B.TECH. – INFORMATION TECHNOLOGY

ACADEMIC CURRICULUM & SYLLABUS

(REGULATIONS 2019 V 21)

CHOICE BASED CREDIT SYSTEM

(Applicable to the students admitted from the Academic Year 2021-22 onwards)

AUTONOMOUS

EASWARI ENGINEERING COLLEGE

(Autonomous Institution)
Bharathi Salai, 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
MANDATORY COURSE								
9.	191GEM101L	Induction Training &	MC	-	-	2	-	1&
10.	191GEM102T	தமிழர் மரபு / Heritage of Tamils	MC	1	-	-	-	1 ^
TOTAL				**17**	**2**	**13**	**1**	**24**

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

^ Mandatory to register for the course 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	தமிழரும் தொழில்நுட்பமும்/ Tamils and Technology	MC	1	-	-	-	1^
TOTAL				**18**	**2**	**9**	**1**	**20**

&& Mandatory to register for the course and earn three credits

* The student may opt for anyone. 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.

^ Mandatory to register for the course and earn one credit

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.	191ECS321T	Digital Principles and System Design	ES	3	-	-	-	3
3.	191ITC301T	Data Structures and Algorithms	PC	3	-	-	-	3
4.	191ITC302T	Object Oriented Programming	PC	3	-	-	-	3
5.	191ITC303T	Operating Systems	PC	3	-	-	-	3
LABORATORY								
6.	191ECS331L	Digital Systems Laboratory	ES	-	-	4	-	2
7.	191ITC311L	Data Structures Laboratory	PC	-	-	4	-	2
8.	191ITC312L	Object Oriented Programming Laboratory	PC	-	-	3	1	2
HUMAN EXCELLENCE COURSE								
9.	191GEH311L	Yoga / Social Service - Phase - I**	HS	-	-	2	-	1
EMPLOYABILITY ENHANCEMENT COURSE								
10.	191ITA311I	Inplant Training / Internship#	EEC	-	-	-	-	1#
11.	191ITA301I	Industry Supported Course (Optional) ##	EEC	-	-	-	-	1##
ONLINE COURSE								
12.		Online Course (Optional) $	PE	-	-	-	-	3$
TOTAL				**12**	**2**	**13**	**1**	**23**

** Student may opt for anyone. 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 Clause 14.9 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.	191ITC401T	Database Management Systems	PC	3	-	-	-	3
3.	191ITC402T	Software Engineering	PC	3	-	-	-	3
4.	191ITC403T	Computer Architecture	PC	3	-	-	-	3
5.	191ECS422T	Principles of Communication	ES	3	-	-	-	3
LABORATORY								
6.	191ITC411L	Database Management Systems Laboratory	PC	-	-	4	-	2
7.	191ITC412L	Software Engineering Laboratory	PC	-	-	3	1	2
8.	191ITC413L	Open Source Programming Laboratory	PC	-	-	4	-	2
TOTAL CREDITS								**22**
MANDATORY COURSE								
9.	191GEM411L	NSS / NCC / YRC -Phase -II*	MC	-	-	2	-	1*
EMPLOYABILITY ENHANCEMENT COURSE								
10.	191ITA411I	Inplant Training / Internship#	EEC	-	-	-	-	1#
11.	191ITA401I	Industry Supported Course (Optional) ##	EEC	-	-	-	-	1##
ONLINE COURSE								
12.		Online Course (Optional) $	PE	-	-	-	-	3$
TOTAL				**15**	**2**	**13**	**1**	**22**

*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 V								
S.No	Course Code	Course Title	Category	Hours / Week				CREDITS
				L	T	P	R	
THEORY								
1.	191MBC521T	Professional Ethics and Principles of Management	HS	3	-	-	-	3
2.	191ITC501T	Computer Networks	PC	3	-	-	-	3
3.	191ITC502T	Data warehousing and Data Mining	PC	3	-	-	-	3
4.	191ITC503T	Web Technology	PC	3	-	-	-	3
5.		Professional Elective - I	PE	3	-	-	-	3
6.		Open Elective - I	OE	3	-	-	-	3
LABORATORY								
7.	191ITC511L	Web Technology Laboratory	PC	-	-	4	-	2
8.	191ITC512L	Mobile Application Development Laboratory	PC	-	-	3	1	2
HUMAN EXCELLENCE COURSE								
9.	191GEH511L	Yoga / Social Service – Phase - II**	HS	-	-	2	-	1
			TOTAL CREDITS					**23**
EMPLOYABILITY ENHANCEMENT COURSE								
10.	191ITA511I	In plant Training / Internship#	EEC	-	-	-	-	1#
11.	191ITA501I	Industry Supported Course (Optional) ##	EEC	-	-	-	-	1##
ONLINE COURSE								
12.		Online Course (Optional) $	PE	3	-	-	-	3$
TOTAL				**21**	**-**	**9**	**1**	**23**

** 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.	191ITC601T	Mobile Computing	PC	3	-	-	-	3
2.	191ITC602T	Artificial Intelligence	PC	3	-	-	-	3
3.	191ITC603T	Embedded Systems and IoT Applications	PC	3	-	-	-	3
4.		Professional Elective - II	PE	3	-	-	-	3
5.		Open Elective - II	OE	3	-	-	-	3
LABORATORY								
6.	191ITC611L	Networks Laboratory	PC	-	-	4	-	2
7.	191ITC612L	Embedded Systems and IoT Laboratory	PC	-	-	3	1	2
8.	191LEH612L	Communication Skills Laboratory	HS	-	-	2	-	1
TOTAL CREDITS								**20**
EMPLOYABILITY ENHANCEMENT COURSE								
9.	191ITA611I	Internship / Industrial Training #	EEC	-	-	-	-	1#
10.	191ITA601I	Industry Supported Course (optional) ##	EEC	-	-	-	-	1##
MANDATORY COURSE								
11.	191GEM611L	NSS / NCC / YRC - Phase – III*	MC	-	-	2	-	1*
12.	191GEM601T	Foreign Language / Indian Constitution&	MC	3	-	-	-	3&
ONLINE COURSE								
13.		Online Course (Optional) $	PE	3	-	-	-	3$
TOTAL				**21**	**-**	**11**	**1**	**20**

* 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 only three 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.	191ITC701T	Cryptography and Network Security	PC	3	-	-	-	3
2.		Open Elective III	OE	3	-	-	-	3
3.		Professional Elective III	PE	3	-	-	-	3
4.		Professional Elective IV	PE	3	-	-	-	3
5.	191ITA701T	Comprehension@	PC	-	-	-	-	3@
LABORATORY								
6.	191ITC711L	Security Laboratory	PC	-	-	4	-	2
EMPLOYABILITY ENHANCEMENT COURSE								
7.	191ITP711J	Project Work / Start up – Phase - I	EEC	-	-	-	4	2
8.	191ITA711I	Inplant Training / Internship#	EEC	-	-	-	-	1
TOTAL CREDITS								**17**
9.	191ITA701I	Industry Supported Course (optional)##	EEC	-	-	-	-	1##
ONLINE COURSE								
10.		Online Course (optional)$	PE	-	-	-	-	3$
TOTAL				**12**	**-**	**4**	**4**	**17**

@ Students may earn 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 only three 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.	191ITP811J	Project Work / Start up – Phase - II	EEC	-	-	-	20	10
TOTAL				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	191LEH612L	Communication Skills Laboratory	VI	1
6	191MBC521T	Professional Ethics	V	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	191MAB405T	Probability and Statistics	IV	4
TOTAL CREDITS				**27**

ENGINEERING SCIENCE COURSES (ES)

S.No	Course Code	Course Title	Semester	Credits
1	191GES102T	Problem Solving and Python Programming	I	3
2	191GES211L	Python Programming Laboratory	I	2
3	191GES101T	Engineering Graphics	I	4
4	191GES201T	Basic Electrical and Electronics Engineering	II	3
5	191GES111L	Engineering Practices Laboratory	II	2
6	191GES204T	Programming in C	II	3
7	191GES213L	C Programming Laboratory	II	2
8	191ECS321T	Digital Principles and System Design	III	3
9	191ECS331L	Digital Systems Laboratory	III	2
10	191ECS422T	Principles of Communication	III	3
TOTAL CREDITS				27

PROFESSIONAL CORE COURSES (PC)

S.No	Course Code	Course Title	Semester	Credits
1	191ITC301T	Data Structures and Algorithms	III	3
2	191ITC302T	Object Oriented Programming	III	3
3	191ITC303T	Operating Systems	III	3
4	191ITC311L	Data Structures Laboratory	III	2
5	191ITC312L	Object Oriented Programming Laboratory	III	2
6	191ITC401T	Database Management Systems	IV	3
7	191ITC402T	Software Engineering	IV	3
8	191ITC403T	Computer Architecture	IV	3
9	191ITC411L	Database Management Systems Laboratory	IV	2
10	191ITC412L	Software Engineering Laboratory	IV	2
11	191ITC413L	Open Source Programming	IV	2
12	191ITC501T	Computer Networks	V	3
13	191ITC502T	Data warehousing and Data Mining	V	3
14	191ITC503T	Web Technology	V	3
15	191ITC511L	Web Technology Laboratory	V	2
16	191ITC512L	Mobile Application Development Laboratory	V	2
17	191ITC601T	Mobile Computing	VI	3
18	191ITC602T	Artificial Intelligence	VI	3
19	191ITC603T	Embedded Systems and IoT Applications	VI	3
20	191ITC612L	Embedded Systems and IoT Laboratory	VI	2
21	191ITC611L	Networks Laboratory	VI	2
22	191ITC701T	Cryptography and Network Security & Laboratory.	VII	3
23	191ITC711L	Security Laboratory.	VII	2
TOTAL CREDITS				**59**

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	தமிழரும் 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**

SYLLABUS OF

SEMESTER – I

COURSES

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 that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in 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**

A. *PHYSICS LABORATORY*

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.

B. 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-I‖ 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

SYLLABUS OF

SEMESTER – II

COURSES

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 managementll Federation Alexandria Virgiia, Third Edition, 2008.

SYLLABUS OF

SEMESTER – III

COURSES

191MAB302T	DISCRETE MATHEMATICS	Periods per week				Credits
		L	T	P	R	
		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**	**9+3**

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

UNIT	**TITLE**	**PERIODS**
II	**COMBINATORICS**	**9+3**

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

UNIT	**TITLE**	**PERIODS**
III	**GRAPHS**	**9+3**

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

UNIT	**TITLE**	**PERIODS**
IV	**ALGEBRAIC STRUCTURES**	**9+3**

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

UNIT	**TITLE**	**PERIODS**
V	**LATTICES AND BOOLEAN ALGEBRA**	**9+3**

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:	Verify the validity of the given propositions by inference theory.
CO2:	Use basic counting principles to get the solution for problems encountered in real life situation.
CO3:	Apply Graph theoretical ideas to find the number of paths between two nodes.
CO4:	Derive group theoretic results and properties.
CO5:	Find the least upper bound and the greatest lower bound of a given Lattice and also simplify Boolean expressions.

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. and Manohar.R, “Discrete Mathematical Structures with Applications to Computer Science", 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 Mark Lipson., "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.

191ECS321T	DIGITAL PRINCIPLES AND SYSTEM DESIGN	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To design digital circuits using simplified Boolean functions
2.	To analyze and design combinational circuits
3.	To analyze and design synchronous and asynchronous sequential circuits
4.	To understand Programmable Logic Devices
5.	To write HDL code for combinational and sequential circuits

UNIT	TITLE	PERIODS
I	BOOLEAN ALGEBRA AND LOGIC GATES	9

Number Systems - Arithmetic Operations - Binary Codes- Boolean Algebra and Logic Gates - Theorems and Properties of Boolean Algebra - Boolean Functions - Canonical and Standard Forms - Simplification of Boolean Functions using Karnaugh Map - Logic Gates — NAND and NOR Implementations.

UNIT	TITLE	PERIODS
II	COMBINATIONAL LOGIC	9

Combinational Circuits – Analysis and Design Procedures - Binary Adder- Subtractor - Decimal Adder - Binary Multiplier - Magnitude Comparator - Decoders – Encoders – Multiplexers - Introduction to HDL – HDL Models of Combinational circuits.

UNIT	TITLE	PERIODS
III	SYNCHRONOUS SEQUENTIAL LOGIC	9

Sequential Circuits - Storage Elements: Latches , Flip-Flops - Analysis of Clocked Sequential Circuits - State Reduction and Assignment - Design Procedure - Registers and Counters - HDL Models of Sequential Circuits.

UNIT	TITLE	PERIODS
IV	ASYNCHRONOUS SEQUENTIAL LOGIC	9

Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race-free State Assignment — Hazards.

UNIT	TITLE	PERIODS
V	MEMORY AND PROGRAMMABLE LOGIC	9

RAM – Memory Decoding – Error Detection and Correction - ROM - Programmable Logic Array – Programmable Array Logic.

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Simplify the Boolean expressions using different methods.
CO2:	Design and analyse the combinational logic circuits.
CO3:	Apply the fundamental knowledge of digital principles to design and implement synchronous and asynchronous sequential circuits.
CO4:	Write simple HDL codes for the combinational and sequential digital circuits using Verilog.
CO5:	Assess the nomenclature and technology in the area of memory devices and apply the concepts in real time applications.

TEXT BOOKS:	
1.	M. Morris R. Mano, Michael D. Ciletti, “Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog”, 6th Edition, Pearson Education, 2017.

REFERENCE BOOKS:	
1.	G. K. Kharate, Digital Electronics, Oxford University Press, 2010
2.	John F. Wakerly, Digital Design Principles and Practices, Fifth Edition, Pearson Education, 2017
3.	Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, Sixth Edition, CENGAGE Learning, 2013
4.	Donald D. Givone, Digital Principles and Designll, Tata Mc Graw Hill, 2003

191ITC301T	DATA STRUCTURES AND ALGORITHMS	Periods per week				Credits
		L	T	P	R	
		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 understand sorting, searching and hashing algorithms
4.	To apply Tree and Graph structures
5.	To Learn Algorithm Design Techniques

UNIT	TITLE	PERIODS
I	LINEAR DATA STRUCTURES – LIST	9
Introduction to Data Structure- Abstract Data Types (ADTs) – List ADT – Array-based implementation – linked listimplementation —singly linked lists- circularly linked lists- Doubly-linked lists – Stack ADT- Queue ADT- Applications of Stack.		
UNIT	TITLE	PERIODS
II	NON-LINEAR DATA STRUCTURES – TREES	9
Tree ADT –Tree terminologies- Binary Tree ADT-Tree traversals – Expression trees – Binary search tree ADT –Threaded Binary Trees- AVL Trees – B-Tree -applications of trees -Heap–Binary Heap- Applications of heap.		
UNIT	TITLE	PERIODS
III	NON-LINEAR DATA STRUCTURES - GRAPHS	9
Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal – Topological Sort – Applications of graphs-minimum spanning tree-Dijkstra's algorithm-Kruskal's algorithm.		
UNIT	TITLE	PERIODS
IV	SEARCHING, SORTING AND HASHING TECHNIQUES	9
Searching- Linear Search - Binary Search. Sorting - Bubble sort –Quick Sort - Insertion sort - Merge sort. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Double Hashing-Extendible Hashing.		
UNIT	TITLE	PERIODS
V	ALGORITHM DESIGN TECHNIQUES	9
Greedy algorithms –Scheduling problem-The multiprocessor case-Divide and conquer-Running time –The Selection Problem- Dynamic programming – Recursive Algorithms-Ordering Matrix Multiplication.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Analyze the concept of ADT for Storage implementation.
CO2:	Apply various hashing techniques to manage memory allocation problem.
CO3:	Design Tree structure to perform various sorting and searching techniques.
CO4:	Compare various non linear algorithms to find the shortest path.
CO5:	Evaluate the context of space and time complexity using Dynamic Programming.
CO6:	Build real time applications with greedy algorithms

TEXT BOOKS:	
1.	Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education, 1997.

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

191ITC302T	OBJECT ORIENTED PROGRAMMING	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
5.	To design and build file handling concepts.
6.	To understand the basics of Scala Programming.

UNIT	TITLE	PERIODS
I	INTRODUCTION TO OOPS AND BASICS OF JAVA	10

OOPS concepts- Introduction to Java: History of Java-Features of Java-Java Development Kit (JDK) - Basics of Java programming-Data types-Variables-Operators-Control structures including selection, Looping-Overloading-Arrays in java. Working of Java; Including Comments; Using Classes in Java-Constructors-Access specifiers-Declaring Methods in Java- The main() Method, Invoking a Method in Java- Saving, Compiling and Executing Java Programs-Packages.

UNIT	TITLE	PERIODS
II	INHERITANCE AND INTERFACES	9

Inheritances-Super class and Sub Class-Types of Inheritance-Types of Relationships- The Abstract Class, Interface, Defining an Interface, Interfaces versus Abstract Classes-Extending and Implementing Interfaces-Array Lists-Strings.

UNIT	TITLE	PERIODS
III	EXCEPTION AND FILE HANDLING	9

Exception Handling: Definition of an Exception-Exception Classes- Common Exceptions; Exception Handling Techniques-Throwing and catching exceptions-Creating own exceptions- Streams-Byte Stream and Character stream-Files-Reading and writing files.

UNIT	TITLE	PERIODS
IV	MULTITHREADING	8

Multithreading- Differences between multi-threading and multitasking- Thread life cycle, Creating threads-Synchronizing threads- Inter-thread communication- Daemon threads- Thread groups-Thread Priority.

UNIT	TITLE	PERIODS
V	SCALA PROGRAMMING	9

Overview-Scala versus Java-Features of Scala-Environment Setup-Basic Syntax-Data Types-Variables- classes & Objects-Access Modifiers-Operators-Control statements and Looping Statements-Strings-Arrays-Functions-Exceptions handling.

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Apply the basic concepts of OOP principles in Java programming.
CO2:	Utilize the concepts of inheritance and interface in interdisciplinary applications.
CO3:	Implement, test and debug solutions in java by various error handling mechanisms.
CO4:	Build Java applications using the concept of threads.
CO5:	Develop and run the programs on different packages.
CO6:	Compare and Contrast different programs of Scala with Java.

TEXT BOOKS:	
1.	Herbert Schildt, ―Java The complete reference‖, 8th Edition, McGraw Hill Education, 2011.
2.	Jason Swartz - Learning Scala Practical Functional Programming for JVM, Oreilly.

REFERENCE BOOKS:	
1.	Cay S. Horstmann, Gary cornell, ―Core Java Volume –I Fundamentals‖, 9th Edition, Prentice Hall, 2013.
2.	Paul Deitel, Harvey Deitel, ―Java SE 8 for programmers‖, 3rd Edition, Pearson, 2015.
3.	Steven Holzner, ―Java 2 Black book‖, Dreamtech press, 2011.

191ITC303T	OPERATING SYSTEMS	Periods per week				Credits
		L	T	P	R	
		3	**0**	**0**	**0**	**3**

PREREQUISITES:
NIL

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

UNIT	**TITLE**	**PERIODS**
I	**OPERATING SYSTEM OVERVIEW**	**9**

Introduction to operating systems – Computer system organization, Architecture – Operating system structure, Operations – Process, memory, storage management – Protection and security – distributed systems – Computing environments – Open-source operating systems – os services – User operating system interface – System calls –types – System programs – OS structure – os generation – system boot.

UNIT	**TITLE**	**PERIODS**
II	**PROCESS MANAGEMENT**	**9**

Processes – Process Scheduling, Operations on Processes, Inter-process Communication; CPU Scheduling – Scheduling algorithms, Threads- Overview, Multithreading models, Threading issues; Process Synchronization – The critical-section problem, Mutex locks, Semaphores, Classic problems of synchronization, Critical regions, Monitors; Deadlock – System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT	**TITLE**	**PERIODS**
III	**STORAGE MANAGEMENT**	**9**

Main Memory – Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with paging, 32 and 64 bit architecture Examples; Virtual Memory – Background, Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS Examples.

UNIT	**TITLE**	**PERIODS**
IV	**FILE SYSTEMS AND I/O SYSTEMS**	**9**

Mass Storage system – Overview of Mass Storage Structure, Disk Structure, Disk Scheduling and Management, swap space management; File-System Interface – File concept, Access methods, Directory Structure, Directory organization, File system mounting, File Sharing and Protection; Directory implementation, Allocation Methods, Free Space Management, Efficiency and Performance, Recovery; I/O Systems.

UNIT	**TITLE**	**PERIODS**
V	**CASE STUDY**	**9**

Linux System – Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, Input-Output Management, File System, Inter-process Communication; Mobile OS – iOS and Android – Architecture and

SDK Framework, Media Layer, Services Layer, Core OS Layer, File System.

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Analyze various scheduling algorithms to improve CPU utilization.
CO2:	Apply deadlock, prevention and avoidance algorithms in real time applications
CO3:	Categorize various memory management schemes for effective implementation in process.
CO4:	Design unique functionality of file systems for effective storage.
CO5:	Evaluate administrative task on Linux servers in application development.
CO6:	Compare iOS and Android Operating Systems for customization.

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

REFERENCE BOOKS:	
1.	Ramaz Elmasri, A. Gil Carrick, David Levine, —Operating Systems – A Spiral Approach‖, Tata McGraw Hill Edition, 2010
2.	Achyut S.Godbole, Atul Kahate, —Operating Systems‖, McGraw Hill Education, 2016
3.	Andrew S. Tanenbaum, —Modern Operating Systems‖, Second Edition, Pearson Education, 2004.
4.	Gary Nutt, —Operating Systems‖, Third Edition, Pearson Education, 2004.
5.	Harvey M. Deitel, —Operating Systems‖, Third Edition, Pearson Education, 2004.
6.	Daniel P Bovet and Marco Cesati, —Understanding the Linux kernel‖, 3rd edition, O‘Reilly, 2005.
7.	Neil Smyth, —iPhone iOS 4 Development Essentials – Xcode‖, Fourth Edition, Payload media, 2011.

191ECS331L	DIGITAL SYSTEMS LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	**0**	**4**	**0**	**2**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand the various basic logic gates
2.	To design and implement the various combinational circuits
3.	To design and implement combinational circuits using MSI devices.
4.	To design and implement sequential circuits
5.	To understand and code with HDL programming
6.	To understand the various basic logic gates

LIST OF PROGRAMS:	
1.	Verification of Boolean Theorems using basic gates
2.	Design and implementation of combinational circuits using basic gates for arbitrary functions, code converters
3.	Design and implement Half/Full Adder and Subtractor.
4.	Design and implement combinational circuits using MSI devices: • 4-bit binary adder / subtractor • Magnitude Comparator
5.	Design and implement shift-registers.
6.	Design and implement synchronous counters
7.	Design and implement asynchronous counters.
8.	Coding combinational circuits using HDL
9.	Coding sequential circuits using HDL
10.	Design and implementation of a simple digital system (Mini Project).

TOTAL PERIODS:	**60**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Examine the concepts and working of logic gates.
CO2:	Design and implementation of combinational circuits using logic gates.
CO3:	Construct combinational circuits using MSI devices
CO4:	Build sequential circuits like registers and counters.
CO5:	Analyze the features of Verilog HDL and the role of HDL in digital logic design.

CO6:	Demonstrate combinational and sequential circuits using HDL.

LIST OF EQUIPMENTS:	
1.	HARDWARE:
• Digital Trainer Kits	
• Digital ICs required for the experiments in sufficient numbers	
2.	SOFTWARE
• HDL/LOGISIM simulator	

191ITC311L	DATA STRUCTURES LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	0	4	0	2

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To implement linear and non-linear data structures
2.	To understand the different operations of search trees
3.	To implement graph traversal algorithms
4.	To be familiar with sorting and searching algorithms
5.	To understand hashing techniques.

LIST OF PROGRAMS:	
1.	Array implementation of Stack and Queue ADTs
2.	Array implementation of List ADT
3.	Linked list implementation of List, Stack and Queue ADTs
4.	Applications of List, Stack and Queue ADTs
5.	Implementation of Binary Trees and operations of Binary Trees
6.	Implementation of Binary Search Trees
7.	Implementation of AVL Trees
8.	Implementation of Heaps using Priority Queues.
9.	Implementation of Breadth first Search and Depth first Search
10.	Minimum Spanning Tree
11.	Implementation of searching and sorting algorithms
12.	Hashing – any two collision techniques

TOTAL PERIODS:	60

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Apply the concept of linear data structures for problem solving.
CO2:	Develop solutions for complex problems using the concept of non-linear data structures.
CO3:	Analyze the time and space Complexity of Algorithms for evaluating its performance.
CO4:	Build operations like searching, insertion, and deletion, traversing mechanism on various data structures.
CO5:	Develop hashing Algorithms for efficient data storage and retrieval.
CO6:	Create applications using appropriate algorithms.

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

191ITC312L	OBJECT ORIENTED PROGRAMMING LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	**0**	**3**	**1**	**2**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To build software development skills using java programming for real-world applications.
2.	To understand and apply the concepts of classes, packages, interfaces, array list, exception handling and file processing.
3.	To develop applications using event handling.
4.	To understand the concept of multithreading.
5.	To develop an application using Scala programming.

LIST OF PROGRAMS:	
1.	Develop a Java application to generate Electricity bill. Create a class with the following members: • Consumer no., consumer name, previous month reading, current month reading, type of EBconnection (i.e. domestic or commercial). Compute the bill amount using the following tariff. • If the type of the EB connection is domestic, calculate the amount to be paid as follows: • First100units - Rs. 1 per unit • 101-200units - Rs. 2.50 per unit • 201 -500 units - Rs. 4 per unit • > 501units - Rs. 6 per unit • If the type of the EB connection is commercial, calculate the amount to be paid as follows: • First 100 units - Rs. 2 per unit • 101-200 units - Rs. 4.50 per unit • 201 -500 units - Rs. 6 per unit • > 501 units - Rs. 7 per unit
2.	Write a java program to implement the concept of packages.
3.	Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, and Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor fromemployee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 %of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
4.	Design a Java interface for ADT Stack. Implement this interface using array. Provide necessary exception handling in both the implementations.
5.	Write a program to perform string operations using Array List. Write functions for the following • Append - add at end • Insert – add at particular index • Search • List all string starts with given letter • Remove elements from the list.
6.	Write a java program to create an abstract class named Shape that contains two integers and an empty method named printArea (). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method print Area( ) that prints the area of the given shape.

7.	Write a program java program to throws the following exceptions • Number Format Exception • Array Index Out of Bound • String Index Out of Bound • Arithmetic Exception
8.	Write Java program to implement user defined exception.
9.	Write a java program that implements a multi-threaded application (Thread Class and Runnable Interface) that has three threads. First thread generates a 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.
10.	Write a Java program to perform write and read operation in file handling.
11.	Write a scala program that handles the exception handling concepts.
12.	Write a scala program that implements string handling operation.
13.	Develop a Mini Project for any application using Java Concepts.

TOTAL PERIODS:	**60**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Develop solutions for complex problems by making use of the OOPS Concepts.
CO2:	Construct java applications using inheritance.
CO3:	Implement the concept of abstract class for problem solving in Java.
CO4:	Build an array list and perform various Java string operations.
CO5:	Apply the concept of multithreading to develop java applications.
CO6:	Create applications using Scala programming.

LIST OF EQUIPMENTS:	
1.	HARDWARE:
• Standalone desktops	
2.	SOFTWARE
• JDK Toolkit, Scala	

SYLLABUS OF

SEMESTER – IV

COURSES

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 time 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	8+4

Probability – The axioms of probability – Conditional probability – 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	8+4

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression.

UNIT	TITLE	PERIODS
III	TESTING OF HYPOTHESIS	8+4

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	8+4

One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design.

UNIT	TITLE	PERIODS
V	STATISTICAL QUALITY CONTROL	8+4

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerancelimits - 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 Unnikrishnapillai, S.,"Probability, Random Variables and
3.	Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.
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. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th Edition, 2007.

191ITC401T	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.
6.	To gain knowledge about advanced database concepts.

UNIT	TITLE	PERIODS
I	RELATIONAL DATABASES	10

Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction torelational 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 FifthNormal Form.

UNIT	TITLE	PERIODS
III	TRANSACTIONS AND CONCURRENCY	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	DATA STORAGE AND QUERYING	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 forSELECT 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.

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Select the suitable Relational Database model based on space and time complexity for the application.
CO2:	Design a database schema with appropriate mapping constraints.
CO3:	Apply appropriate normal form while designing database.
CO4:	Ensure data integrity and accuracy in transactions using ACID properties.
CO5:	Select appropriate indexing strategy for efficient storage and retrieval of data.
CO6:	Design Object oriented database models using NOSQL techniques.

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

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

191ITC402T	SOFTWARE ENGINEERING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand the phases in a software project.
2.	To learn the principles and process models of software engineering.
3.	To understand fundamental concepts of requirements engineering and estimation of the project.
4.	To gather knowledge on various software testing, maintenance methods.
5.	To know the fundamental concepts of monitoring and managing risks and quality of project.

UNIT	TITLE	PERIODS
I	SOFTWARE PROCESSES MODELS	9
Generic view of Process - Software life-cycle and process models; Process assessment models; Overview of Project Management activities; Agile methodologies- Extreme Programming, Scrum, DSDM, FDD, Crystal, Lean Software Development.		
UNIT	TITLE	PERIODS
II	REQUIREMENTS ENGINEERING AND PROJECT ESTIMATION	9
Software requirements and specifications: Requirements elicitation; Requirements analysis modeling techniques; Functional and non-functional requirements; User requirements, System requirements, requirement validation, Use Cases – software requirement specification documentation. Software Project Estimation: Decomposition Techniques - LOC and Function Points.		
UNIT	TITLE	PERIODS
III	SOFTWARE DESIGN/DESIGN ENGINEERING	9
Design Concepts – Design Guidelines – Design Approach - Structured approach – Object-oriented approach - User Interface Design - Design Notations – Data Flow Diagram – Context Diagram - UML Diagrams – Use case diagram, Class Diagram - Sequential Diagram – Design Documentation.		
UNIT	TITLE	PERIODS
IV	SOFTWARE TESTING	9
Testing Process – Testing Strategies - Test Case Specifications – Testing techniques – Black box testing –Equivalence Partitioning – Boundary Value Analysis – Cause effect graph – White box testing – Control Flow Graph – Program Dependence Graph – Testing levels – Modular testing – Integration testing – Regression testing – Systemtesting — User acceptance testing — Validation Report.		
UNIT	TITLE	PERIODS
V	QUALITY, CHANGE AND RISK MANAGEMENT	9
Quality Concepts, Software Quality Assurance, Software Reviews, Formal Technical Reviews, Software Configuration Management, SCM Process, Risk Management: Risk Strategies, Software Risks, Risk Identification, Risk Projection, Risk Refinement, Risk Migration, Monitoring and Management, RMMM Plan.		

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Analyze various software processes in all software phase of the product.
CO2:	Select appropriate process model depending on the user requirements.
CO3:	Estimate the cost of software project using Lines of code and Function points.
CO4:	Construct Data flow and UML diagrams for the project.
CO5:	Apply appropriate testing techniques at various levels to test code snippets.
CO6:	Evaluate the risks in a software project and quantify their potential effects.

TEXT BOOKS:	
1.	Ian Somerville , "Software Engineering" , 8th Edition, John Wiley and sons,2010.
2.	James Rumbaugh, Ivar Jacobson, Grady Booch, The Unified Modeling Language Reference Manual 2nd Edition, Addison Wesley, 2005.
3.	Roger S.Pressman," Software Engineering, A Practitioner‘s Approach", 7th Edition, McGraw Hill, 2010.

191ITC403T	COMPUTER ARCHITECTURE	Periods per week				Credits
		L	T	P	R	
		3	**0**	**0**	**0**	**3**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To make students understand the basic structure and operation of digital computer
2.	To familiarize with implementation of fixed point and floating-point arithmetic operations.
3.	To learn the basics of pipelined execution, types of hazards in sequence of instructions and methods to overcome.
4.	To understand the concept of various memories interfacing and different ways of communication with I/O devices.
5.	To introduce the parallel processing technique.

UNIT	**TITLE**	**PERIODS**
I	**BASIC STRUCTURE OF A COMPUTER SYSTEM**	**9**
Eight ideas — Functional Units — Basic Operational Concepts — Technology — Performance –Power wall — Uniprocessors to multiprocessors; Instructions – Operations and operands – Representing instructions – Logicaloperations – Control operations – Addressing and Addressing modes.		
UNIT	**TITLE**	**PERIODS**
II	**ARITHMETIC OPERATIONS**	**9**
Addition and Subtraction – Multiplication – Division – Floating Point Representation– Floating Point Operations – Subword Parallelism.		
UNIT	**TITLE**	**PERIODS**
III	**PROCESSOR AND CONTROL UNIT**	**9**
A Basic MIPS implementation – Building a Data path – Control Implementation Scheme Pipelining – Pipelined Data path and control – Handling Data Hazards & Control Hazards –Exceptions.		
UNIT	**TITLE**	**PERIODS**
IV	**MEMORY & I/O SYSTEMS**	**9**
Memory hierarchy - Memory Chip Organization - Cache memory - Virtual memory - Parallel Bus Architectures - Internal Communication Methodologies - Serial Bus Architectures – Mass storage -Input and Output Devices.		
UNIT	**TITLE**	**PERIODS**
V	**ADVANCED COMPUTER ARCHITECTURE**	**9**
Parallel processing architectures and challenges - Hardware multithreading - Multicore and shared memory multiprocessors - Introduction to Multiprocessor network topologies- Introduction to Graphics Processing Units - Clusters and Warehouse scale computers.		

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Analyze the impact of instruction set architecture on cost-performance of computer design.
CO2:	Apply computer arithmetic operations on various problems.
CO3:	Design pipelined control units and hazards for the use of high-level programming languages.
CO4:	Develop the system skills in parallelism and to optimize memory management.
CO5:	Evaluate the performance of memory systems using appropriate set of instructions.
CO6:	Compare the system design issues in terms of speed, technology, cost and performance.

TEXT BOOKS:	
1.	David A. Patterson and John L. Hennessey, —Computer Organization and Design‖, Fifth edition, Morgan Kauffman / Elsevier, 2014.
2.	V. Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, —Computer Organization—, Fifth edition, Mc Graw-Hill Education India Pvt Ltd, 2014.
3.	Miles J. Murdocca and Vincent P. Heuring, —Computer Architecture and Organization: An Integrated approach‖, Second edition, Wiley India Pvt Ltd, 2015.

REFERENCE BOOKS:	
1.	Govindarajalu, — Computer Architecture and Organization, Design Principles and Applications", Second edition, McGraw-Hill Education India Pvt Ltd, 2014.
2.	William Stallings — Computer Organization and Architecture‖, Seventh Edition, Pearson Education, 2006.

191ECS422T	PRINCIPLES OF COMMUNICATION	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To learn the basic elements of Electronic communication systems.
2.	To understand analog communication techniques.
3.	To learn data and pulse communication techniques.
4.	To be familiarized with source and Error control coding.
5.	To gain knowledge on multi-user radio communication.
6.	To study about various multiple access schemes.

UNIT	TITLE	PERIODS
I	ANALOG COMMUNICATION	9

Elements of Communication Systems, Modulation – Need for Modulation, Amplitude Modulation – Mathematical representation & Waveform representation in Time domain, frequency domain, Generation of AM - Switching modulator, Detection of AM - Envelope detector, SSB — Generation by Filter & Phase shift method, Coherent detection, Limitations of AM, Frequency and Phase Modulation –Mathematical & waveform representation- Comparison of Analog Communication Systems (AM — FM — PM).

UNIT	TITLE	PERIODS
II	PULSE AND DATA COMMUNICATION	9

Pulse Communication: Pulse Amplitude Modulation (PAM) – Pulse Width Modulation (PWM) – Pulse Position Modulation (PPM) - Pulse code Modulation (PCM).

Data Communication: Data Communication Hardwares – DTE/DCE, Two & Multipoint Data Communication Circuits – Line control unit – UART.

UNIT	TITLE	PERIODS
III	DIGITAL COMMUNICATION	9

Amplitude Shift Keying (ASK) – Frequency Shift Keying (FSK) – Phase Shift Keying (PSK) – BPSK – QPSK – Quadrature Amplitude Modulation (QAM) – 8 QAM – 16 QAM – Bandwidth Efficiency– Comparison of various Digital Communication System (ASK — FSK — PSK — QAM).

UNIT	TITLE	PERIODS
IV	SOURCE AND ERROR CONTROL CODING	9

Entropy, Source encoding theorem, Shannon fano coding, Huffman coding, Mutual information, Channel capacity, Channel coding theorem, Error Control Coding- ARQ- Linear block codes.

UNIT	TITLE	PERIODS
V	CELLULAR AND SATELLITE COMMUNICATION	9

Cellular technology- Fundamental concepts, Frequency reuse, Interference, Cell splitting, sectoring, Roaming, Hand-off – GSM architecture , Satellite Communication – Orbital pattern, Antenna look angle, satellite system link model,

system parameters, Link equation.

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Generate the Amplitude, Frequency and Phase modulated waveforms.
CO2:	Interpret the interfacing methods for serial and parallel communication.
CO3:	Classify the performance characteristics of digital communication techniques.
CO4:	Apply the source and error control coding theorem for digital communication.
CO5:	Illustrate the concepts in Cellular and satellite communication.

TEXT BOOKS:	
1.	Wayne Tomasi, Advanced Electronic Communication Systems, 6th Edition, Pearson Education, 2009.
2.	Simon Haykin, Communication Systems‖, 4th Edition, John Wiley & Sons, 2004.

REFERENCE BOOKS:	
1.	Rappaport T.S, "Wireless Communications: Principles and Practice", Pearson Education, 2007
2.	H.Taub, D L Schilling and G Saha, Principles of Communication‖, Pearson Education, 2007
3.	P.Lathi, ,Modern Analog and Digital Communication Systems‖, Oxford University Press.
4.	B.Sklar, —Digital Communication Fundamentals and Applications‖ Pearson Education 2007.

191ITC411L	DATABASE MANAGEMENT SYSTEMS LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	0	4	0	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 PROGRAMS:	
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 modeling, normalization and Implementation for any application
9.	Database Connectivity with Front End Tools
10.	Implementation of real time database applications (Mini Project).

TOTAL PERIODS:	60

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Formulate and query a database using SQL DDL/DML/TCL commands
CO2:	Analyze the use of Tables, Views, Functions and Procedures
CO3:	Implement exception handling using triggers and procedures.
CO4:	Create database using constraints and normal forms.
CO5:	Design a database schema for a given problem-domain.
CO6:	Develop applications with GUI and database connectivity

LIST OF EQUIPMENTS:	
1.	HARDWARE:
	• Standalone desktops
2.	SOFTWARE
• **Front end**: PHP/VB/VC ++/JAVA • **Back end**: XAMPP/Oracle / SQL / MySQL	

191ITC412L	SOFTWARE ENGINEERING LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	**0**	**3**	**1**	**2**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To implement the phases in a software project.
2.	To understand fundamental concepts of requirements engineering and estimation of the project.
3.	To gather knowledge on various software testing
4.	To develop application with documentation using Software Engineering processes.
5.	To construct the UML diagrams for the real time application

Considering any real time applications apply and develop:	
1.	Introduction to Agile Process Model and team formation of the project
2.	Identifying the requirements from the problem statements and gathering requirements.
3.	Develop Project Scheduling using Gantt chart.
4.	Estimate the project based on LOC and FP.
5.	Model Data Flow Diagrams for the project
6.	Model UML Use Case Diagrams for the project.
7.	Model Sequence Diagrams for the project
8.	Model Class diagram for the project.
9.	Validation methods (White Box - Unit testing, Code Coverage, Black Box testing).
10.	Documentation of the project and Deployment.

LIST OF PROGRAMS:	
1.	Course registration system
2.	Online ticket reservation system
3.	Student mark analysis system
4.	Expert system to prescribe medicines for the given symptoms
5.	Remote computer monitoring system
6.	ATM system
7.	Stock maintenance system
8.	Online quiz system
9.	Email client system

TOTAL PERIODS:	**60**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Infer the software requirements in real time software projects.
CO2:	Assess the schedule and estimate the cost of the application.
CO3:	Design Data flow and UML diagrams for the software application.
CO4:	Develop the code for various software projects.
CO5:	Validate the software application using software testing tools.
CO6:	Create the documentation for software application.

LIST OF EQUIPMENTS:	
1.	HARDWARE:
	• Standalone desktops
2.	SOFTWARE
	• Argo UML / Star UML / UML Graph / Topcased or Equivalent.

191ITC413L	OPEN SOURCE PROGRAMMING LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	**0**	**4**	**0**	**2**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To learn the installation of Linux Operating System.
2.	To learn the installation of MySQL Database.
3.	To learn the installation and working of Apache Webserver.
4.	To develop web application using Python and PERL.
5.	To learn the installation and working of NS2 Simulator

LIST OF PROGRAMS:	
1.	Linux Operating System Installation
2.	MySQL Database Installation
3.	Apache Web server Installation and configuring web server
4.	Design a web application for online examination using Ruby Programming
5.	XAMPP Server Installation and configuring.
6.	Design a login form using PHP and test the connectivity with MYSQL Database.
7.	Design a Registration form validation using Python Programming with database connectivity.
8.	Design a Dynamic website using Perl Programming.
9.	NS2 Installation.

TOTAL PERIODS:	**60**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Install Linux, web server and NS2.
CO2:	Build Web Applications using Open Source Software.
CO3:	Create Web Applications using PHP.
CO4:	Construct Perl program for database Connectivity.
CO5:	Develop applications using Ruby Scripting Language.
CO6:	Configure Apache Web Server and XAMPP.

LIST OF EQUIPMENTS:	
1.	HARDWARE:
• Standalone desktops	
2.	SOFTWARE
• Latest distribution of Linux ,Windows	

SYLLABUS OF

SEMESTER – V

COURSES

191MBC521T	PROFESSIONAL ETHICS AND PRINCIPLES OF MANAGEMENT	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Knowledge the students to study the functions and principles of management
2.	To learn the application of the principles in an organization.
3.	To enable the students to create an awareness on engineering ethics and human values
4.	To instill moral and social values and loyalty and to appreciate the rights of others.
5.	To understand engineer's responsibility.

UNIT	TITLE	PERIODS
I	INTRODUCTION TO MANAGEMENT AND PLANNING	9

Definition of Management, Evolution of Management – Scientific, human relations, system and contingency approaches, Managerial roles and skills, Types of Business organization, Business Environment, Functions of Management. Planning process – types of planning – objectives – policies – Strategic Management- Planning toolsfor management, Decision making steps and process.

UNIT	TITLE	PERIODS
II	ORGANIZING AND STAFFING	9

Formal and informal organization – Organization chart – types - delegation of authority – centralization and decentralization – Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management and its techniques, Career Planning.

UNIT	TITLE	PERIODS
III	DIRECTING AND CONTROLLING	9

Motivation – motivation theories – motivational techniques – leadership – types – communication – process of communication – barrier in communication – Trends for effective communication in Organization. System and process of controlling – budgetary and non-budgetary control techniques, Use of computers and IT in Management control.

UNIT	TITLE	PERIODS
IV	HUMAN VALUES IN ENGINEERING ETHICS	9

Morals, values and Ethics (Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality), Stress management, Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory
– Consensus and Controversy, Customs and Religion – Uses of Ethical Theories.

UNIT	TITLE	PERIODS
V	ENGINEERS RESPONSIBILITY, RIGHTS AND ISSUES	9

Codes of Ethics – Assessment of Safety and Risk analysis – Occupational Crime – Professional and Employee Rights – Intellectual Property Rights (IPR) – Discrimination. Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert –Code of Conduct –

Corporate

Social Responsibility.

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Study the functions and principles of management
CO2:	Understand the application of the principles in an organization.
CO3:	Create an awareness on engineering ethics and human values
CO4:	Apply moral and social values and loyalty in the organization
CO5:	Analyze the human values in engineering ethics.
CO6:	Appreciate the rights of others in the society.

REFERENCE BOOKS:	
1.	Stephen P. Robbins & Mary Coulter, “Management”, 10th Edition, Prentice Hall (India) Pvt. Ltd., 2009.
2.	JAF Stoner, Freeman R.E and Daniel R Gilbert “Management”, 6th Edition, Pearson Education, 2004.
3.	Harold Koontz & Heinz Weihrich “Essentials of management” Tata Mc Graw Hill, 1998.
4.	Tripathy PC & Reddy PN, “Principles of Management”, Tata McGraw Hill, 1999.
5.	Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi, 2003.
6.	Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.
7.	Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 2004.
8.	Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – Concepts and Cases”, Cengage Learning, 2009.

191ITC501T	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 understand the various components required to build different networks.
4.	To learn the functions of network layer and the various routing protocols.
5.	To familiarize the functions and protocols of the all the OSI layer

UNIT	TITLE	PERIODS
I	INTRODUCTION AND PHYSICAL LAYER	9

Building a Network - Network Edge and Core - Layering and Protocols - OSI Reference Model - Network Topologies - Internet Architecture - Networking Devices - Modems - Routers - Switches - Gateways.

Signal Characteristics - Data Transmission - Physical Links and Transmission Media - Signal Encoding Techniques - Channel Access Techniques - TDM - FDM.

UNIT	TITLE	PERIODS
II	DATA LINK LAYER AND LAN	9

Link Layer Services - Framing - Error Control - Media Access Control - Ethernet - CSMA/CD - FDDI - Wireless LANS - CSMA/CA.

UNIT	TITLE	PERIODS
III	NETWORK AND ROUTING	12

Circuit Switching - Packet Switching - Virtual Circuit Switching - Routing - IP - Global Address - Datagram Forwarding - Subnetting - CIDR - ARP - DHCP - ICMP - Ipv6.

UNIT	TITLE	PERIODS
IV	TRANSPORT LAYER	8

Overview of Transport Layer - UDP - TCP - Reliable Byte Stream - Connection Management - Flow Control - Retransmission - Congestion Control - Congestion Avoidance.

UNIT	TITLE	PERIODS
V	APPLICATION LAYER	7

Needs/Principles of Application Layer Protocols - Web and HTTP - FTP - Electronic Mail (SMTP - POP3 - IMAP - MIME) - DNS — SNMP.

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will learn:	
CO1:	Elaborate the concepts of Protocol layering and its functions.
CO2:	Distinguish between various physical layer communications techniques.
CO3:	Analyze the use of different Link Layer Services.
CO4:	Compare and contrast the various Routing algorithms.
CO5:	Evaluate among transport layer protocols.
CO6:	Apply the appropriate protocol in networking applications.

TEXT BOOK:	
1.	Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.

REFERENCE BOOKS:	
1.	Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
2.	James F Kurose, Keith W Ross, ǁComputer Networking - A Top-Down Approach Featuring the Internetǁ, Pearson Education, New Delhi, Sixth Edition, 2013.

191ITC502T	DATA WAREHOUSING AND DATA MINING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
Database Management System

COURSE OBJECTIVES:	
1.	To understand data warehouse concepts, architecture, business analysis and tools
2.	To understand data pre-processing and data visualization techniques
3.	To study algorithms for finding hidden and interesting patterns in data
4.	To understand and apply various classification and clustering techniques using tools.
5.	To implement various data mining algorithms on the given data set.

UNIT	TITLE	PERIODS
I	DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE ANALYTICAL PROCESSING (OLAP)	9

Basic Concepts – Data Warehousing Components – Building a Data Warehouse – Database Architectures for ParallelProcessing – Parallel DBMS Vendors – Multidimensional Data Model – Data Warehouse Schemas for Decision Support, Concept Hierarchies -Characteristics of OLAP Systems – Typical OLAP Operations, OLAP and OLTP.

UNIT	TITLE	PERIODS
II	DATA MINING – INTRODUCTION	9

Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques – Issues – applications- Data Objects and attribute types, Statistical description of data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

UNIT	TITLE	PERIODS
III	DATA MINING – FREQUENT PATTERN ANALYSIS	9

Mining Frequent Patterns, Associations and Correlations – Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel, Multi-Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns.

UNIT	TITLE	PERIODS
IV	CLASSIFICATION AND CLUSTERING	9

Decision Tree Induction – Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines –– Lazy Learners – Model Evaluation and Selection-Techniques to improve Classification Accuracy. Clustering Techniques – Cluster analysis-Partitioning Methods – Hierarchical Methods – Density Based Methods – Grid Based Methods – Evaluation of clustering – Clustering high dimensional data-Clustering with constraints, Outlier analysis-outlier detection methods.

UNIT	TITLE	PERIODS
V	WEKA TOOL	9

Datasets – Introduction, Iris plants database, Breast cancer database, Auto imports database – Introduction to WEKA,The Explorer – Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms, Association–rule learners.

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will learn:	
CO1:	Design Data warehouse for business analysis using OLAP operations.
CO2:	Choose suitable pre-processing and visualization techniques for data analysis.
CO3:	Apply association rule mining algorithm for discovering frequent pattern in transaction applications.
CO4:	Analyze the implication of classification and clustering techniques.
CO5:	Examine real time datasets using suitable data mining techniques.
CO6:	Demonstrate various data mining algorithms using WEKA Tool.

TEXT BOOK:	
1.	Jiawei Han and Micheline Kamber, —Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012.

REFERENCE BOOKS:	
1.	Alex Berson and Stephen J.Smith, —Data Warehousing, Data Mining & OLAP‖, Tata McGraw – Hill Edition, 35th Reprint 2016.
2.	Ian H.Witten and Eibe Frank, —Data mining: Practical Machine Learning Tools and Techniques, Elsevier, Second Edition.
3.	K.P. Soman, Shyam Diwakar and V. Ajay, —Insight into Data Mining Theory and Practice, Eastern Economy Edition, Prentice Hall of India, 2006.

191ITC503T	WEB TECHNOLOGY	Periods per week				Credits
		L	T	P	R	
		3	**0**	**0**	**0**	**3**

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.

UNIT	**TITLE**	**PERIODS**
I	**WEB ESSENTIALS AND HTML**	**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	**TITLE**	**PERIODS**
II	**CASCADING STYLE SHEETS AND DOM**	**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	**TITLE**	**PERIODS**
III	**SCRIPTING LANGUAGES**	**9**

Introduction to JavaScript-JavaScript Statements-Operators-Data Types-Functions ,Angular JS Basics-Expressions-Filters-Directives-Controllers- 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	**TITLE**	**PERIODS**
IV	**SERVER SIDE PROGRAMMING**	**9**

Java Servlets- Architecture -Overview-A Servlet-Generating Dynamic Content-Life Cycle- Parameter Data Sessions-JSP Technology Introduction-JSP Architecture -Running JSP Applications Basic JSP- Classes and JSP tags - Databases and JSP- Representing Web Data.

UNIT	**TITLE**	**PERIODS**
V	**XML AND WEB SERVICES**	**9**

XML-Documents -Versions and Declaration-Namespaces-Transforming XML Documents-Selecting XML Data: XPATH- XSLT-Displaying XML Documents in Browsers -Web Services: Writing a Java Web Service-Writing a Java Web Service Client- UDDI- WSDL- SOAP.

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will learn:	
CO1:	Configure the network by applying the concept of Internet and networking principles.
CO2:	Design web pages using HTML and CSS for the given requirements.
CO3:	Create dynamic web pages using DHTML and java script.
CO4:	Implement Server Side Programming using Servlets and JSP.
CO5:	Develop web pages using JSP and XML web data.
CO6:	Deploy the various web services in servers.

TEXT BOOK:	
1.	Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.

REFERENCE BOOKS:	
1.	Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" Third Edition, 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‖ Second Edition, Volume I and II, Pearson Education, 2001. 4. Bates, —Developing Web Applications, Wiley, 2006

191ITC511L	WEB TECHNOLOGY LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	**0**	**4**	**0**	**2**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To learn about client-server communication and protocols used during communication, web page creation using HTML.
2.	To design interactive web pages using Scripting languages.
3.	To learn server side programming using servlets and JSP.
4.	To develop web pages using XML/XSLT
5.	To develop web service applications.

LIST OF PROGRAMS:	
1.	Create a web page with the following using HTML. i) To embed an image map in a web page ii) To fix the hot spots. iii) how all the related information when the hot spots are clicked.
2.	Create a web page with all types of Cascading style sheets.
3.	Installation of Apache Tomcat web server
4.	Write programs in Java using Servlets: i) To invoke servlets from HTML forms. ii) Session Tracking
5.	Write programs in Java to create three-tier applications using JSP and Databases i) For conducting on-line examination. ii) For displaying student mark list. Assume that student information is available in a database which has been stored in a database server
6.	Programs using XML – Schema – XSLT/XSL.
7.	Programs using DOM and SAX parsers.
8.	Programs using AJAX.
9.	Consider a case where we have two web Services- an airline service and a travel agent and the travel agent is searching for an airline. Implement this scenario using Web Services and Data base.
10.	To develop J2EE server applications to perform arithmetic operation.
11.	Design a real time website Design (Mini Project).

	TOTAL PERIODS:	**60**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Construct Web pages using HTML/DHTML and style sheets.

CO2:	Develop the Client Server applications.
CO3:	Design applications using DOM and SAX parsers
CO4:	Build dynamic web pages using server side scripting.
CO5:	Create web service applications.
CO6:	Implement XML Transformation.

LIST OF EQUIPMENTS:	
1.	HARDWARE:
• Standalone desktops	
2.	SOFTWARE
• Dream Weaver or Equivalent, MySQL or Equivalent, Apache Server, WAMP/XAMPP	

191ITC512L	MOBILE APPLICATION DEVELOPMENT LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	**0**	**3**	**1**	**2**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
2.	To understand how to work with various mobile application development frameworks.
3.	To learn the basic and important design concepts and issues of development of mobile applications.
4.	To understand the capabilities and limitations of mobile devices.
5.	To develop real time mobile applications.

LIST OF PROGRAMS:	
1.	Develop an application that uses GUI components, Font and Colors.
2.	Develop an application that uses Layout Managers and event listeners.
3.	Write an application that draws basic graphical primitives on the screen.
4.	Develop an application that makes use of databases.
5.	Develop an application that makes use of Notification Manager.
6.	Implement an application that uses Multi-threading.
7.	Develop a native application that uses GPS location information.
8.	Implement an application that writes data to the SD card.
9.	Implement an application that creates an alert upon receiving a message.
10.	Write a mobile application that makes use of RSS feed.
11.	Develop a mobile application to send an email.
12.	Develop a Mobile application for simple needs (Mini Project)

TOTAL PERIODS:	**60**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Design GUI for mobile applications.
CO2:	Apply the multi-threading concepts in mobile applications.
CO3:	Develop applications with Event Listeners.
CO4:	Create application using Database connectivity.
CO5:	Experiment RSS Feed in mobile applications.

CO6:	Construct mobile applications to resolve real world problems

LIST OF EQUIPMENTS:	
1.	HARDWARE:
• Standalone desktops	
2.	SOFTWARE
• iOS or Equivalent Mobile Application Development Tools with appropriate emulators and debuggers.	

SYLLABUS OF

SEMESTER – VI

COURSES

191ITC601T	MOBILE COMPUTING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Understand the basic concepts of mobile computing
2.	Understand Wireless LAN, Bluetooth and Wi-Fi Technologies
3.	Be familiar with the network protocol stack
4.	Learn the basics of mobile telecommunication system and satellite systems
5.	Be exposed to Ad-Hoc networks

UNIT	TITLE	PERIODS
I	INTRODUCTION	9
Introduction to Mobile Computing – Applications of Mobile Computing- Multiplexing – MAC Protocols – SDMA-TDMA-FDMA- CDMA.		
UNIT	TITLE	PERIODS
II	MOBILE TELECOMMUNICATION SYSTEMS	9
GSM – System Architecture - Protocols – Connection Establishment – Localization and calling – Handover– Security –UMTS-4G Vision-Features and Challenges-Applications.		
UNIT	TITLE	PERIODS
III	WIRELESS LAN	9
IEEE 802.11 Standard – System Architecture – Protocol Architecture - MAC management– HIPERLAN- Blue Tooth-Wi-Max.		
UNIT	TITLE	PERIODS
IV	MOBILE NETWORK LAYER AND SATELLITE SYSTEMS	9
Mobile IP – DHCP – Mobile ad-hoc networks– Satellite systems- GEO-LEO-MEO-Routing.		
UNIT	TITLE	PERIODS
V	MOBILE TRANSPORT AND APPLICATION LAYER	9
Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WML – WMLScript.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Analyze the basic concepts of mobile computing along with its applications.

CO2:	Compare the protocols of mobile telecommunication systems in wireless network.
CO3:	Design the architecture of emerging Wireless LAN technologies using IEEE 802.11 standard.
CO4:	Evaluate the optimal routing protocols for Ad hoc networks.
CO5:	Analyze the functionality of mobile Transport and Application layer in WAP.
CO6:	Create the applications of mobile Communication systems using WML script.

TEXT BOOKS:	
1.	Jochen Schiller, —Mobile Communications‖, PHI, Second Edition, 2003.
2.	Prasant Kumar Pattnaik, Rajib Mall, —Fundamentals of Mobile Computing‖, PHI Learning Pvt.Ltd, NewDelhi — 2012

REFERENCE BOOKS:	
1.	Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
2.	Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, —Principles of Mobile Computing‖, Springer, 2003.
3.	William.C.Y.Lee,—Mobile Cellular Telecommunications-Analog and Digital Systems‖, Second Edition, Tata Mc Graw Hill Edition ,2006.
4.	C.K.Toh, —AdHoc Mobile Wireless Networks‖, First Edition, Pearson Education, 2002.
5.	Android Developers: http://developer.android.com/index.html
6.	Apple Developer: https://developer.apple.com/
7.	Windows Phone Dev Center: http://developer.windowsphone.com
8.	BlackBerry Developer: http://developer.blackberry.com

191ITC602T	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 learning
5.	Introduce the more advanced topics of AI like Expert system, agents and robotics and planning

UNIT	TITLE	PERIODS
I	INTRODUCTION	9
Introduction to Artificial Intelligence-Search-Heuristic Search-A* algorithm-Game Playing- Alpha-Beta Pruning-Inference-Rules-Forward Chaining and Backward Chaining- Genetic Algorithms.		
UNIT	TITLE	PERIODS
II	KNOWLEDGE REPRESENTATION	9
Proposition Logic - First Order Predicate Logic – Unification – Forward Chaining -Backward Chaining - Resolution – Knowledge Representation - Ontological Engineering - Categories and Objects – Events Mental Events and Mental Objects.		
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-Temporal Logic-Temporal Reasoning-Neural Networks-Neuro-fuzzy Inference- Bayes Rule and its Applications - Bayesian Networks — Exact and Approximate Inference in Bayesian Networks - Hidden Markov Models.		
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	EXPERT SYSTEMS	9
Expert systems – Architecture of expert systems, Roles of expert systems – Knowledge Acquisition –Meta knowledge, Heuristics, Types of expert systems – MYCIN, DART, XOON, Expert systems.		

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:	Develop the knowledge based expert systems based on MYCIN,DART and XCON.
CO6:	Design the real time applications using artificial intelligence (AI) concepts

TEXT BOOKS:	
1.	Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, Mc-Graw Hill- 2008.
2.	Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2007.

REFERENCE BOOKS:	
1.	Stuart Russel and Peter Norvig “AI – A Modern Approach”, 2nd Edition, Pearson Education 2007.
2.	Peter Jackson, “Introduction to Expert Systems”, 3rd Edition, Pearson Education, 2007.
3.	Deepak Khemani “Artificial Intelligence”, Tata Mc Graw Hill Education 2013.

191ITC603T	EMBEDDED SYSTEMS AND IOT APPLICATIONS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand the Architecture of PIC microprocessor.
2.	To interface microcontroller with external devices.
3.	To learn the architecture and programming of ARM processor.
4.	To become familiar with the embedded computing platform design and analysis.
5.	To understand the fundamentals of Internet of Things
6.	To build a small low-cost embedded system using Raspberry Pi.

UNIT	TITLE	PERIODS
I	INTRODUCTION TO PIC MICROCONTROLLER	9
Introduction to PIC Microcontroller–PIC 16C6x and PIC16C7x Architecture–PIC16cxx–- Pipelining -Program Memory considerations – Register File Structure - Instruction Set - Addressing modes –Simple Operations.		
UNIT	TITLE	PERIODS
II	PERIPHERALS AND INTERFACING	9
Serial EEPROM— Analog to Digital Converter–UART-Baud rate selection– LCD and keyboard Interfacing - ADC,DAC, and Sensor Interfacing.		
UNIT	TITLE	PERIODS
III	INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS	9
Complex systems and microprocessors– Embedded system design process –Design example: Model train controller-Instruction sets preliminaries - ARM Processor – CPU: programming input and output supervisor mode, exceptions and traps — Co-processors.		
UNIT	TITLE	PERIODS
IV	EMBEDDED COMPUTING PLATFORM DESIGN	9
The CPU Bus-Memory devices and systems– Components for embedded programs- Models of programs- Assembly, linking and loading — Compilation Techniques.		
UNIT	TITLE	PERIODS
V	INTRODUCTION OF IOT AND ITS APPLICATIONS	9
Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs — Case Study-Smart City.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Choose suitable architecture of the PIC and ARM Microcontroller for given applications.
CO2:	Analyze various memory and I/O interfacing techniques in terms of Baud Rate.
CO3:	Identify the architecture support of the ARM processor and analyze various types of co-processors.
CO4:	Apply system software techniques for embedded computing platforms.
CO5:	Compare the different deployment templates of IoT platforms.
CO6:	Develop a simple IoT system using Embedded Techniques.

TEXT BOOKS:	
1.	Muhammad Ali Mazidi, Danny Causey, Rolin McKinlay, —The PIC Microcontroller and Embedded Systems: Using Assembly and C, Second Edition, Pearson education, 2016.
2.	Wayne Wolf -- Computers as Components-principles of embedded computer system design, Elsevier, 2008.
3.	Peatman, J.B., “Design with PIC Micro Controllers” PearsonEducation,3rd Edition, 2004.

REFERENCE BOOKS:	
1.	Shibu K.V, —Introduction to Embedded Systems‖, McGraw Hill.2014
2.	Jonathan W.Valvano, —Embedded Microcomputer Systems Real Time Interfacing‖, Third Edition Cengage Learning, 2012
3.	Raj Kamal, —Embedded Systems-Architecture, Programming and Design‖, 3 edition,TMH.2015
4.	Lyla, —Embedded Systems‖, Pearson, 2013 6. David E. Simon, —An Embedded Software Primer‖, Pearson Education, 2000.
5.	ArshdeepBahga, Vijay Madisetti, —Internet of Things – A hands-on approach‖, Universities Press, 2015
6.	Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things‖, Springer, 2011.

191ITC611L	NETWORKS LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	0	4	0	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 PROGRAMS:	
1.	Study of Network Components
2.	Study of Basic Network Commands and Network Configuration Commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and traceroute PDUs using a network protocol analyzer and examine.
3.	The following experiments are to be implement I. Simple Chat Program using TCP Sockets II. Sliding Window Protocol using TCP Sockets III. File Transfer
4.	Study of Wireshark and Cisco Packet Tracer Tools.
5.	Tracing of TCP and UDP Connection using Wireshark
6.	Write a code simulating ARP /RARP protocols
7.	Simulation of Congestion Control Algorithms using Simulator Tool.
8.	Simulation of Distance Vector/ Link State Routing algorithm.
9.	Simulation of TCP Performance using Simulator Tool
10.	Simulation of UDP Performance using Simulator Tool
11.	Implement an IPv6 Addressing, Subnetted IPv6 Addressing Scheme using Simulator.
12.	Configure VLANs, Trunks and Switch. Simulate the following scenario using Cisco Packet Tracer, configure a LAN network, with 5 Switches and 5 VLANs also make sure that a VLAN cannot ping on another VLAN.
13.	Performance Comparison of Routing Protocols Such as RIP, OSPF and BGP using Simulator Tool.

TOTAL PERIODS:	60

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Distinguish the basic network commands and components.

CO2:	Create Socket programing for network applications.
CO3:	Evaluate the performance of different transport layer protocols using Wireshark tool.
CO4:	Simulate various routing algorithms and visualize the data flow.
CO5:	Configure IPV6 addressing using network simulator.
CO6:	Construct VLAN architecture for real time networking scenario.

LIST OF EQUIPMENTS:

1.	HARDWARE:
	• Standalone desktops
2.	SOFTWARE
	• C / C++ / Java / Python / Equivalent Compiler • Network simulator like NS2/Glomosim/OPNET/ Packet Tracer/Packet Sniffer / Equivalent.

191ITC612L	EMBEDDED SYSTEMS AND IOT LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	0	3	1	2

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Learn the working of ARM processor
2.	Understand the Building Blocks of Embedded Systems
3.	Learn the concept of memory map and memory interface
4.	Know the characteristics of Real Time Systems
5.	Write programs to interface memory, I/O s with processor.
6.	Study the performance of interrupts.

LIST OF PROGRAMS:	
1.	Study of PIC microcontroller system.
2.	Study of ARM microcontroller system
3.	Toggle all the led to port and with some time delay using ARM7
4.	Interfacing analog to digital converter with ARM processor
5.	Interface LED and PWM and to verify the output in the ARM7
6.	Interfacing Real Time clock and Serial port.
7.	Interfacing Keyboard and LCD.
8.	Interrupt performance characteristics of ARM and FPGA.
9.	Interfacing Stepper motor and Temperature sensor.
10.	Turn an LED on and off with Arduino.
11.	Read a switch, print the state out to the Arduino Serial Monitor
12.	Read an analog input and print the voltage to the Arduino Serial Monitor.
13.	Detect knocks with a Piezo element sensor.
14.	Study and implementation of IoT using Arduino/Raspberry pi.
15.	Mini Projects using embedded system and IoT.

TOTAL PERIODS:	60

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Design applications using ARM processor.
CO2:	Implement programs for memory interface with ARM processor.

CO3:	Interface A/D and D/A convertors with ARM system.
CO4:	Analyze the impact of interrupts on system performance.
CO5:	Develop programs for hardware interfacing with Arduino.
CO6:	Formulate a mini project using embedded system and IoT.

LIST OF EQUIPMENTS:

1.	HARDWARE:
• Embedded trainer kits with ARM board • Adequate quantities of Hardware, software and consumables.	
2.	SOFTWARE
• Arduino IDE • KEIL • FLASHMAGIC	

191LEH612L	COMMUNICATION SKILLS LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	0	2	0	1

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Develop communicative competence in English.
2.	Enhance the Employability and Career Skills of students.
3.	Orient the students towards grooming as a professional

UNIT	TITLE	PERIODS
I		
Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Time Management—Stress Management-Leadership Traits-Role play-IELTS-TOEFL-Civil Services-Verbal Ability.		
UNIT	TITLE	PERIODS
II		
Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – Listening to TED Talks-Watchingdocumentaries/YouTube videos.		
UNIT	TITLE	PERIODS
III		
Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic – questioning and clarifying –GD strategies- activities to improve GD skills -Ethical Dilemmas.		
UNIT	TITLE	PERIODS
IV		
Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview &panel interview Mock Interview-Emotional Intelligence-Intercultural Communication-Critical and Creative Thinking.		
UNIT	TITLE	PERIODS
V		
Recognizing differences between groups and teams- managing time-managing stress- networking professionally-respecting social protocols-understanding career management-developing a long-term career plan-making career changes-Writing Statement of Purpose (SOP).		

TOTAL PERIODS:	30

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Make effective presentations
CO2:	Participate confidently in Group Discussions.
CO3:	Attend job interviews and be successful in them.

CO4:	Develop adequate Soft Skills required for the workplace.
CO5:	Take international examinations like IELTS,TOEFL.
CO6:	Write Statement of Purpose.

REFERENCE BOOKS:	
1.	Butterfield, Jeff. Soft Skills for Everyone. Cengage Learning: New Delhi, 2015
2.	E. Suresh Kumar et al., Communication for Professional Success. Orient Blackswan: Hyderabad, 2015
3.	Dr.Dhanavel.S.P. English and Soft Skills. Orient BlackSwan, 2010
4.	International English Language Testing System Practice Tests, Cambridge University Press

LIST OF EQUIPMENTS:

HARDWARE:

1. Server 1 No.
2. Client Systems.
3. Handicam 1 No.
4. Television 1 No.
5. Collar mike 1 No.
6. Amplifier 1 No.
7. DVD player 1 No.
8. LCD Projector with MP3/CD/DVD provision for Audio/video facility 1 No.

SOFTWARE

- Open Source Software

SYLLABUS OF

SEMESTER – VII

COURSES

191ITC701T	CRYPTOGRAPHY AND NETWORK SECURITY	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Learn basic principles of cryptography, network and information security.
2.	Acquire fundamental knowledge on the concepts of finite fields and number theory.
3.	Understand various block cipher and stream cipher models.
4.	Understand the principles of public key cryptosystems, hash functions and digital signature
5.	Introduce the practices of cryptography and network security technology.

UNIT	TITLE	PERIODS
I	BASICS OF SECURITY	8
Overview: Security Concepts - OSI security architecture-Attacks, Services, Mechanisms-Network security model-Classical Encryption techniques -Symmetric cipher model, Substitution Techniques, Transposition techniques, Rotor machine, Steganography.		
UNIT	TITLE	PERIODS
II	FINITE FIELDS, NUMBER THEORY AND BLOCK CIPHERS	10
Divisibility and Division Algorithm-Euclidean Algorithm-Modular Arithmetic–Prime numbers-Fermat's and Euler's theorem-Testing for primality -The Chinese remainder theorem. Block ciphers: Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES.		
UNIT	TITLE	PERIODS
III	PUBLIC KEY CRYPTOGRAPHY AND HASH FUNCTION	9
Public key cryptography: Principles of public key cryptosystems-The RSA algorithm-Key management - Diffie Hellman Key exchange -Elliptic curve arithmetic-Elliptic curve cryptography. Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC –MD5 - SHA - HMAC – CMAC.		
UNIT	TITLE	PERIODS
IV	DIGITAL SIGNATURES SYSTEM AND EMAIL SECURITY	9
Digital signature and authentication protocols – EI Gamal – Schnorr. Authentication applications – Kerberos – X.509 Authentication services –Types of Firewalls – Intruder – Intrusion detection system – Virus and related threats – Countermeasures –– Trusted systems – Practical implementation of cryptography and security. E-mail Security: Pretty Good Privacy-S/MIME.		
UNIT	TITLE	PERIODS
V	IP, CLOUD AND WEB SECURITY	9
IPSecurity: Overview of IPSec - IP and IPv6-Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchanges – Cloud Security Risks and Counter Measures. Web Security: SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSLAttacks fixed in v3- Exportability-Encoding-Secure Electronic		

Transaction (SET).

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Design various encryption and decryption algorithm to improve network security.
CO2:	Categorize various security vulnerabilities in computer networks.
CO3:	Apply encryption/key exchange algorithms to provide secure communication for real time applications.
CO4:	Examine different authentication and digital signature schemes in cryptography.
CO5:	Analyze various security issues in network, transport and application layers.
CO6:	Deploy different security algorithms in real time applications.

TEXT BOOKS:	
1.	Charlie Kaufman, Radia Perlman and Mike Speciner, “Network Security”, Prentice Hall of India, 2002.
2.	William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013.

REFERENCE BOOKS:	
1.	Behrouz A. Ferouzan, “Cryptography & Network Security”, Tata Mc Graw Hill, 2007.
2.	Bruce Schneier and Neils Ferguson, “Practical Cryptography”, First Edition, Wiley Dreamtech
3.	Charles Pfleeger, “Security in Computing”, 4th Edition, Prentice Hall of India, 2006.
4.	Charlie Kaufman and Radia Perlman, Mike Speciner, “Network Security, Second Edition, Private Communication in Public World”, PHI 2002.
5.	Douglas R Simson “Cryptography – Theory and practice”, First Edition, CRC Press, 1995.
6.	Man Young Rhee, “Internet Security: Cryptographic Principles”, “Algorithms and Protocols”, Wiley Publications, 2003.
7.	Ulysess Black, “Internet Security Protocols”, Pearson Education Asia, 2000.
8.	http://nptel.ac.in/.

191ITC711L	SECURITY LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	0	4	0	2

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Be exposed to the different cipher techniques.
2.	Learn to implement the algorithms DES, AES, RSA, and SHA-1.
3.	Understand authentications scheme using Digital signature algorithm.
4.	Use network security tools and vulnerability assessment tools.
5.	To implement code for various authentication algorithms.

LIST OF PROGRAMS:	
1.	Perform encryption, decryption using the following substitution techniques (i) Ceaser cipher, (ii) playfair cipher iii) Hill Cipher iv) Vigenere cipher
2.	Perform encryption and decryption using following transposition techniques (i) Rail fence (ii) row & Column Transformation
3.	Apply DES algorithm for practical applications.
4.	Apply AES algorithm for practical applications.
5.	Implement RSA Algorithm using practical applications.
6.	Implement the Diffie-Hellman Key Exchange algorithm for a given problem.
7.	Calculate the message digest of a text using the SHA-1 algorithm.
8.	Implement the SIGNATURE SCHEME – Digital Signature Standard.
9.	Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG).
10.	Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w.
11.	Automated Attack and Penetration Tools Exploring N-Stalker, a Vulnerability Assessment Tool.
12.	Defeating Malware (i) Building Trojans (ii) Rootkit Hunter
13.	Setup a honey pot and monitor the honeypot on network (KF Sensor)

TOTAL PERIODS:	60

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Build code for classical Encryption Techniques to solve the real time problems.
CO2:	Model cryptosystems by applying symmetric and Asymmetric algorithms.
CO3:	Design Secure communication system by using various public key cryptography algorithms.

CO4:	Construct code for authentication algorithms to improve security.
CO5:	Apply various open source tools to create network security system.
CO6:	Develop a signature scheme using Digital signature standard.

LIST OF EQUIPMENTS:	
1.	HARDWARE:
•	Standalone desktops
2.	SOFTWARE
•	JDK Toolkit/ Turbo C

EASWARI ENGINERING COLLEGE

(Autonomous)

Bharathi Salai, Ramapuram, Chennai-89

Department of Information Technology

Verticals for B. Tech – IT (R2019 v21)

Vertical III	Vertical VII
IT	**IT**
CLOUD COMPUTING AND DATA CENTER TECHNOLOGIES	**EMERGING TECHNOLOGIES II**
191ITE013T: Cloud Computing	**191CCE015J:** Ethical Hacking
191ITE023J: Virtualization	**191ITE027J:** Multimedia and Animation
191CSE032J: Cloud Services Management	**191CSE042J:** UI and UX Design
191ITE043J: Data Engineering in Cloud	**191ITE047J:** Digital Marketing
191ITE053T: Storage Technologies	**191CAE084J:** Ethics and AI
191ITE063J: Software Defined Networks	**191AIE061J:** Image and Video Analytics
191ITE073J: Stream Processing	**191AIE071J:** Computer Vision
191ITE083J: Security and Privacy in Cloud	**191ITE083J:** Security and Privacy in Cloud

SYLLABUS OF

Vertical III – Cloud Computingand Data Center Technologies

COURSES

191ITE013T	CLOUD COMPUTING	Periods per week				Credits
		L	T	P	R	
		3	**0**	**0**	**0**	**3**

COURSE OBJECTIVES:	
1.	To understand the principles of cloud architecture, models and infrastructure
2.	To understand the concepts of virtualization and virtual machines.
3.	To gain knowledge about virtualization Infrastructure.
4.	To explore and experiment with various Cloud deployment environments
5.	To learn about the security issues in the cloud environment.

UNIT	**TITLE**	**PERIODS**
I	**CLOUD ARCHITECTURE MODELS AND INFRASTRUCTURE**	**9**
Cloud Architecture: System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture – Cloud deployment models – Cloud service models; Cloud Infrastructure: Architectural Design of Compute and Storage Clouds – Design Challenges-Elasticity in Cloud – On-demand Provisioning.		
UNIT	**TITLE**	**PERIODS**
II	**CLOUD ENABLING TECHNOLOGIES**	**9**
Service Oriented Architecture – REST and Systems of Systems- Web Services – Basics of Virtualization- Virtual Machine Basics – Taxonomy of Virtual Machines – Hypervisor – Key Concepts – Virtualization structure – Implementation levels of virtualization – Virtualization Types: Full Virtualization – Para Virtualization – Hardware Virtualization**.**		
UNIT	**TITLE**	**PERIODS**
III	**VIRTUALIZATION INFRASTRUCTURE AND DOCKER**	**9**
Virtualization of CPU, Memory and I/O devices, Desktop Virtualization – Network Virtualization – Storage Virtualization– Application Virtualization – Virtual clusters -Containers vs. Virtual Machines – Introduction to Docker – Docker Components – Docker Container – Docker Images and Repositories.		
UNIT	**TITLE**	**PERIODS**
IV	**RESOURCE MANAGEMENT & DEPLOYMENT ENVIRONMENT**	**9**
Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods Hadoop – MapReduce -Google App Engine – Amazon AWS; Cloud Software Environments – Eucalyptus – OpenStack.		
UNIT	**TITLE**	**PERIODS**

V	CLOUD SECURITY	9
Cloud Security Challenges-Virtualization System-Specific Attacks: Guest hopping – VM migration attack – hyper jacking. Data Security and Storage; Identity and Access Management (IAM) - IAM Challenges - IAM Architecture and Practice-Federation in the Cloud – Four Levels of Federation- Federated Services and Applications.		

	45 PERIODS

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Understand the Cloud Architecture and design challenges in the cloud.
CO2:	Apply the concept of virtualization and its types.
CO3:	Experiment with virtualization of hardware resources and Docker.
CO4:	Develop and deploy services on the cloud and set up a cloud environment
CO5:	Explain security challenges in the cloud environment.

TEXT BOOKS:	
1.	Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012
2.	James Turnbull, “The Docker Book”, O’Reilly Publishers, 2014.
3.	Krutz, R. L., Vines, R. D, “Cloud security. A Comprehensive Guide to SecureCloud Computing”, Wiley Publishing, 2010.

REFERENCE BOOKS:	
1.	James E. Smith, Ravi Nair, “Virtual Machines: Versatile Platforms for Systemsand Processes”, Elsevier/Morgan Kaufmann, 2005.
2.	Tim Mather, Subra Kumaraswamy, and Shahed Latif, “Cloud Security and Privacy: anenterprise perspective on risks and compliance”, O’Reilly Media, Inc.,2009.

191ITE023J	VIRTUALIZATION	Periods per week				Credits
		L	T	P	R	
		2	0	2	0	3

COURSE OBJECTIVES:	
1.	To Learn the basics and types of Virtualization
2.	To understand the Hypervisors and its types
3.	To Explore the Virtualization Solutions
4.	To Experiment the virtualization platforms

UNIT	TITLE	PERIODS
I	INTRODUCTION TO VIRTUALIZATION	6
Virtualization and cloud computing - Need of virtualization — cost, administration, fast deployment, reduce infrastructure cost — limitations- Types of hardware virtualization: Fullvirtualization - partial virtualization - Paravirtualization-Types of Hypervisors.		
UNIT	TITLE	PERIODS
II	SERVER AND DESKTOP VIRTUALIZATION	6
Virtual machine basics- Types of virtual machines- Understanding Server Virtualization- typesof server virtualization- Business Cases for Server Virtualization — Uses of Virtual Server Consolidation — Selecting Server Virtualization Platform-Desktop Virtualization-Types of Desktop Virtualization		
UNIT	TITLE	PERIODS
III	NETWORK VIRTUALIZATION	6
Introduction to Network Virtualization-Advantages- Functions-Tools for Network Virtualization-VLAN-WAN Architecture-WAN Virtualization		
UNIT	TITLE	PERIODS
IV	STORAGE VIRTUALIZATION	6
Memory Virtualization-Types of Storage Virtualization-Block, File-Address space Remapping-Risks of Storage Virtualization-SAN-NAS-RAID		
UNIT	TITLE	PERIODS
V	VIRTUALIZATION TOOLS	6
VMWare-Amazon AWS-Microsoft HyperV- Oracle VM Virtual Box - IBM PowerVM- Google Virtualization-Case study.		

	30 PERIODS

PRACTICAL EXCERCISE		30 PERIODS
1.	Create type 2 virtualization in VMWARE or any equivalent Open Source Tool. Allocate memory and storage space as per requirement. Install Guest OS on that VMWAR	
2.	a. Shrink and extend virtual disk b. Create, Manage, Configure and schedule snapshots c. Create Spanned, Mirrored and Striped volume d. Create RAID 5 volume	
3.	a. Desktop Virtualization using VNC b. Desktop Virtualization using Chrome Remote Desktop	
4.	Create type 2 virtualization on ESXI 6.5 server	
5.	Create a VLAN in CISCO packet tracer	
6.	Install KVM in Linux	
7.	Create Nested Virtual Machine(VM under another VM)	
	TOTAL	**60 PERIODS**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Analyse the virtualization concepts and Hypervisor
CO2:	Apply the Virtualization for real-world applications
CO3:	Install & Configure the different VM platforms
CO4:	Experiment with the VM with various software

TEXT BOOKS:	
1.	Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter,TATA McGraw- Hill , New Delhi — 2010
2.	Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011
3.	David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach
4.	Chris Wolf, Erick M. Halter, “Virtualization: From the Desktop to the Enterprise”, APress,2005.
5.	James E. Smith, Ravi Nair, “Virtual Machines: Versatile Platforms for Systems and Processes”, Elsevier/Morgan Kaufmann, 2005.
6.	David Marshall, Wade A. Reynolds, “Advanced Server Virtualization: VMware andMicrosoft Platform in the Virtual Data Center”, Auerbach Publications, 2006.

191CSE032J	CLOUD SERVICES MANAGEMENT	Periods perweek				Credits
		L	T	P	R	
		2	**0**	**2**	**0**	**3**

COURSE OBJECTIVES:	
1.	Introduce Cloud Service Management terminology, definition & concepts
2.	Compare and contrast cloud service management with traditional IT service management
3.	Identify strategies to reduce risk and eliminate issues associated with adoption of cloud services
4.	Select appropriate structures for designing, deploying and running cloud-based services in a business environment
5.	Illustrate the benefits and drive the adoption of cloud-based services to solve real world problems

UNIT	**TITLE**	**PERIODS**
I	**CLOUD SERVICE MANAGEMENT FUNDAMENTALS**	**6**
Cloud Ecosystem, The Essential Characteristics, Basics of Information Technology Service Management and Cloud Service Management, Service Perspectives, Cloud Service Models,Cloud Service Deployment Models		
UNIT	**TITLE**	**PERIODS**
II	**CLOUD SERVICES STRATEGY**	**6**
Cloud Strategy Fundamentals, Cloud Strategy Management Framework, Cloud Policy, Key Driver for Adoption, Risk Management, IT Capacity and Utilization, Demand and Capacitymatching, Demand Queueing, Change Management, Cloud Service Architecture		
UNIT	**TITLE**	**PERIODS**
III	**CLOUD SERVICE MANAGEMENT**	**6**
Cloud Service Reference Model, Cloud Service LifeCycle, Basics of Cloud Service Design, Dealing with Legacy Systems and Services, Benchmarking of Cloud Services, Cloud Service Capacity Planning, Cloud Service Deployment and Migration, Cloud Marketplace, CloudService Operations Management.		
UNIT	**TITLE**	**PERIODS**
IV	**CLOUD SERVICE ECONOMICS**	**6**
Pricing models for Cloud Services, Freemium, Pay Per Reservation, Pay per User, Subscription based Charging, Procurement of Cloud-based Services, Capex vs Opex Shift,Cloud service Charging, Cloud Cost Models		

UNIT	TITLE	PERIODS
V	CLOUD SERVICE GOVERNANCE & VALUE	6
IT Governance Definition, Cloud Governance Definition, Cloud Governance Framework, CloudGovernance Structure, Cloud Governance Considerations, Cloud Service Model Risk Matrix, Understanding Value of Cloud Services, Measuring the value of Cloud Services, Balanced Scorecard, Total Cost of Ownership		

	30 PERIODS

PRACTICAL EXCERCISE		30 PERIODS
1.	Create a Cloud Organization in AWS/Google Cloud/or any equivalent Open Source cloudsoftware's like Open stack, Eucalyptus, Open Nebula with Role-based access control	
2.	Create a Cost-model for a web application using various services and do Cost-Benefit analysis	
3.	Create alerts for usage of Cloud resources	
4.	Create Billing alerts for your Cloud Organization	
5.	Compare Cloud cost for a simple web application across AWS, Azure andGCP and suggest the best one	
TOTAL:		60 PERIODS

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Exhibit cloud-design skills to build and automate business solutions using cloud technologies.
CO2:	Possess Strong theoretical foundation leading to excellence and excitement towards adoption of cloud-based services
CO3:	Solve the real world problems using Cloud services and technologies

TEXT BOOKS:	
1.	Cloud Service Management and Governance: Smart Service Management inCloud Era by Enamul Haque, Enel Publications
2.	Cloud Computing: Concepts, Technology & Architecture by Thomas Erl,Ricardo Puttini, Zaigham Mohammad 2013
3.	Cloud Computing Design Patterns by Thomas Erl, Robert Cope, Amin Naserpour.

REFERENCE BOOKS:	
1.	Economics of Cloud Computing by Praveen Ayyappa, LAP Lambert Academic Publishing
2.	Mastering Cloud Computing Foundations and Applications Programming Rajkumar Buyya,Christian Vechhiola, S. Thamarai Selvi

191ITE043J	DATA ENGINEERING IN CLOUD	Periods per week				Credits
		L	T	P	R	
		2	**0**	**2**	**0**	**3**

COURSE OBJECTIVES:	
1.	Understand the foundation of a database and its architecture.
2.	Learn about the undercurrents of the data engineering lifecycle, which are key foundations that support all data engineering efforts.
3.	Understand Operational source system patterns and the significant types of source systems.
4.	Knowing the use case of the data and the way to retrieve it in the future.
5.	Understand Google cloud platform and working of cloud composer.

UNIT	**TITLE**	**PERIODS**
1	**FOUNDATION OF DATA ENGINEERING**	**6**
What Is Data Engineering- Life Cycle-Evolution-Data engineering skill and activities-Data Maturity-Business Responsibility-Technical Roles		
UNIT	**TITLE**	**PERIODS**
2	**THE DATA ENGINEERING LIFECYCLE**	**6**
Stages of Life Cycle-Major Undercurrents Across the Data Engineering Lifecycle-Data architecture definitions-Principles-Major architecture Concepts-Distributed Systems, Scalability, and Designing for Failure		
UNIT	**TITLE**	**PERIODS**
3	**DATA GENERATION IN SOURCE SYSTEMS**	**6**
Source of Data-Source systems-Files and unstructured data-API-Application Data base-OLAP-Major considerations for understanding database technologies-Data Sharing-Third Party Data Source-Message Queues and Event		
UNIT	**TITLE**	**PERIODS**
4	**BIG DATA CAPABILITY IN CLOUD**	**6**
ELT Concept-process multiple files using map reduce-On Demand nature of cloud-introduction to GCP console-GCP cloud shell-GCP services –GCP server less services-service mapping and prioritization- IAM tool		
UNIT	**TITLE**	**PERIODS**
5	**BUILDING A DATAWAREHOUSE IN BIG QUERY**	**6**
Introduction to Google cloud storage and big query-big query console-pre requisites-developing a data warehouse-cloud composer-working of airflow.		

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Apply the data engineering lifecycle to design and build a robust architecture
CO2:	Assess a wide range of requirements and apply relevant database techniques to create a robust architecture
CO3:	Apply the proper storage solutions for data architecture in real time.
CO4:	Analyze data engineering problems using an end-to-end framework of best practices
CO5:	Build data warehouse in big query for real time applications.

LAB EXCERCISE		30 PERIODS
1.	Installing and configuring Apache NiFi & Air flow	
2.	Installing and configuring Elasticsearch & Kibana	
3.	Installing and configuring PostgreSQL & Installing pgAdmin	
4.	Reading and writing CSVs using pandas DataFrames	
5.	Inserting and extracting relational data in Python	
6.	Inserting data into PostgreSQL	
7.	Inserting and extracting NoSQL database data in Python	
8.	Inserting data into Elasticsearch	
9.	Build data pipeline orchestration using cloud composer	
10.	Building a data lake on dataproc cluster.	
TOTAL:		**60 PERIODS**

TEXT BOOKS:	
1.	Joe Reis and Matt Housley ,"Fundamentals of Data Engineering Plan and Build Robust Data Systems "O'Reilly Media Inc, 2022,First Edition.
2.	Adi Wijaya,"Data Engineering with Google Cloud Platform" Packet publicating Ltd ,2022,First edition.

REFERENCE BOOKS:	
1.	Paul Crickard" Data Engineering with Python" O'Reilly Media Inc, 2020.

191ITE053T	STORAGE TECHNOLOGIES	Periods perweek				Credits
		L	T	P	R	
		3	**0**	**0**	**0**	**3**

COURSE OBJECTIVES:	
1.	Characterize the functionalities of logical and physical components of storage
2.	Describe various storage networking technologies
3.	Identify different storage virtualization technologies
4.	Discuss the different backup and recovery strategies
5.	Understand common storage management activities and solutions

UNIT	**TITLE**	**PERIODS**
I	**STORAGE SYSTEMS**	**9**
Introduction to Information Storage: Digital data and its types, Information storage, Key characteristics of data center and Evolution of computing platforms. Information Lifecycle Management. Third Platform Technologies: Cloud computing and its essential characteristics,Cloud services and cloud deployment models, Big data analytics, Social networking and mobilecomputing, Characteristics of third platform infrastructure and Imperatives for third platform transformation. Data Center Environment: Building blocks of a data center, Compute systems and compute virtualization and Software-defined data center.		
UNIT	**TITLE**	**PERIODS**
II	**INTELLIGENT STORAGE SYSTEMS AND RAID**	**5**
Components of an intelligent storage system, Components, addressing, and performance of hard disk drives and solid-state drives, RAID, Types of intelligent storage systems, Scale-up and scale- out storage Architecture.		
UNIT	**TITLE**	**PERIODS**
III	**STORAGE NETWORKING TECHNOLOGIESAND VIRTUALIZATION**	**13**
Block-Based Storage System, File-Based Storage System, Object-Based and Unified Storage.Fibre Channel SAN: Software-defined networking, FC SAN components and architecture, FC SAN topologies, link aggregation, and zoning, Virtualization in FC SAN environment. Internet Protocol SAN: iSCSI protocol, network components, and connectivity, Link aggregation, switchaggregation, and VLAN, FCIP protocol,		

connectivity, and configuration. Fibre Channel over Ethernet SAN: Components of FCoE SAN,FCoE SAN connectivity, Converged Enhanced Ethernet, FCoE architecture.		
UNIT	**TITLE**	**PERIODS**
IV	**BACKUP, ARCHIVE AND REPLICATION**	**12**
Introduction to Business Continuity, Backup architecture, Backup targets and methods, Data deduplication, Cloud-based and mobile device backup, Data archive, Uses of replication and its characteristics, Compute based, storage-based, and network-based replication, Data migration, NDisaster Recovery as a Service (DRaaS).		
UNIT	**TITLE**	**PERIODS**
V	**SECURING STORAGE INFRASTRUCTURE**	**6**
Information security goals, Storage security domains, Threats to a storage infrastructure, Security controls to protect a storage infrastructure, Governance, risk, and compliance, Storageinfrastructure management functions, Storage infrastructure management processes.		

TOTAL:	**45 PERIODS**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Demonstrate the fundamentals of information storage management and variousmodels of Cloud infrastructure services and deployment
CO2:	Illustrate the usage of advanced intelligent storage systems and RAID
CO3:	Interpret various storage networking architectures - SAN, including storagesubsystems and virtualization
CO4:	Examine the different role in providing disaster recovery and remote replicationtechnologies
CO5:	Infer the security needs and security measures to be employed in informationstorage management

TEXT BOOKS:	
1.	EMC Corporation, Information Storage and Management, Wiley, India
2.	Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel and Libor Miklas,Introduction to Storage Area Networks,Ninth Edition, IBM - Redbooks, December 2017
3.	Ulf Troppens, Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, NilsHaustein ,Storage Networks Explained, Second Edition, Wiley, 2009.

		Periods per week				Credits
		L	T	P	R	
191ITE063J	**SOFTWARE DEFINED NETWORKS**	**2**	**0**	**2**	**0**	**3**

COURSE OBJECTIVES:	
1.	To understand the need for SDN and its data plane operations
2.	To understand the functions of control plane
3.	To comprehend the migration of networking functions to SDN environment
4.	To explore various techniques of network function virtualization
5.	To comprehend the concepts behind network virtualization

UNIT	**TITLE**	**PERIODS**
I	**SDN: INTRODUCTION**	6
Evolving Network Requirements – The SDN Approach – SDN architecture - SDN Data Plane ,Control plane and Application Plane		
UNIT	**TITLE**	**PERIODS**
II	**SDN DATA PLANE AND CONTROL PLANE**	6
Data Plane functions and protocols - OpenFLow Protocol - Flow Table - Control Plane Functions - Southbound Interface, Northbound Interface — SDN Controllers - Ryu, OpenDaylight, ONOS - Distributed Controllers		
UNIT	**TITLE**	**PERIODS**
III	**SDN APPLICATIONS**	6
SDN Application Plane Architecture – Network Services Abstraction Layer – Traffic Engineering – Measurement and Monitoring – Security – Data Center Networking		
UNIT	**TITLE**	**PERIODS**
IV	**NETWORK FUNCTION VIRTUALIZATION**	6
Network Virtualization - Virtual LANs – OpenFlow VLAN Support - NFV Concepts – Benefitsand Requirements – Reference Architecture		
UNIT	**TITLE**	**PERIODS**
V	**NFV FUNCTIONALITY**	6
NFV Infrastructure – Virtualized Network Functions – NFV Management and Orchestration –		

NFV Use cases – SDN and NFV	
	30 PERIODS

PRACTICAL EXCERCISE		**30 PERIODS**
1.	Setup your own virtual SDN lab I. Virtualbox/Mininet Environment for SDN - http://mininet.org II. https://www.kathara.org III. GNS3	
2.	Create a simple mininet topology with SDN controller and use Wireshark to captureand visualize the OpenFlow messages such as OpenFlow FLOW MOD, PACKET IN, PACKET OUT etc.	
3.	Create a SDN application that uses the Northbound API to program flow table rules on the switch for various use cases like L2 learning switch, Traffic Engineering, Firewall etc	
4.	Create a simple end-to-end network service with two VNFs using vim-emu	
5.	Install OSM and onboard and orchestrate network service.	
TOTAL		**60 PERIODS**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Describe the motivation behind SDN
CO2:	Identify the functions of the data plane and control plane
CO3:	Design and develop network applications using SDN
CO4:	Orchestrate network services using NFV
CO5:	Explain various use cases of SDN and NFV

TEXT BOOKS:	
1.	William Stallings, “Foundations of Modern Networking: SDN, NFV, QoE, IoT and Cloud”,Pearson Education, 1st Edition, 2015.

REFERENCE BOOKS:	
1.	Ken Gray, Thomas D. Nadeau, “Network Function Virtualization”, Morgan Kauffman, 2016.
2.	Thomas D Nadeau, Ken Gray, “SDN: Software Defined Networks”, O’Reilly Media, 2013.
3.	Fei Hu, “Network Innovation through OpenFlow and SDN: Principles and Design”, 1stEdition, CRC Press, 2014
4.	Paul Goransson, Chuck Black Timothy Culver, “Software Defined Networks: A Comprehensive Approach”, 2nd Edition, Morgan Kaufmann Press, 2016.
5.	Oswald Coker, Siamak Azodolmolky, “Software-Defined Networking with OpenFlow”, 2ndEdition, O’Reilly Media, 2017.

191ITE073J	STREAM PROCESSING	Periods perweek				Credits
		L	T	P	R	
		2	**0**	**2**	**0**	**3**

COURSE OBJECTIVES:	
1.	Introduce Data Processing terminology, definition & concepts
2.	Define different types of Data Processing
3.	Explain the concepts of Real-time Data processing
4.	Select appropriate structures for designing and running real-time data services in abusiness environment
5.	Illustrate the benefits and drive the adoption of real-time data services to solve real worldproblems

UNIT	**TITLE**	**PERIODS**
I	**FOUNDATIONS OF DATA SYSTEMS**	**6**
Introduction to Data Processing, Stages of Data processing, Data Analytics, Batch Processing,Stream processing, Data Migration, Transactional Data processing, Data Mining, Data Management Strategy, Storage, Processing, Integration, Analytics, Benefits of Data as a Service, Challenges.		
UNIT	**TITLE**	**PERIODS**
II	**REAL-TIME DATA PROCESSING**	**6**
Introduction to Big data, Big data infrastructure, Real-time Analytics, Near real-time solution, Lambda architecture, Kappa Architecture, Stream Processing,Understanding Data Streams, Message Broker, Stream Processor, Batch & Real-time ETL tools, Streaming Data Storage.		
UNIT	**TITLE**	**PERIODS**
III	**DATA MODELS AND QUERY LANGUAGES**	**6**
Relational Model, Document Model, Key-Value Pairs, NoSQL, Object-Relational Mismatch, Many- to-One and Many-to-Many Relationships, Network data models, Schema Flexibility, Structured Query Language, Data Locality for Queries, Declarative Queries, Graph Data models, Cypher Query Language, Graph Queries in SQL, The Semantic Web, CODASYL, SPARQL.		
UNIT	**TITLE**	**PERIODS**

IV	EVENT PROCESSING WITH APACHE KAFKA	6
Apache Kafka, Kafka as Event Streaming platform, Events, Producers, Consumers, Topics, Partitions, Brokers, Kafka APIs, Admin API, Producer API, Consumer API, Kafka Streams API,Kafka Connect API.		
UNIT	**TITLE**	**PERIODS**
V	**REAL-TIME PROCESSING USING SPARK STREAMING**	**6**
Structured Streaming, Basic Concepts, Handling Event-time and Late Data, Fault-tolerant Semantics, Exactly-once Semantics, Creating Streaming Datasets, Schema Inference, Partitioning of Streaming datasets, Operations on Streaming Data, Selection, Aggregation, Projection, Watermarking, Window operations, Types of Time windows, Join Operations, Deduplication.		

	30 PERIODS

PRACTICAL EXCERCISE		**30 PERIODS**
1.	Install MongoDB	
2.	Design and Implement Simple application using MongoDB	
3.	Query the designed system using MongoDB	
4.	Create a Event Stream with Apache Kafka	
5.	Create a Real-time Stream processing application using Spark Streaming	
6.	Build a Micro-batch application	
7.	Real-time Fraud and Anomaly Detection,	
8.	Real-time personalization, Marketing, Advertising	
TOTAL		**60 PERIODS**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Understand the applicability and utility of different streaming algorithms.
CO2:	Describe and apply current research trends in data-stream processing.
CO3:	Analyze the suitability of stream mining algorithms for data stream systems
CO4:	Program and build stream processing systems, services and applications.
CO5:	Solve problems in real-world applications that process data streams.

TEXT BOOKS:	
1.	Streaming Systems: The What, Where, When and How of Large-Scale Data Processingby Tyler Akidau, Slava Chemyak, Reuven Lax, O'Reilly publication
2.	Designing Data-Intensive Applications by Martin Kleppmann, O'Reilly Media
3.	Practical Real-time Data Processing and Analytics : Distributed Computing andEvent Processing using Apache Spark, Flink, Storm and Kafka, Packt Publishing

REFERENCE BOOKS:	
1.	https://spark.apache.org/docs/latest/streaming-programming-guide.html
2.	Kafka.apache.org

191ITE083J	SECURITY AND PRIVACY IN CLOUD	Periods perweek				Credits
		L	T	P	R	
		2	**0**	**2**	**0**	**3**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To Introduce Cloud Computing terminology, definition & concepts
2.	To understand the security design and architectural considerations for Cloud
3.	To understand the Identity, Access control in Cloud
4.	To follow best practices for Cloud security using various design patterns
5.	To be able to monitor and audit cloud applications for security

UNIT	**TITLE**	**PERIODS**
I	**FUNDAMENTALS OF CLOUD SECURITY CONCEPTS**	**7**
Overview of cloud security- Security Services - Confidentiality, Integrity, Authentication, Non- repudiation, Access Control - Basic of cryptography - Conventional and public-key cryptography, hash functions, authentication, and digital signatures.		
UNIT	**TITLE**	**PERIODS**
II	**SECURITY DESIGN AND ARCHITECTURE FOR CLOUD**	**6**
Security design principles for Cloud Computing - Comprehensive data protection - End-to-endaccess control - Common attack vectors and threats - Network and Storage - Secure IsolationStrategies - Virtualization strategies - Inter-tenant network segmentation strategies — Data Protection strategies: Data retention, deletion and archiving procedures for tenant data,Encryption, Data Redaction, Tokenization, Obfuscation, PKI and Key		
UNIT	**TITLE**	**PERIODS**
III	**ACCESS CONTROL AND IDENTITY MANAGEMENT**	**6**
Access control requirements for Cloud infrastructure - User Identification - Authentication and Authorization - Roles-based Access Control - Multi-factor authentication - Single Sign-on, Identity Federation - Identity providers and service consumers - Storage and network access control options - OS Hardening and minimization - Verified and measured boot – Intruder Detection and prevention		
UNIT	**TITLE**	**PERIODS**
IV	**CLOUD SECURITY DESIGN PATTERNS**	**6**

Introduction to Design Patterns, Cloud bursting, Geo-tagging, Secure Cloud Interfaces, CloudResource Access Control, Secure On-Premise Internet Access, Secure External Cloud		
UNIT	**TITLE**	**PERIODS**
V	**MONITORING, AUDITING AND MANAGEMENT**	**5**
Proactive activity monitoring - Incident Response, Monitoring for unauthorized access, malicious traffic, abuse of system privileges - Events and alerts - Auditing — Record generation,Reporting and Management, Tamper-proofing audit logs, Quality of Services, Secure Management, User management, Identity management, Security Information and Event Management		
		30 PERIODS

PRACTICAL EXCERCISE	**30 PERIODS**
1.	Simulate a cloud scenario using Cloud Sim and run a scheduling algorithm not present in CloudSim
2.	Simulate resource management using cloud sim
3.	simulate log forensics using cloud sim
4.	simulate a secure file sharing using a cloud sim
5.	Implement data anonymization techniques over the simple dataset (masking, k-anonymization, etc)
6.	Implement any encryption algorithm to protect the images
7.	Implement any image obfuscation mechanism
8.	Implement a role-based access control mechanism in a specific scenario
9.	implement an attribute-based access control mechanism based on a particular scenario
10.	Develop a log monitoring system with incident management in the cloud
TOTAL	**60 PERIODS**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Understand the cloud concepts and fundamentals
CO2:	Explain the security challenges in the cloud.
CO3:	Define cloud policy and Identity and Access Management.
CO4:	Understand various risks and audit and monitoring mechanisms in the cloud.
CO5:	Define the various architectural and design considerations for security in the cloud.

TEXT BOOKS:	
1.	Raj Kumar Buyya , James Broberg, andrzejGoscinski, —Cloud Computing:‖, Wiley 2013
2.	Dave shackleford, —Virtualization Security‖, SYBEX a wiley Brand 2013.

REFERENCE BOOKS:	
1.	Mark C. Chu-Carroll —Code in the Cloud‖,CRC Press, 2011
2.	Mastering Cloud Computing Foundations and Applications Programming RajkumarBuyya,Christian Vechhiola, S. ThamaraiSelvi

SYLLABUS OF

Vertical VII – EmergingTechnologies II

COURSES

		Periods perweek				
		L	T	P	R	Credits
191CCE015J	**ETHICAL HACKING**	**2**	**0**	**2**	**0**	**3**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand the basics of computer based vulnerabilities
2.	To explore different foot printing, reconnaissance and scanning methods
3.	To expose the enumeration and vulnerability analysis methods
4.	To understand hacking options available in Web and wireless applications.
5.	To explore the options for network protection
6.	To practice tools to perform ethical hacking to expose the vulnerabilities.

UNIT	**TITLE**	**PERIODS**
I	**INTRODUCTION**	**6**
Ethical Hacking Overview - Role of Security and Penetration Testers .- Penetration-Testing Methodologies- Laws of the Land - Overview of TCP/IP- The Application Layer - The TransportLayer - The Internet Layer - IP Addressing .- Network and Computer Attacks - Malware - Protecting Against Malware Attacks.- Intruder Attacks - Addressing Physical Security		
UNIT	**TITLE**	**PERIODS**
II	**FOOT PRINTING, RECONNAISSANCE AND SCANNING NETWORKS**	**6**
Foot printing Concepts – Foot printing through Search Engines, Web Services, Social Networking Sites, Website, Email - Competitive Intelligence – Foot printing through Social Engineering – Foot printing Tools - Network Scanning Concepts - Port-Scanning Tools - Scanning Techniques - Scanning Beyond IDS and Firewall		
UNIT	**TITLE**	**PERIODS**
III	**ENUMERATION AND VULNERABILITY ANALYSIS**	**6**
Enumeration Concepts - NetBIOS Enumeration — SNMP, LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts - Desktop and Server OS Vulnerabilities - Windows OS Vulnerabilities - Tools for Identifying Vulnerabilities in Windows- Linux OS Vulnerabilities- Vulnerabilities of Embedded Oss		
UNIT	**TITLE**	**PERIODS**
IV	**SYSTEM HACKING**	**6**

Hacking Web Servers - Web Application Components- Vulnerabilities - Tools for Web Attackersand Security Testers Hacking Wireless Networks - Components of a Wireless Network — Wardriving- Wireless Hacking - Tools of the Trade		
UNIT	**TITLE**	**PERIODS**
V	**NETWORK PROTECTION SYSTEMS**	**6**
Access Control Lists - Cisco Adaptive Security Appliance Firewall - Configuration and Risk Analysis Tools for Firewalls and Routers - Intrusion Detection and Prevention Systems - Network- Based and Host-Based IDSs and IPSs - Web Filtering - Security Incident Response Teams – Honeypots.		
		30 PERIODS

PRACTICAL EXCERCISE		**30 PERIODS**
1.	Install Kali or Backtrack Linux / Metasploitable/ Windows XP	
2.	Practice the basics of reconnaissance.	
3.	Using FOCA / Search Diggity tools, extract metadata and expanding the target	
4.	Aggregates information from public databases using online free tools likePaterva's Maltego	
5.	Information gathering using tools like Robtex	
6.	Scan the target using tools like Nessus.	
7.	View and capture network traffic using Wireshark	
8.	Automate dig for vulnerabilities and match exploits using Armitage FOCA : http://www.informatica64.com/foca.aspx. Nessus : http://www.tenable.com/products/nessus. Wireshark : http://www.wireshark.org. Armitage : http://www.fastandeasyhacking.com/. Kali or Backtrack Linux, Metasploitable, Windows XP	
TOTAL		**60 PERIODS**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Express knowledge on basics of computer based vulnerabilities
CO2:	Gain understanding on different foot printing, reconnaissance and scanningmethods.
CO3:	Demonstrate the enumeration and vulnerability analysis methods
CO4:	Gain knowledge on hacking options available in Web and wireless applications
CO5:	Acquire knowledge on the options for network protection
CO6:	To use tools to perform ethical hacking to expose the vulnerabilities

TEXT BOOKS:	
1.	Michael T. Simpson, Kent Backman, and James E. Corley, Hands-On Ethical Hacking and Network Defense, Course Technology,Delmar Cengage Learning, 2010.
2.	The Basics of Hacking and Penetration Testing - Patrick Engebretson, SYNGRESS,Elsevier, 2013.
3.	The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, DafyddStuttard and Marcus Pinto, 2011.

REFERENCE BOOKS:	
1.	Black Hat Python: Python Programming for Hackers and Pentesters, JustinSeitz , 2014.

191ITE027J	MULTIMEDIA AND ANIMATION	Periods perweek				Credits
		L	T	P	R	
		2	0	2	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To grasp the fundamental knowledge of Multimedia elements and systems
2.	To get familiar with Multimedia file formats and standards
3.	To learn the process of Authoring multimedia presentations
4.	To learn the techniques of animation in 2D and 3D and for the mobile UI
5.	To explore different popular applications of multimedia

UNIT	TITLE	PERIODS
I	INTRODUCTION TO MULTIMEDIA	6
Definitions, Elements, Multimedia Hardware and Software, Distributed multimedia systems, challenges: security, sharing / distribution, storage, retrieval, processing, computing.Multimedia metadata, Multimedia databases, Hypermedia, Multimedia Learning		
UNIT	TITLE	PERIODS
II	MULTIMEDIA FILE FORMATS AND STANDARDS	6
File formats – Text, Image file formats, Graphic and animation file formats, Digital audio andVideo file formats, Color in image and video, Color Models. Multimedia data and file formats forthe web.		
UNIT	TITLE	PERIODS
III	MULTIMEDIA AUTHORING	6
Authoring metaphors, Tools Features and Types: Card and Page Based Tools, Icon andObject Based Tools, Time Based Tools, Cross Platform Authoring Tools, Editing Tools, Painting and Drawing Tools, 3D Modeling and Animation Tools, Image Editing Tools, audio Editing Tools, Digital Movie Tools, Creating interactive presentations, virtual Learning ,simulations.		
UNIT	TITLE	PERIODS
IV	ANIMATION	7
Principles of animation: staging, squash and stretch, timing, onion skinning, secondary action, 2D,2 ½ D, and 3D animation, Animation techniques: Keyframe, Morphing, Inverse Kinematics, Hand Drawn, Character rigging, vector animation, stop motion, motion graphics, Fluid Simulation, skeletal animation, skinning Virtual Reality, Augmented Reality.		

UNIT	TITLE	PERIODS
V	**MULTIMEDIA APPLICATIONS**	**5**
Multimedia Big data computing, social networks, smart phones, surveillance, Analytics, Multimedia Cloud Computing, Multimedia streaming cloud, media on demand, security and forensics, Online social networking, multimedia ontology, Content based retrieval from digital libraries.		

	30 PERIODS

PRACTICAL EXCERCISE		**30 PERIODS**
1.	Working with Image Editing tools: Install tools like GIMP/ InkScape / Krita / Pencil and perform editing operations: • Usedifferent selection and transform tools to modify or improve an image • Create logos and banners for home pages of websites	
2.	Working with Audio Editing tools: • Install tools like, Audacity / Ardour for audio editing, sound mixing and specialeffects like fade- in or fade-out etc., • Perform audio compression by choosing a proper codec	
3.	Working with Video Editing and conversion tools: Install tools like OpenShot / Cinelerra / HandBrake for editing video content. • Edit and mix video content, remove noise, create special effects, add captions. • Compress and convert video file format to other popular formats.	
4.	Working with web/mobile authoring tools: Adapt / KompoZer/ BlueGriffon / BlueFish / Aptana Studio/ NetBeans / WordPress /Expression Web: • Design simple Home page with banners, logos, tables quick links etc • Provide a search interface and simple navigation from the home page to the insidepages of the website. • Design Responsive web pages for use on both web and mobile interfaces	
5.	Working with Animation tools: Install tools like, Krita, Wick Editor, Blender: • Perform a simple 2D animation withsprites • Perform simple 3D animation with keyframes, kinematics • Working with Mobile UI animation tools: Origami studio / Lottie / Framer etc.,	
6.	Working with E-Learning authoring tools: Install tools like EdApp / Moovly / CourseLab/ IsEazy and CamStudio/Ampache, VideoLAN: • Demonstrate screen recording and further editing for e-learning content. • Create a simple E-Learning module for a topic of your choice	
7.	Creating VR and AR applications: • Any affordable VR viewer like Google Cardboard and any development platform	

	like Openspace 3D / ARCore etc. Note: all tools listed are open source. Usage of any proprietary tools in place of open source tools is not restricted.
TOTAL:	**60 PERIODS**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Get the bigger picture of the context of Multimedia and its applications
CO2:	Use the different types of media elements of different formats on content pages
CO3:	Author 2D and 3D creative and interactive presentations for different target multimediaapplications
CO4:	Use different standard animation techniques for 2D, 21/2 D, 3D applications
CO5:	Understand the complexity of multimedia applications in the context ofcloud, security,bigdata streaming, social networking, CBIR etc.,

TEXT BOOKS:	
1.	Ze-Nian Li, Mark S. Drew, Jiangchuan Liu, Fundamentals of Multimedia", Third Edition, Springer Texts in Computer Science, 2021. (UNIT-I, II, III)

REFERENCE BOOKS:	
1.	John M Blain, The Complete Guide to Blender Graphics: Computer Modeling &Animation, CRC press, 3rd Edition, 2016
2.	Gerald Friedland, Ramesh Jain, "Multimedia Computing", Cambridge University Press,2018.
3.	Prabhat K.Andleigh, Kiran Thakrar, "Multimedia System Design", Pearson Education, 1st Edition, 2015.
4.	Mohsen Amini Salehi, Xiangbo Li, "Multimedia Cloud Computing Systems", SpringerNature, 1st Edition, 2021.
5.	Mark Gaimbruno, "3D Graphics and Animation", Second Edition, New Riders, 2002.
6.	Rogers David, "Animation: Master – A Complete Guide (GraphicsSeries)", Charles RiverMedia, 2006.
7.	Rick parent, "Computer Animation: Algorithms and Techniques", Morgan Kauffman, 3rd Edition, 2012.
8.	Emilio Rodriguez Martinez, Mireia Alegre Ruiz, "UI Animations with Lottie and After Effects: Create, render, and ship stunning After Effects animations natively on mobile with React Native", Packt Publishing, 2022.

191CSE042J	UI AND UX DESIGN	Periods perweek				Credits
		L	T	P	R	
		2	**0**	**2**	**0**	**3**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To provide a sound knowledge in UI & UX
2.	To understand the need for UI and UX
3.	To understand the various Research Methods used in Design
4.	To explore the various Tools used in UI & UX
5.	Creating a wireframe and prototype

UNIT	**TITLE**	**PERIODS**
I	**FOUNDATIONS OF DESIGN**	**6**
UI vs. UX Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy		
UNIT	**TITLE**	**PERIODS**
II	**FOUNDATIONS OF UI DESIGN**	**6**
Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles —Branding - Style Guides		
UNIT	**TITLE**	**PERIODS**
III	**FOUNDATIONS OF UX DESIGN**	**5**
Introduction to User Experience - Why You Should Care about User Experience - Understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know about Business Goals		
UNIT	**TITLE**	**PERIODS**
IV	**WIREFRAMING, PROTOTYPING AND TESTING**	**7**
Sketching Principles - Sketching Red Routes - Responsive Design — Wire framing - Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools- Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings - Prototype Iteration		

UNIT	TITLE	PERIODS
V	**RESEARCH, DESIGNING, IDEATING, & INFORMATIONARCHITECTURE**	**6**
Identifying and Writing Problem Statements - Identifying Appropriate ResearchMethods – Creating Personas - Solution Ideation - Creating User Stories – Creating Scenarios - Flow Diagrams - Flow Mapping - Information Architecture		
		30 PERIODS

PRACTICAL EXCERCISE		**30 PERIODS**
1.	Designing a Responsive layout for an societal application	
2.	Exploring various UI Interaction Patterns	
3.	Developing an interface with proper UI Style Guides	
4.	Developing Wireflow diagram for application using open source software	
5.	Exploring various open source collaborative interface Platform	
6.	Hands on Design Thinking Process for a new product	
7.	Brainstorming feature for proposed product	
8.	Defining the Look and Feel of the new Project	
9.	Create a Sample Pattern Library for that product (Mood board, Fonts,Colors based on UI principles)	
10.	Identify a customer problem to solve	
11.	Conduct end-to-end user research - User research, creating personas, Ideation process (User stories Scenarios), Flow diagrams, Flow Mapping	
12.	Sketch, design with popular tool and build a prototype and performusability testing and identify improvements	
TOTAL		**60 PERIODS**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Build UI for user Applications
CO2:	Evaluate UX design of any product or application
CO3:	Demonstrate UX Skills in product development
CO4:	Implement Sketching principles
CO5:	Create Wireframe and Prototype

TEXT BOOKS:	
1.	Joel Marsh, “UX for Beginners”, O’Reilly , 2022
2.	Jon Yablonski, “Laws of UX using Psychology to Design BetterProduct & Services” O’Reilly2021

REFERENCE BOOKS:	
1.	Jenifer Tidwell, Charles Brewer, Aynne Valencia, “Designing Interface” 3 rd Edition ,O’Reilly 2020
2.	Steve Schoger, Adam Wathan “Refactoring UI”, 2018
3.	Steve Krug, “Don't Make Me Think, Revisited: A Commonsense Approach to Web &Mobile”, Third Edition,2015.
4.	. https://www.nngroup.com/articles/
5.	. https://www.interaction-design.org/literature.

191ITE047J	DIGITAL MARKETING	Periods perweek				Credits
		L	T	P	R	
		2	**0**	**2**	**0**	**3**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	The primary objective of this module is to examine and explore the role and importance of digital marketing in today's rapidly changing business environment.
2.	It also focuses on how digital marketing can be utilized by organizations and how itseffectiveness can be measured

UNIT	**TITLE**	**PERIODS**
I	**INTRODUCTION TO ONLINE MARKET**	**6**
Online Market space- Digital Marketing Strategy- Components - Opportunities for buildingBrand Website - Planning and Creation - Content Marketing		
UNIT	**TITLE**	**PERIODS**
II	**SEARCH ENGINE OPTIMISATION**	**6**
Search Engine optimisation - Keyword Strategy- SEO Strategy - SEO success factors -On-Page Techniques - Off-Page Techniques. Search Engine Marketing- How Search Engine works- SEM components- PPC advertising -Display Advertisement		
UNIT	**TITLE**	**PERIODS**
III	**E- MAIL MARKETING**	**6**
E- Mail Marketing - Types of E- Mail Marketing - Email Automation - Lead Generation - Integrating Email with Social Media and Mobile- Measuring and maximizing email campaign effectiveness. Mobile Marketing- Mobile Inventory/channels- Location based; Context based; Coupons and offers, Mobile Apps, Mobile Commerce, SMS Campaigns-Profiling and targeting		
UNIT	**TITLE**	**PERIODS**
IV	**SOCIAL MEDIA MARKETING**	**6**
Social Media Marketing - Social Media Channels- Leveraging Social media for brand conversations and buzz. Successful /benchmark Social media campaigns.EngagementMarketing- Building Customer relationships - Creating Loyalty drivers - Influencer Marketing		
UNIT	**TITLE**	**PERIODS**
V	**DIGITAL TRANSFORMATION**	**6**
Digital Transformation & Channel Attribution- Analytics- Ad-words, Email, Mobile, Social Media, Web Analytics - Changing your strategy based on analysis- Recent trends in Digital marketing.		

	30 PERIODS

PRACTICAL EXCERCISE		30 PERIODS
1.	Subscribe to a weekly/quarterly newsletter and analyze how its content and structure aidwith the branding of the company and how it aids its potential customer segments.	
2.	Perform keyword search for a skincare hospital website based on search volume andcompetition using Google keyword planner tool.	
3.	Demonstrate how to use the Google WebMasters Indexing API	
4.	Discuss an interesting case study regarding how an insurance company manages leads.	
5.	Discuss negative and positive impacts and ethical implications of using social media for political advertising	
6.	Discuss how Predictive analytics is impacting marketing automation	
TOTAL:		60 PERIODS

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Examine and explore the role and importance of digital marketing in today'srapidly changing business environment..
CO2:	Focuses on how digital marketing can be utilized by organizations and how itseffectiveness can be measured
CO3:	Know the key elements of a digital marketing strategy.
CO4:	Study how the effectiveness of a digital marketing campaign can be measured
CO5:	Demonstrate advanced practical skills in common digital marketing tools such as SEO,SEM, Social media and Blogs.

TEXT BOOKS:	
1.	Fundamentals of Digital Marketing by Puneet Singh Bhatia;Publisher: PearsonEducation
2.	First edition (July 2017);ISBN-10: 933258737X;ISBN-13: 978-9332587373
3.	Digital Marketing by Vandana Ahuja ;Publisher: Oxford University Press(April 2015). ISBN-10: 0199455449.
4.	Marketing 4.0: Moving from Traditional to Digital by Philip Kotler; Publisher: Wiley;1st edition (April 2017); ISBN10: 9788126566938;ISBN 13: 9788126566938;ASIN: 8126566930
5.	Ryan, D. (2014). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited.
6.	Barker, Barker, Bormann and Neher(2017), Social Media Marketing: A Strategic Approach, 2E South-Western ,Cengage Learning.
7.	Pulizzi,J Beginner's Guide to Digital Marketing , Mcgraw Hill Education

191CAE084J	ETHICS AND AI	Periods perweek				Credits
		L	T	P	R	
		2	**0**	**2**	**0**	**3**

COURSE OBJECTIVES:	
1.	Study the morality and ethics in AI
2.	Learn ae Ethical initiatives in the field of artificial intelligence
3.	Study about AI standards and Regulations
4.	Study about social and ethical issues of Robot Ethics
5.	Study about AI and Ethics- challenges and opportunities

UNIT	**TITLE**	**PERIODS**
I	**INTRODUCTION**	6
Definition of morality and ethics in AI-Impact on society-Impact on human psychology-Impacton the legal system-Impact on the environment and the planet-Impact on trust		
UNIT	**TITLE**	**PERIODS**
II	**ETHICAL INITIATIVES IN AI**	6
International ethical initiatives-Ethical harms and concerns-Case study: healthcare robots,Autonomous Vehicles , Warfare and weaponization.		
UNIT	**TITLE**	**PERIODS**
III	**AI STANDARDS AND REGULATION**	6
Model Process for Addressing Ethical Concerns During System Design - Transparency of Autonomous Systems-Data Privacy Process- Algorithmic Bias Considerations - Ontological Standard for Ethically Driven Robotics and Automation Systems		
UNIT	**TITLE**	**PERIODS**
IV	**ROBOETHICS: SOCIAL AND ETHICAL IMPLICATION OF ROBOTICS**	6
Robot-Roboethics- Ethics and Morality- Moral Theories-Ethics in Science and Technology - Ethical Issues in an ICT Society- Harmonization of Principles- Ethics and ProfessionalResponsibility- Roboethics Taxonomy**.**		
UNIT	**TITLE**	**PERIODS**
V	**AI AND ETHICS- CHALLENGES AND OPPORTUNITIES**	6
Challenges - Opportunities- ethical issues in artificial intelligence- Societal Issues Concerning the Application of Artificial Intelligence in Medicine - decision-making role in industries-National and International Strategies on AI.		

	30 PERIODS

PRACTICAL EXCERCISE		30 PERIODS
1.	Recent case study of ethical initiatives in healthcare, autonomous vehicles and defense	
2.	Exploratory data analysis on a 2 variable linear regression model	
3.	Experiment the regression model without a bias and with bias	
4.	Classification of a dataset from UCI repository using a perceptron with and without bias	
5.	Case study on ontology where ethics is at stake	
6.	Identification on optimization in AI affecting ethics	
TOTAL:		60 PERIODS

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Learn about morality and ethics in AI
CO2:	Acquire the knowledge of real time application ethics, issues and its challenges.
CO3:	Understand the ethical harms and ethical initiatives in AI
CO4:	Learn about AI standards and Regulations like AI Agent, Safe Design of Autonomous andSemi-Autonomous Systems
CO5:	Understand the concepts of Roboethics and Morality with professional responsibilities
CO6:	Learn about the societal issues in AI with National and International Strategies on AI

TEXT BOOKS:	
1.	y. Eleanor Bird, Jasmin Fox-Skelly, Nicola Jenner, Ruth Larbey, Emma Weitkamp and Alan Winfield ,"The ethics of artificial intelligence: Issues and initiatives", EPRS | European Parliamentary Research Service Scientific Foresight Unit (STOA) PE 634.452 – March 2020
2.	Patrick Lin, Keith Abney, George A Bekey," Robot Ethics: The Ethical and Social Implicationsof Robotics", The MIT Press- January 2014

REFERENCE BOOKS:	
1.	Towards a Code of Ethics for Artificial Intelligence (Artificial Intelligence: Foundations, Theory, and Algorithms) by Paula Boddington, November 2017
2.	Mark Coeckelbergh," AI Ethics", The MIT Press Essential Knowledge series, April 2020
3.	https://sci-hub.mksa.top/10.1007/978-3-540-30301-5_65
4.	https://www.scu.edu/ethics/all-about-ethics/artificial-intelligence-and-ethics-sixteenchallenges-and-opportunities/
5.	https://www.weforum.org/agenda/2016/10/top-10-ethical-issues-in-artificial-intelligence/
6.	. https://www.weforum.org/agenda/2016/10/top-10-ethical-issues-in-artificial-intelligence/

191AIE061J	IMAGE AND VIDEO ANALYTICS	Periods per week				Credits
		L	T	P	R	
		2	**0**	**2**	**0**	**3**

COURSE OBJECTIVES:	
1.	To understand the basics of image processing techniques for computer vision.
2.	To learn the techniques used for image pre-processing
3.	To discuss the various object detection techniques.
4.	To understand the various Object recognition mechanisms.
5.	To elaborate on the video analytics techniques.

UNIT	**TITLE**	**PERIODS**
I	**INTRODUCTION**	**6**
Computer Vision – Image representation and image analysis tasks - Image representations – digitization – properties – color images – Data structures for Image Analysis - Levels of image data representation - Traditional and Hierarchical image data structures		
UNIT	**TITLE**	**PERIODS**
II	**IMAGE PRE-PROCESSING**	**7**
Local pre-processing - Image smoothing - Edge detectors - Zero-crossings of the second derivative - Scale in image processing - Canny edge detection - Parametric edge models – Edges in multi-speralct images - Local pre-processing in the frequency domain - Line detection by local pre-processing operators - Image restoration		
UNIT	**TITLE**	**PERIODS**
III	**OBJECT DETECTION USING MACHINE LEARNING**	**5**
Object detection– Object detection methods – Deep Learning framework for Object detection– bounding box approach-Intersection over Union (IoU) –Deep Learning Architectures-R-CNN- Faster R-CNN-You Only Look Once(YOLO)-Salient features-Loss Functions-YOLO architectures		
UNIT	**TITLE**	**PERIODS**
IV	**FACE RECOGNITION AND GESTURE RECOGNITION**	**6**
Face Recognition-Introduction-Applications of Face Recognition-Process of Face Recognition- DeepFace solution by Facebook-FaceNet for Face Recognition- Implementation using FaceNet- Gesture Recognition		

UNIT	**TITLE**	**PERIODS**
V	**VIDEO ANALYTICS**	**6**
Video Processing – use cases of video analytics-Vanishing Gradient and exploding gradient problem-RestNet architecture-RestNet and skip connections-Inception Network-GoogleNet architecture-Improvement in Inception v2-Video analytics-RestNet and Inception v3.		

	30 PERIODS

LAB EXCERCISE		**30 PERIODS**
1.	Write a program that computes the T-pyramid of an image	
2.	Write a program that derives the quad tree representation of an image using thehomogeneity criterion of equal intensity	
3.	Develop programs for the following geometric transforms: (a) Rotation (b) Change of scale (c) Skewing (d) Affine transform calculated from three pairs of corresponding points(e)Bilinear transform calculated from four pairs of corresponding points.	
4.	Develop a program to implement Object Detection and Recognition	
5.	Develop a program for motion analysis using moving edges, and apply it to your image sequences	
6.	Develop a program for Facial Detection and Recognition	
7.	Write a program for event detection in video surveillance system	
TOTAL:		**60 PERIODS**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Understand the basics of image processing techniques for computer vision and videoanalysis.
CO2:	Explain the techniques used for image pre-processing.
CO3:	Develop various object detection techniques
CO4:	Understand the various face recognition mechanisms
CO5:	Elaborate on deep learning-based video analytics.

TEXT BOOKS:	
1.	Milan Sonka, Vaclav Hlavac, Roger Boyle, “Image Processing, Analysis, and MachineVision”, 4nd edition, Thomson Learning, 2013.
2.	Vaibhav Verdhan,(2021, Computer Vision Using Deep Learning Neural Network Architectures with Python and Keras,Apress 2021(UNIT-III,IV and V)

REFERENCE BOOKS:	
1.	Richard Szeliski, “Computer Vision: Algorithms and Applications”,Springer Verlag London Limited,2011.
2.	Caifeng Shan, FatihPorikli, Tao Xiang, Shaogang Gong, “VideoAnalytics for Business Intelligence”, Springer, 2012.
3.	A. Forsyth, J. Ponce, “Computer Vision: A Modern Approach”, Pearson Education,2003.
4.	E. R. Davies, (2012), “Computer & Machine Vision”, Fourth Edition, Academic Press.

191AIE071J	COMPUTER VISION	Periods per week				Credits
		L	T	P	R	
		2	0	2	0	3

COURSE OBJECTIVES:	
1.	To understand the fundamental concepts related to Image formation and processing
2.	To learn feature detection, matching and detection
3.	To become familiar with feature based alignment and motion estimation
4.	To develop skills on 3D reconstruction
5.	To understand image based rendering and recognition

UNIT	TITLE	PERIODS
I	INTRODUCTION TO IMAGE FORMATION AND PROCESSING	6
Computer Vision - Geometric primitives and transformations - Photometric image formation - The digital camera - Point operators - Linear filtering - More neighborhood operators - Fourier transforms - Pyramids and wavelets - Geometric transformations - Global optimization		
UNIT	TITLE	PERIODS
II	FEATURE DETECTION, MATCHING AND SEGMENTATION	6
Points and patches - Edges - Lines - Segmentation - Active contours - Split and merge -Meanshift and mode finding - Normalized cuts - Graph cuts and energy-based methods.		
UNIT	TITLE	PERIODS
III	FEATURE-BASED ALIGNMENT & MOTION ESTIMATION	5
2D and 3D feature-based alignment - Pose estimation - Geometric intrinsic calibration - Triangulation - Two-frame structure from motion - Factorization - Bundle adjustment – Constrained structure and motion - Translational alignment - Parametric motion - Spline-basedmotion - Optical flow - Layered motion.		
UNIT	TITLE	PERIODS
IV	3D RECONSTRUCTION	7
Shape from X - Active range finding - Surface representations - Point-based representations-		
Volumetric representations - Model-based reconstruction - Recovering texture maps andalbedosos.		
UNIT	TITLE	PERIODS
V	IMAGE-BASED RENDERING AND RECOGNITION	6
View interpolation Layered depth images - Light fields and Lumigraphs - Environment mattes -Video-based rendering-Object detection - Face recognition - Instance recognition - Category recognition - Context and scene understanding- Recognition databases and test sets		

	30 PERIODS

PRACTICAL EXCERCISE		**30 PERIODS**
Software needed: OpenCV computer vision Library for OpenCV in Python / PyCharm or C++ / Visual Studio or or equivalent		
1.	OpenCV Installation and working with Python	
2.	Basic Image Processing - loading images, Cropping, Resizing, Thresholding,Contour analysis, Bolb detection.	
3.	Image Annotation – Drawing lines, text circle, rectangle, ellipse on images	
4.	Image Enhancement - Understanding Color spaces, color space conversion, Histogram equialization, Convolution, Image smoothing, Gradients, Edge Detection	
5.	Image Features and Image Alignment – Image transforms – Fourier, Hough, Extract ORB Image features, Feature matching, cloning, Feature matching based image alignment	
6.	Image segmentation using Graphcut / Grabcut	
7.	Camera Calibration with circular grid	
8.	Pose Estimation	
9.	3D Reconstruction – Creating Depth map from stereo images	
10.	Object Detection and Tracking using Kalman Filter, Camshift	
1. docs.opencv.org 2. https://opencv.org/opencv-free-course/		
TOTAL:		**60 PERIODS**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Understand basic knowledge, theories and methods in image processing and computervision
CO2:	Implement basic and some advanced image processing techniques inOpenCV.
CO3:	Apply 2D a feature-based based image alignment, segmentation and motionestimations
CO4:	Apply 3D image reconstruction techniques
CO5:	Design and develop innovative image processing and computer visionapplications.

TEXT BOOKS:	
1.	Richard Szeliski, “Computer Vision: Algorithms and Applications”,Springer- Texts inComputer Science, Second Edition, 2022.
2.	Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education,Second Edition, 2015.

REFERENCE BOOKS:

1.	Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision,Second Edition, Cambridge University Press,March 2004.
2.	Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer,2006
3.	E. R. Davies, Computer and Machine Vision, Fourth Edition, Academic Press,2012.

191ITE083J	SECURITY AND PRIVACY IN CLOUD	Periods perweek				Credits
		L	T	P	R	
		2	**0**	**2**	**0**	**3**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To Introduce Cloud Computing terminology, definition & concepts
2.	To understand the security design and architectural considerations for Cloud
3.	To understand the Identity, Access control in Cloud.
4.	To follow best practices for Cloud security using various design patterns
5.	To be able to monitor and audit cloud applications for security

UNIT	**TITLE**	**PERIODS**
I	**FUNDAMENTALS OF CLOUD SECURITY CONCEPTS**	**7**
Overview of cloud security- Security Services - Confidentiality, Integrity, Authentication, Non- repudiation, Access Control - Basic of cryptography - Conventional and public-key cryptography, hash functions, authentication, and digital signatures		
UNIT	**TITLE**	**PERIODS**
II	**SECURITY DESIGN AND ARCHITECTURE FOR CLOUD**	**6**
Security design principles for Cloud Computing - Comprehensive data protection - End-to-endaccess control - Common attack vectors and threats - Network and Storage - Secure IsolationStrategies - Virtualization strategies - Inter-tenant network segmentation strategies — Data Protection strategies: Data retention, deletion and archiving procedures for tenant data, Encryption, Data Redaction, Tokenization, Obfuscation, PKI and Key		
UNIT	**TITLE**	**PERIODS**
III	**ACCESS CONTROL AND IDENTITY MANAGEMENT**	**6**
Access control requirements for Cloud infrastructure - User Identification - Authentication and Authorization - Roles-based Access Control - Multi-factor authentication - Single Sign-on, Identity Federation - Identity providers and service consumers - Storage and network access control options - OS Hardening and minimization - Verified and measured boot – Intruder Detection and prevention		
UNIT	**TITLE**	**PERIODS**
IV	**CLOUD SECURITY DESIGN PATTERNS**	**6**

Introduction to Design Patterns, Cloud bursting, Geo-tagging, Secure Cloud Interfaces, CloudResource Access Control, Secure On-Premise Internet Access, Secure External Cloud		
UNIT	**TITLE**	**PERIODS**
V	**MONITORING, AUDITING AND MANAGEMENT**	**5**
Proactive activity monitoring - Incident Response, Monitoring for unauthorized access, malicious traffic, abuse of system privileges - Events and alerts - Auditing — Record generation,Reporting and Management, Tamper-proofing audit logs, Quality of Services, Secure Management, User management, Identity management, Security Information and Event Management		
		30 PERIODS

PRACTICAL EXCERCISE		**30 PERIODS**
1.	Simulate a cloud scenario using Cloud Sim and run a scheduling algorithm not present in CloudSim	
2.	Simulate resource management using cloud sim	
3.	simulate log forensics using cloud sim	
4.	simulate a secure file sharing using a cloud sim	
5.	Implement data anonymization techniques over the simple dataset (masking, k-anonymization, etc)	
6.	Implement any encryption algorithm to protect the images	
7.	Implement any image obfuscation mechanism	
8.	Implement a role-based access control mechanism in a specific scenario	
9.	Implement an attribute-based access control mechanism based on a particular scenario	
10	Develop a log monitoring system with incident management in the cloud	
TOTAL:		**60 PERIODS**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Understand the cloud concepts and fundamentals
CO2:	Explain the security challenges in the cloud.
CO3:	Define cloud policy and Identity and Access Management.
CO4:	Understand various risks and audit and monitoring mechanisms in the cloud.
CO5:	Define the various architectural and design considerations for security in the cloud.

TEXT BOOKS:	
1.	Raj Kumar Buyya , James Broberg, and rzejGoscinski, —Cloud Computing:ll, Wiley 2013
2.	Dave shackleford, —Virtualization Securityll, SYBEX a wiley Brand 2013.
3.	Mather, Kumaraswamy and Latif, —Cloud Security and Privacyll, OREILLY 2011

REFERENCE BOOKS:	
1.	Mark C. Chu-Carroll —Code in the Cloud‖,CRC Press, 2011
2.	Mastering Cloud Computing Foundations and Applications Programming Rajkumar Buyya, Christian Vechhiola, S. Thamarai Selvi