS
IV	STREAM MEMORY	9

Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing, Sampling Data in a Stream–Filtering Streams–Counting Distinct Elements in a Stream–Estimating moments–Counting oneness in

A Window– Decaying Window –Real time Analytics Platform (RTAP) Applications-Case Studies-Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

UNIT	TITLE	PERIODS
V	NoSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION	9

NoSQL Data bases: Schema-less Models‖: Increasing Flexibility for Data Manipulation-Key Value Stores- Documen Stores - Tabular Stores - Object Data Stores - Graph Databases Hive – Sharding –- H base – Analyzing big data with twitter-Big data for E-Commerce Big data for blogs-Review of Basic Data Analytic Methods using R.

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Work with big data tools and its analysis techniques
CO2:	Analyze data by utilizing clustering and classification algorithms
CO3:	Learn and apply different mining algorithms and recommendation systems for large volumes of data
CO4:	Perform analytics on data streams
CO5:	Learn NoSQL databases and management.

TEXT BOOKS:	
1.	Anand Rajaraman and Jeffrey David Ull man, "Mining of Massive Data sets", Cambridge University Press, 2012.
2.	David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL and Graph", Morgan Kaufmann/Elsevier Publishers,2013.

REFERENCE BOOKS:	
1.	EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.
2.	Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015.
3.	Dietmar Jannach and Markus Zanker, "Recommender Systems: An Introduction", Cambridge University Press, 2010.
4.	Kim H. Pries and Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers" CRC Press, 2015.
5.	Jimmy Lin and Chris Dyer, "Data-Intensive Text Processing with Map Reduce", Synthesis Lectures on Human Language Technologies, Vol.3, No1, Pages 1-177, Morgan Clay pool publishers, 2010.

191CAC503T	FORMAL AUTOMATA AND COMPILER DESIGN	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To present the core concepts in automata theory and formal languages.
2.	Classify machines by their power to recognize languages.
3.	Understand Turing Machine and their capability.
4.	To learn the various phases of compiler.
5.	To learn the various parsing techniques.

UNIT	TITLE	PERIODS
I	FORMAL PROOFS AND FINITE AUTOMATA	9

Formal proofs- Introduction - Inductive Proofs , Finite Automata – Introduction - Deterministic Finite Automata, Non deterministic Finite Automata, Finite Automata with ϵ- transition, Equivalence of DFA and NFA - with and without ϵ transition, Equivalence of Finite Automata, Minimization of Finite Automata.

UNIT	TITLE	PERIODS
II	REGULAR EXPRESSIONS AND GRAMMARS	9

Regular expressions, Equivalence of finite automata and regular expressions, pumping lemma for regular languages Grammars- Context-Free Grammar (CFG), Derivations and Parse tree - Relationship between derivation and derivation trees – Ambiguity.

UNIT	TITLE	PERIODS
III	TURING MACHINE	9

Turing machines – Models, Computable languages and functions, Techniques for Turing machine construction, Mult head and Multi tape Turing Machines, Non-deterministic Turing machine, The Halting problem, Chomsky hierarchy o languages.

UNIT	TITLE	PERIODS
IV	INTRODUCTION TO COMPILERS & LEXICAL ANALYSIS	9

Introduction- Translators- Compilation and Interpretation- Language processors -The Phases of Compiler – Lexica Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Finite Automata – Regular Expressions to Automata NFA, DFA – Minimizing DFA - Language for Specifying Lexica Analyzers – Lex tool.

UNIT	TITLE	PERIODS
V	SYNTAX ANALYSIS	9

Role of Parser – Grammars – Context-free grammars – Writing a grammar Top Down Parsing - General Strategies Recursive Descent Parser Predictive Parser-LL(1) - Parser-Shift Reduce Parser-LR Parser- LR (0)Item Construction of SLR Parsing Table - Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC too Design of a syntax Analyzer for a Sample Language

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Apply the fundamentals concepts of automata theory and formal languages.
CO2:	Illustrate the knowledge of language classes & grammars in regular expression
CO3:	Construct turing machine for given language
CO4:	Understand the techniques in different phases of a compiler.
CO5:	Design a lexical analyser for a sample language and learn to use the LEX tool.

TEXT BOOKS:	
1.	Hopcroft J.E, Motwani R and Ullman J. D, — Introduction to Automata Theory, Languages and Computations, Third Edition, Pearson Education, 2007.
2.	Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, “Compilers: Principles, Techniques and Tools”, Second Edition, Pearson Education, 2009.

REFERENCE BOOKS:	
1.	H.R.Lewis H.R. and C.H.Papadimitriou C. H. — Elements of the theory of Computation, Second Edition, PHI,2003.
2.	John C Martin, “Introduction to Languages and the Theory of Computation”, Third Edition, Tata McGraw Hill Publishing Company, New Delhi, 2007.
3.	Kamala Krithivasan and Rama. R, “Introduction to Formal Languages, Automata Theory and Computation”, Pearson Education 2009.
4.	Randy Allen, Ken Kennedy, Optimizing Compilers for Modern Architectures: A Dependence based Approach, Morgan Kaufmann Publishers, 2002.
5.	V. Raghavan, Principles of Compiler Design‖, Tata McGraw Hill Education Publishers, 2010.

191CAC504T	PROFESSIONAL ETHICS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To create an awareness on Engineering Ethics and Human Values.
2.	To instill Moral, Social Values and Loyalty.
3.	To appreciate the rights of others.
4.	To proficiency in recognizing moral problems in engineering
5.	To learn ethical issues related to engineering.
6.	To apply business ethics in organization.

UNIT	TITLE	PERIODS
I	HUMAN VALUES	9

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character–Spirituality–Introduction to Yoga and meditation for professional excellence and stress management.

UNIT	TITLE	PERIODS
II	ENGINEERING ETHICS	9

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles – Theories about right action –Self-interest–Customs and Religion–Uses of Ethical Theories.

UNIT	TITLE	PERIODS
III	ENGINEERING AS SOCIAL EXPERIMENTATION	9

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT	TITLE	PERIODS
IV	SAFETY, RESPONSIBILITIES AND RIGHTS	9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights –Employee Rights–Intellectual Property Rights (IPR)–Discrimination

UNIT	TITLE	PERIODS
V	GLOBAL ISSUES	9

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct–Corporate Social Responsibility.

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Understand the importance of Values and Ethics.
CO2:	Analyze the ethical issues related to engineering
CO3:	Realize the responsibilities and rights in the society
CO4:	Impart the social responsibility among the students.
CO5:	Apply the ethics in society

TEXT BOOKS:	
1.	Mike W. Martin and Roland Schinzinger, Ethics in Engineering, Tata McGraw Hill, NewDelhi,2003.
2.	Govindarajan M, Natarajan S, Senthil Kumar V.S, Engineering Ethics, Prentice Hall of India, New Delhi, 2004.

REFERENCE BOOKS:	
1.	Charles B. Fleddermann,— Engineering Ethics, Pearson Prentice Hall, NewJersey,2004.
2.	Charles E. Harris, Michael S. Pritchard and Michael J. Rabins,—Engineering Ethics–Concepts and Cases, Cengage Learning, 2009.
3.	John R Boat right,—Ethics and the Conduct of Business, Pearson Education, NewDelhi,2003
4.	Edmund G See bauer and Robert L Barry,—Fundamentals of Ethics for Scientists and Engineers, Oxford University Press, Oxford,2001.
5.	Laura P. Hartman and Joe Desjardins,—Business Ethics: Decision Making for Personal Integrity and Social Responsibility McGraw Hill education, India Pvt. Ltd., New Delhi,2013.
6.	World Community Service Centre, Value Education', Vethathiri publications, Erode,2011.

191CAC511L	MACHINE LEARNING LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	0	3	1	2

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Make use of Data sets in implementing the machine learning algorithms
2.	Implement the machine learning concepts and algorithms in any suitable language of choice
3.	To Design Java/Python programs for various Learning algorithms.
4.	To be familiar with Machine Learning Algorithm
5.	To be able to create application based on ML Algorithms.

Description:

1. The programs can be implemented in either JAVA or Python.
2. For Problems1 to 6 and10, programs are to be developed without using the built-in classes or APIs of Java/Python.
3. Data sets can be taken from standard repositories (https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students.

S.NO	List of Experiments
1.	Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on A given set of training data samples. Read the training data from a.CSV file.
2.	For a given set of training data examples stored in a.CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of these to fall hypotheses consistent with thetraining examples.
3.	Write a program to demonstrate the working of the decision tree based ID algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4.	Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
5.	Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file Compute the accuracy of the classifier, considering few test data sets.
6.	Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7.	Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8.	Apply EM algorithm to cluster a set of data stored in a.CSV file. Use the same data set for clustering Using k-Means algorithm. Compare the results of the set wo algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9.	Write a program to implement k-Nearest Neighbour algorithm to classify theiris data set. Print both Correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10.	Mini Project.

TOTAL PERIODS:	45

COURSE OUT COMES:	
Upon completion of this course, student will be able to:	
CO1:	Understand the implementation procedures for the machine learning algorithms.
CO2:	Design Java/Python programs for various Learning algorithms.
CO3:	Apply appropriate data sets to the Machine Learning algorithms.
CO4:	Identify and apply Machine Learning algorithms to solve real world problems.
CO5:	Build Application based on ML Algorithms.
CO6:	Familiarize with ML Algorithms.

191CAC512L	BIG DATA ANALYTICS LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	0	4	0	2

COURSE OBJECTIVES:	
1.	To learn optimization of business decisions and create competitive advantage with Big Data Analytics
2.	To implement Map Reduce programs for processing big data
3.	To realize storage of big data using H base, Mongo DB.
4.	To analyze big data using linear models
5.	To develop analytical projects using R

LIST OF EXPERIMENTS	
Hadoop	
1.	Install, configure and run Hadoop and HDFS
2.	Implement word count/frequency programs using Map Reduce
3.	Implement an MR program that processes a weather data set
R	
4.	Implement Linear and logistic Regression
5.	Implement SVM/Decision tree classification techniques
6.	Implement clustering techniques
7.	Visualize data using any plotting framework
8.	Implement an application that stores big data in H base/Mongo DB/Pig using Hadoop/ R

TOTALP ERIODS:	45

COURSE OUT COMES:	
Upon completion of this course, student will be able to:	
CO1:	Process big data using Hadoop frame work
CO2:	Design and write efficient programs using R
CO3:	Document analytical work flow using R
CO4:	Analyze various data storage formats
CO5:	Apply available functions and loop functions using R
C06:	Visualize data using R

SEMESTER VI

Course Code	Course Title	Periods per week				Credits
		L	T	P	R	
191CAC601T	NATURAL LANGUAGE PROCESSING	3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To learn the fundamentals of natural language processing
2.	To implement a rule based system to tackle morphology/syntax of a Language
3.	To understand the use of Context Free Grammar in NLP
4.	To understand the role of semantics of sentences and pragmatics
5.	To apply the NLP techniques to IR applications

UNIT	TITLE	PERIODS
1	INTRODUCTION	9

Introduction- Human languages- models- ambiguity-processing paradigms; Origins and challenges of NLP- Phases in natural language processing. Natural Language Processing tasks in syntax- semantics and pragmatics- Language Modeling- Evaluating language models.

UNIT	TITLE	PERIODS
2	MORPHOLOGY AND PART OF SPEECH TAGGING	9

Regular expressions- Finite State Automata- word recognition-lexicon. Morphology- acquisition models- Finite State Transducer- Tokenization- N-grams- Unsmoothed N-grams- Evaluating N-grams- Smoothing; Part of Speech tagging- Stochastic POS tagging- Rule-Based Part of Speech Tagging - Markov Models- Hidden Markov Models- Transformation based tagging- Maximum Entropy Models.

UNIT	TITLE	PERIODS
3	SYNTACTIC ANALYSIS AND PARSING	9

Context Free Grammar- Probabilistic CFG- spoken language syntax- Normal Forms for grammar- Dependency Grammar- Parsing- Syntactic Parsing- Ambiguity- Parsing with Context Free Grammars- Dynamic Programming parsing – Shallow parsing, probabilistic parsing- Statistical parsing and probabilistic CFGs (PCFGs)-Lexicalized PCFGs- Features and Unification-TreeBank.

UNIT	TITLE	PERIODS
4	SEMANTIC AND DISCOURSE ANALYSIS	9

Semantics- Meaning representation- semantic analysis- lexical semantics-WordNet- Word Sense Disambiguation- Selectional restriction- Supervised – Dictionary based and Unsupervised Approaches- Machine learning approaches; Discourse Analysis- Discourse- Reference resolution- constraints on co-reference-algorithm for pronoun resolution-text coherence-discourse structure.

UNIT	TITLE	PERIODS
5	APPLICATIONS	9

Applications of NLP- Spell-checking- Summarization- Named entity recognition and relation extraction- IE using sequence labeling-Machine Translation (MT)- Basic issues in MT- Statistical translation -word alignment- phrase-based translation, Question Answering- Information Retrieval- Vector space model - term weighting-homonymy- polysemy- synonymy-improving user queries.

TOTAL PERIODS: 45

COURSE OUTCOMES:	
Upon completion of this course, student will be able	
CO1:	To tag a given text with basic Language features.
CO2:	To implement a rule based system to tackle morphology/syntax of a language.
CO3:	To design a tag set to be used for real-time applications.
CO4:	To design an innovative application using NLP components.
CO5:	To compare and contrast the use of different approaches for different types of NLP applications.

TEXT BOOKS:	
1.	Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition, Prentice Hall, 2nd edition (May 16, 2008); eBook (3rd ed. draft, January 12, 2022)
2.	Foundations of Statistical Natural Language Processing by Christopher D. Manning and HinrichSchuetze, MIT Press, 2000.

REFERENCE BOOKS:	
1.	Steven Bird, Ewan Klein and Edward Loper Natural Language Processing with Python, O'Reilly Media; First edition, 2009.
2.	Roland R. Hausser, Foundations of Computational Linguistics: Human- C o m p u t e r Communication in Natural Language, Paperback, MIT Press, 2011
3.	Pierre M. Nugues, An Introduction to Language Processing with Perl and Prolog: An Outline of Theories, Implementation, and Application with Special Consideration of English, French, and German (Cognitive Technologies) Softcover reprint, 2010
4.	James Allen, Natural Language Understanding, Addison Wesley; Second edition 1994
5	Breck Baldwin, —Language Processing with Java and LingPipe Cookbook, Atlantic Publisher,2015.
6	Richard M Reese, —Natural Language Processing with Javall, O_Reilly Media, 2015.

191CAC602J	WEB TECHNOLOGY	Periods per week				Credits
		L	T	P	R	
		3	0	2	0	4

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To introduce the concept of Internet, Networks and its working principles.
2.	To know scripting languages.
3.	To learn about client-server communication and protocols used during communication ,web page creation Using HTML.
4.	To design interactive web pages using Scripting languages.
5.	To learn server-side programming using servlets and JSP.
6.	To develop the Java web service

UNIT	WEB ESSENTIALS AND HTML	PERIODS
I		9

Web Essentials: Creating a Website - Working principle of a Website - Browser fundamentals-Client - Server Communication. The Basic Internet Protocols - The World Wide Web - Markup Languages: An Introduction to HTML History – Versions - Basic XHTML Syntax and Semantics-Some Fundamental HTML Elements -Lists - tables - Frames - Forms - HTML 5.0.

UNIT	CASCADING STYLE SHEETS AND DOM	PERIODS
II		9

Style Sheets: CSS-Introduction to Cascading Style Sheets-Features Core Syntax-Style Sheets and HTML- Style Rule Cascading and Inheritance-Selectors-CSS Properties Host Objects: Browsers and the DOM-Introduction to the Document Object Model DOM History and Levels-Intrinsic Event Handling-Modifying Element Style- DOM Event Handling

UNIT	JAVA SCRIPT AND REACT JS	PERIODS
III		9

Introduction to JavaScript-JavaScript Statements-Operators-Data Types-Functions ,Angular JS Basics- Expressions-Filters-DirectivesControllers- JS Modules-JS Forms. React-Introduction to JSX-Virtual DOM-Setting up your React JS-Development Environment-Creating a simple React Application-React UI and Forms- Component Life Cycle.

UNIT	SERVLET AND JSP	PERIODS
IV		9

Java Servlets- Architecture -Overview-A Servlet-Generating Dynamic Content-Life Cycle- creating first servlet application using Netbeans IDE –Session -Database connectivity- JSP Technology Introduction-JSP Architecture -

Running JSP Applications in Net beans IDE- Basic JSP Classes and JSP tags-Databases and JSP-Representing Web Data.		
UNIT	**XML AND WEB SERVICES**	**PERIODS**
V		**9**
XML-Documents -Versions and Declaration-Namespaces Transforming XML Documents-Selecting XML Data: XPATH- XSLT -Displaying XML Documents in Browsers -Web Services: Writing a Web Service using Netbeans IDE-Writing a Web Service Client using Netbeans IDE- UDDI- WSDL-SOAP.		

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Design and deploy web-applications
CO2:	Design web pages using markup languages like HTML and XHTML.
CO3:	Create dynamic webpages using DHTML and java script.
CO4:	Implement Server Side Programming Using Servlets and JSP.
CO5:	Represent web data using XML and develop web pages using JSP.
CO6:	Develop various web services for web applications.

TEXT BOOKS:	
1.	Jeffrey C. Jackson, "Web Technologies—A Computer Science Perspective", Pearson Education, 2011.

REFERENCE BOOKS:	
1.	Robin Nixon," Learning PHP, MySQL, JavaScript,CSS&HTML5"ThirdEdition, O'REILLY,2014.
2.	Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007.
3.	Deitel, Deitel, Goldberg, "Internet &World Wide Web How To Program ",Third Edition, Pearson Education, 2006
4.	Marty Hall and Larry Brown, ‖Core Web Programming I, Second Edition, Volume I and II ,Pearson Education,2001.4.Bates,—DevelopingWebApplications,Wiley,2006
5.	Learning React by Alex Banks, Eve Porcello, Released May2017,Publisher(s):O'Reilly Media ,Inc.

LIST OF EXPERIMENT	Total:30Hrs
1.	Create a webpage with the following using HTML. • To embed an image map in a webpage • To fix the hotspots. • How all the related information when the hotspots are clicked.
2.	Create a web page with all types of Cascading stylesheets
3.	Installation of Apache Tomcat webserver
4.	Write programs to perform simple calculator using JSP
5.	Programs using DOM and SAX parsers.
6.	Programs using XML–Schema–XSLT/XSL
7.	Write programs in Java using Servlet
8.	Create Java Web Services to implement the calculator function

191CAC603T	DATAEXPLORATION AND VISUALIZATION	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To familiarize with the process of data exploration.
2.	To introduce visual perception and core skills for visual analysis.
3.	To understand visualization for time-series analysis, ranking and deviation analysis.
4.	To know about the advanced visualization techniques.
5.	To understand issues and best practices in information dashboard design.

UNIT	EXPLORATORY DATA ANALYSIS	PERIODS
I	EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data – Comparing EDA with classical and Bayesian analysis – Software tools for EDA - Visual Aids for EDA- Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques - Grouping Datasets - data aggregation – Pivot tables and cross-tabulations.	9

UNIT	CORE SKILLS FOR VISUAL ANALYSIS	PERIODS
II	Information visualization – effective data analysis – traits of meaningful data – visual perception –making abstract data visible – building blocks of information visualization – analyticalinteraction–analyticalnavigation–optimalquantitativescales –reference lines and regions –trellises and crosstabs–multiple concurrent views–focus and context –details on demand –over-plotting reduction–analytical patterns –pattern examples.	9

UNIT	TIME-SERIES, RANKING, AND DEVIATION ANALYSIS	PERIODS
III	Time-series analysis – time-series patterns – time-series displays – time-series best practices – part-to-whole and ranking patterns – part-to-whole and ranking displays – best practices – deviation analysis – deviation analysis displays – deviation analysis best practices.	9

UNIT	DISTRIBUTION, CORRELATION, AND MULTIVARIATE ANALYSIS	PERIODS
IV	Distribution analysis – describing distributions – distribution patterns – distribution displays – distribution analysis best practices – correlation analysis – describing correlations – correlation patterns – correlation displays – correlation analysis techniques and best practices – multivariate analysis – multivariate patterns – multivariate displays – multivariate analysis techniques and best practices.	9

UNIT	INFORMATION DASHBOARD DESIGN	PERIODS
V	Information dashboard – Introduction– dashboard design issues and assessment of needs – Considerations for designing dashboard-visual perception – Achieving eloquence	9

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Understand the fundamentals of exploratory data analysis.
CO2:	Apply the concept of data visualization for various data analysis tasks.
CO3:	Understand the various time series and ranking analysis.
CO4:	Understand the distribution, correlation, and multivariate analysis.
CO5:	Develop an interactive dashboard to gain meaningful insights from the data.

TEXT BOOKS:	
1.	Stephen Few, "Now you see it: Simple Visualization techniques for quantitative analysis", Analytics Press, 2009.
2.	Stephen Few, "Information dashboard design: Displaying data for at-a-glance monitoring", second edition, Analytics Press, 2013.
3.	Suresh Kumar Mukhiya, Usman Ahmed, “Hands-On Exploratory Data Analysis with Python”, Packt Publishing, 2020.

REFERENCE BOOKS:	
1.	Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008.
2.	Evan Stubbs, "The value of business analytics: Identifying the path to profitability", Wiley, 2011.
3.	Edward R. Tufte, "The visual display of quantitative information", Second Edition, Graphics Press, 2001.
4.	Tamara Munzner, Visualization Analysis and Design, AK Peters Visualization Series, CRC Press, Nov. 2014

191CAC611L	DATA VISUALIZATION LABORATORY	Periods per week				Credits
		L	T	P	R	
		-	-	3	1	2

COURSE OBJECTIVES:	
1.	To understand data visualization concepts using tableau.
2.	To Work with various data sources including text files, MS Excel files, databases.
3.	Create bar charts, pie charts, water fall charts, bump charts, line graphs, box plot and line graphs etc.
4.	Learn various data exploratory analysis techniques.
5.	To develop projects using data visualization tools.

LIST OF EXPERIMENTS:	
1.	Using a data visualization tool, create a pie chart, bar chart, water fall charts for sales trend analysis.
2.	Build an interactive dash board using tableau.
3.	Create an interactive visualization form an aging traffic problems in metro cities (Uber traffic data visualization)
4.	Build an interactive dash board on Credit Card Fraud detection.
5.	Create a visualization concept for Annual rainfall analysis.
6.	Visualize Stock market prediction using tableau.
7.	Using tweets data set for detection of cyber trolls, create an interactive visualization using tableau.
8.	Visualize the impact of Covid-19on Air traffic.
9.	Visualize plastic waste and E-waste pollution using water fall charts.
10.	Build professional interactive dashboards to effectively communicate data insights OnCovid-19Tracking.

TOTAL PERIODS:	60

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Identify and use Tableau.
CO2:	Design dash board using tableau.
CO3:	Visualize data using bar charts, pie charts, histogram etc.
CO4:	Build dash boards for various real-time projects.
CO5:	Build visualization projects for various real time scenarios.

REQUIREMENTS:	
1.	Tableau desktop software.

REFERENCES:	
1.	www.tableau.com
2.	www.kaggle.com
3.	https://www.tableau.com/academic/students
4.	https://www.udemy.com/course/data-visualization-with-tableau-x/

SEMESTER –VII

Course Code	Course Title	Periods per week				Credits
		L	T	P	R	
191CAC701T	DEEP LEARNING	3	0	0	0	3

PREREQUISITES:
Nil

COURSE OBJECTIVES:	
1.	To present the mathematical, statistical and computational challenges of building neural Networks
2.	To study the concepts of deep learning
3.	To introduce dimensionality reduction techniques
4.	To enable the students to know deep learning techniques to support real-time applications
5.	To examine the case studies of deep learning techniques

UNIT	TITLE	PERIODS
1	INTRODUCTION	9

Introduction to machine learning- Linear models (SVMs and Perceptron, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates

UNIT	TITLE	PERIODS
2	DEEP NETWORKS	9

History of Deep Learning- A Probabilistic Theory of Deep Learning- Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks Convolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning

UNIT	TITLE	PERIODS
3	DIMENTIONALITY REDUCTION	9

Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyper parameter optimization

UNIT	TITLE	PERIODS
4	OPTIMIZATION AND GENERALIZATION	9

Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience

UNIT	TITLE	PERIODS
5	APPLICATIONS AND CASE STUDY OF DEEP LEARNING	9

Images segmentation – Object Detection – Automatic Image Captioning – Image generation with Generative adversarial networks – Video to Text with LSTM models – Attention models for Computer Vision – Case Study: Named Entity Recognition – Opinion Mining using Recurrent Neural Networks – Parsing and Sentiment Analysis using Recursive Neural Networks – Sentence Classification using Convolutional Neural Networks – Dialogue Generation with LSTMs.

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able	
CO1:	Understand basics of deep learning
CO2:	Implement various deep learning models
CO3:	Realign high dimensional data using reduction techniques
CO4:	Analyze optimization and generalization in deep learning
CO5:	Explore the deep learning applications

TEXT BOOKS:	
1.	Ian J. Good fellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2017.
2.	Francois Chollet, “Deep Learning with Python”, Manning Publications, 2018

REFERENCE BOOKS:	
1.	Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.
2.	Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013
3.	Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015

Course Code	Course Title	Periods per week				Credits
		L	T	P	R	
191CAC711L	**DEEP LEARNING LAB**	**0**	**0**	**4**	**0**	**2**

COURSE OBJECTIVES:	
1.	To understand complexity of Deep Learning algorithms and their limitations
2	To understand modern notions in data analysis oriented computing;
3	Able to be capable of confidently applying common Deep Learning algorithms in practice and implementing their own;
4	Able to be capable of performing distributed computations;
5	Able to be capable of performing experiments in Deep Learning using real-world data.

LIST OF EXPERIMENTS	
1.	Solving XOR problem using Multilayer perceptron
2.	Implement character and Digit Recognition using ANN.
3.	Implement the analysis of X-ray image using auto encoders
4.	Implement Speech Recognition using NLP
5.	Develop a code to design object detection and classification for traffic analysis using CNN
6.	Implement online fraud detection of share market data using any one of the data analytics tools.
7.	Implement image augmentation using deep RBM.
8.	Implement Sentiment Analysis using LSTM.
9.	Mini Project: Number plate recognition of traffic video analysis.
10.	Mini Project: Facemask Detection using Tensor flow.

TOTAL PERIODS:	**60**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	The students will be able to familiarize deep learning concepts
CO2:	The students will be able to Explain the basic concepts in Neural Networks and applications
CO3:	The students will be able to Explain the deep learning concepts using Back Propagation Network
CO4:	The students will be able to Discuss Convolutional Neural Network models to Object K2 Detection and image Retrieval
CO5:	The students will be able to Discuss feed forward networks and their training issues
CO6:	The students will be able to Build own deep learning project ,Troubleshoot and improve deep learning models