B.TECH. – INFORMATION TECHNOLOGY

ACADEMIC CURRICULUM & SYLLABUS

(REGULATIONS 2019)

CHOICE BASED CREDIT SYSTEM

**(Applicable to the students admitted from the
Academic Year 2020-21 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)]**

CONTENTS

S.No	Course Code	Course Title	Category	Hours / Week				CREDITS
		SEMESTER I						
				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&
TOTAL				**17**	**2**	**13**	**1**	**24**

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

S.No	Course Code	Course Title	Category	Hours / Week				CREDITS
				L	**T**	**P**	**R**	
SEMESTER II								
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*
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.

		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.

S.No	Course Code	Course Title	Category	Hours / Week				CREDITS
				L	T	P	R	
SEMESTER VI								
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.

				Hours / Week				
S.No	Course Code	Course Title	Category	L	T	P	R	CREDITS
SEMESTER VIII								
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	191LEH611L	Interpersonal Skills / Listening and Speaking	VI	1
6	191MBH721T	Professional Ethics	VII	3
TOTAL CREDITS				**12**

BASIC SCIENCE COURSES (BS)

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

PROFESSIONAL ELECTIVE COURSES (PE)

S.No	Course Code	Course Title	Semester	Credits
PROFESSIONAL ELECTIVE – I				
1	191ITE501T	Big Data Analytics	V	3
2	191ITE502T	Image Processing	V	3
3	191ITE503T	Cyber Law	V	3
4	191ITE504T	Block Chain Technology	V	3
5	191ITE505T	Principles of Cloud Computing	V	3
6	191ITE506T	Design and Development of Cloud	V	3
7	191ITE507T	Software Testing	V	3
8	191ITE508T	Principles of Compiler Design	V	3
PROFESSIONAL ELECTIVE – II				
1	191ITE601T	NO SQL	VI	3
2	191ITE602T	Machine Learning	VI	3
3	191ITE603T	Network Programming, Protocols and Standards.	VI	3
4	191ITE604T	Ethical Hacking	VI	3
5	191ITE605T	Cloud Architecture and Application Development	VI	3
6	191ITE606T	Cloud Data Streaming	VI	3
7	191ITE607T	Internet of Things	VI	3
8	191ITE608T	Human Computer Interaction	VI	3
PROFESSIONAL ELECTIVE – III				
1	191ITE701T	Deep Learning	VII	3
2	191ITE702T	Knowledge Engineering	VII	3
3	191ITE703T	Mobile and Wireless Security	VII	3
4	191ITE704T	Security Governance, Risk and Compliance	VII	3
5	191ITE705T	Cloud Big Data Essentials	VII	3
6	191ITE706T	Cloud Strategy Planning and Management	VII	3
7	191ITE707T	Robotics	VII	3
8	191ITE708T	Genetic Algorithms	VII	3
PROFESSIONAL ELECTIVE – IV				
1	191ITE711T	Natural Language Processing	VII	3
2	191ITE712T	Business Intelligence	VII	3
3	191ITE713T	Malware Analysis	VII	3

S.No	Course Code	Course Title	Semester	Credits
4	191ITE714T	Secure Coding and Principles	VII	3
5	191ITE715T	IoT -Architecture Protocols and Security	VII	3
6	191ITE716T	Cloud Security	VII	3
7	191ITE717T	3D Printing and Design	VII	3
8	191ITE718T	Parallel Programming Using Open CL	VII	3
PROFESSIONAL ELECTIVE – V				
1	191ITE801T	Bio Inspired Computing	VIII	3
2	191ITE802T	Database Security	VIII	3
3	191ITE803T	Software Defined Networks	VIII	3
4	191ITE804T	Forensics and Incident Response	VIII	3
5	191ITE805T	Edge Computing	VIII	3
6	191ITE806T	Energy Management for IOT devices	VIII	3
7	191ITE807T	Pervasive Computing	VIII	3
8	191ITE808T	OS for Smart Devices	VIII	3
PROFESSIONAL ELECTIVE – VI				
1	191ITE811T	Data Visualization Techniques	VIII	3
2	191ITE812T	Data Science	VIII	3
3	191ITE813T	Cyber Security	VIII	3
4	191ITE814T	Data Centric Networks	VIII	3
5	191ITE815T	Cloud Virtualization	VIII	3
6	191ITE816T	IoT Security	VIII	3
7	191ITE817T	Virtual Reality	VIII	3
8	191ITE818T	Quantum Computing	VIII	3

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&

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**

NON CGPA COURSES DETAILS

	I	II	III	IV	V	VI	VII	VIII	Minimum credits to be earned for awarding degree
In plant Training / Internship			√	√	√	√	√		1
Industry Supported Course			√	√	√	√	√		-
Mandatory courses (MC)	√	√		√		√			7
Online Courses (PE)			√	√	√	√	√		-

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 – Modal verbs – 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 – Reduction of 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 increasing and 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 Rational functions 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 rank method.
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 acid battery 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 – Accident report/– Industrial visit report – Words often Misspelt – Describing a process using sequence words – Words used as different parts of speech		
UNIT	TITLE	PERIODS
IV		9
Small talk – review on films and books – email etiquette - Cover letter & Resume – Calling for quotations – Placing order – 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 – Harmonic conjugates – Construction of analytic function – Conformal mapping – Mapping by function $w = z + c,\ c\,z,\ \dfrac{1}{z},\ z^2$ - 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 of circular 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 distribution function – 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 – Tunnel diode - 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 and characteristics, 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 Output operations – 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 – matrix operations.

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 using Structures 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 leading to 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 – disaster management: 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 management‖ 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 – Predicate calculus – 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 and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion 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 and graph 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 Designǁ, 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 list implementation ——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
		3	0	0	0	

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 EB connection (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 from employee 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) – Tolerance limits - Acceptance sampling.

	TOTAL PERIODS:	60

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

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

REFERENCE BOOKS:	
1.	Devore. J.L., "Probability and Statistics for Engineering and the Sciences‖, Cengage Learning, New Delhi, 8th Edition, 2014.
2.	Papoulis, A. and 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 to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL.

UNIT	TITLE	PERIODS
II	DATABASE DESIGN	8

Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT	TITLE	PERIODS
III	TRANSACTIONS 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 for SELECT and JOIN operations – Query optimization using Heuristics and Cost Estimation.

UNIT	TITLE	PERIODS
V	ADVANCED TOPICS	9

Distributed Databases: Architecture, Data Storage, Transaction Processing- Object-based Databases: Object Database Concepts, Object-Relational features, ODMG Object Model, ODL, OQL – XML Databases: XML Hierarchical Model, DTD, XML Schema, XQuery.

	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 – System testing – 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 – Logical operations – Control operations – Addressing and Addressing modes.

UNIT	TITLE	PERIODS
II	**ARITHMETIC OPERATIONS**	9

Addition and Subtraction – Multiplication – Division – Floating Point Representation– Floating Point Operations – Sub word 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.

		Periods per week				Credits
191ITC411L	**DATABASE MANAGEMENT SYSTEMS LABORATORY**	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 tools for 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, ‖Computer Networking - A Top-Down Approach Featuring the Internet‖, 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 Parallel Processing – 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, New Delhi – 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-Watching documentaries/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

SYLLABUS OF

PROFESSIONAL ELECTIVE - I

COURSES

191ITE501T	BIG DATA ANALYTICS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Database Management Systems

COURSE OBJECTIVES:

1.	To know the fundamental concepts of big data and analytics.
2.	To explore tools and practices for working with big data .
3.	To learn about stream computing.
4.	To know about the research that requires the integration of large amounts of data.
5.	To understand different mining and clustering algorithms.

UNIT	TITLE	PERIODS
I	**INTRODUCTION TO BIG DATA AND HADOOP**	8

Introduction to Big Data- Big Data characteristics- Types of Big Data- Traditional vs. Big Data business approach- Web data- Introduction to Hadoop- RDBMS versus Hadoop-History of Hadoop - Hadoop Overview- HDFS- Processing Data with Hadoop -Hadoop Ecosystem.

UNIT	TITLE	PERIODS
II	**MAP REDUCE & NO SQL DATABASES**	10

MapReduce: The Map Tasks- Grouping by Key- The Reduce Tasks- Combiners- Details of Map Reduce Execution- Coping with Node Failures-Algorithms Using MapReduce. Hive - Sharding –- Hbase - NoSQL data bases: Introduction to Pig- Data Types in Pig - Execution Modes of Pig.

UNIT	TITLE	PERIODS
III	**MINING DATA STREAMS**	9

Introduction to Streams Concepts – Stream data model and architecture - Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window – Real time Analytics Platform(RTAP) applications - case studies - real time sentiment analysis, stock market predictions.

UNIT	TITLE	PERIODS
IV	**FREQUENT ITEM SETS AND CLUSTERING**	10

Mining Frequent item sets - Market based model – Apriori Algorithm – Handling large data sets in Main memory: PCY, multi stage and multi hash algorithms –Limited Pass algorithm – Counting frequent item sets in a stream - The SON Algorithm and MapReduce– Clustering Techniques – Hierarchical – K- Means Clustering - CURE Algorithm.

UNIT	TITLE	PERIODS
V	**DATA ANALYSIS IN SOCIAL NETWORKS**	8

Analyzing big data with twitter - Big data for E-Commerce Big data for blogs - Review of Basic Data Analytic Methods using R. Mining Social networks: Social networks as graphs: Varieties of Social Networks- Graphs with Several Node

Types - Simrank.

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1:	Compare the characteristics of traditional database and big data.
CO2:	Apply Map Reduce algorithms to improve scalability.
CO3:	Analyze stream data elements to mine useful insights.
CO4:	Evaluate the performance of various mining and clustering algorithms.
CO5:	Examine social network applications using big data analytics.
CO6:	Develop a complete data analytics solution for RTAP applications

TEXT BOOKS:

1.	Anand Rajaraman and Jeff Ullman "Mining of Massive Datasets", Cambridge University Press, 2012.
2.	Seema Acharya, Subhashini Chellappan , "Big Data and Analytics", Wiley India , First Edition,2015

REFERENCE BOOKS:

1.	EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015..
2.	Judith Hurwitz, Alan Nugent, Fern Halper, Marcia Kaufman, "Big Data for Dummies", Wiley Brand, 2013

191ITE502T	IMAGE PROCESSING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	Learn digital image fundamentals.
2.	Be exposed to simple image processing techniques.
3.	Be familiar with image compression and segmentation techniques.
4.	Learn to represent image in form of features.
5.	Understand pattern recognition algorithms.

UNIT	TITLE	PERIODS
I	**DIGITAL IMAGE FUNDAMENTALS**	9

Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels- color models.

UNIT	TITLE	PERIODS
II	**TIMAGE ENHANCEMENT**	9

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering – Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

UNIT	TITLE	PERIODS
III	**IMAGE RESTORATION**	9

Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering.

UNIT	TITLE	PERIODS
IV	**SEGMENTATION**	9

Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – Basic concepts – Dam construction – Watershed segmentation algorithm.

UNIT	TITLE	PERIODS
V	**IMAGE REPRESENTATION AND RECOGNITION**	9

Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor, Moments- Regional Descriptors –Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will learn:

CO1:	Infer the fundamental concepts of a digital image processing system.
CO2:	Evaluate the image enhancement techniques for preprocessing in real time applications.
CO3:	Choose the appropriate restoration techniques for image reconstruction.
CO4:	Interpret image segmentation and representation techniques to detect objects.
CO5:	Analyze the various feature extraction techniques for image analysis.
CO6:	Apply suitable algorithms for object detection and pattern recognition.

TEXT BOOKS:

1.	Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2010.

REFERENCE BOOKS:

1.	Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011.
2.	Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2011.
3.	Willliam K Pratt, "Digital Image Processing", John Willey, 2002.
4.	Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", First Edition, PHI Learning Pvt. Ltd., 2011.
5.	http://eeweb.poly.edu/~onur/lectures/lectures.html.
6.	http://www.caen.uiowa.edu/~dip/LECTURE/lecture.html

191ITE503T	CYBER LAW	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	Understand the basics of cyber law and cyber security
2.	Familiarize the issues those are specific to amendment rights
3.	Become aware on copyright issues in software's
4.	Understand the Cyber-crimes and Cyber Frauds
5.	Understand the Legal Framework
6.	To understand ethical laws of computer for different countries

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

History of Internet and World Wide Web – Need for cyber law - Cyber-crime on the rise- Important terms related to cyber law- Cyber law in India- Need for cyber law in India- History of cyber law in India- Information Technology Act, 2000- Information Technology Act, and 2000- National Policy on Information Technology 2012

UNIT	TITLE	PERIODS
II	**OVERVIEW OF THE INFORMATION TECHNOLOGY ACT, 2000**	9

Applicability of the Act- Scheme of the Act- Important provisions of the Act- Digital Signature under the IT Act, 2000- E-Governance- Attribution, Acknowledgement and Dispatch of Electronic Records- Certifying Authorities- Controller of Certifying Authorities (CCA)- Security Guidelines for Certifying Authorities- Electronic Signature Certificates- Duties of Subscribers- Penalties and Offences- Intermediaries- Rules Issued Under The IT Act 2000

UNIT	TITLE	PERIODS
III	**CYBER-CRIMES / CYBER FRAUDS**	9

Definition of cyber crime- First Cyber crime- Types of cyber frauds- Cyber frauds in India- Preventive measures- Cyber crimes - Penalties and offences under the IT Act, 2000- Offences under other legislations- Investigation of cyber-crimes in India- Regulatory Authorities.

UNIT	TITLE	PERIODS
IV	**CYBER CRIMES & LEGAL FRAMEWORK**	9

Cyber Crimes against Individuals, Institution and State- Hacking- Digital Forgery- Cyber Stalking/Harassment- Cyber Pornography- Identity Theft & Fraud- Cyber Terrorism- Cyber Defamation- Right to Privacy and Data Protection on Internet- Concept of privacy- Self-regulation approach to privacy- Ingredients to decide confidentiality of Information- Intellectual Property Issues in Cyber Space- Interface with Copyright Law- Interface with Patent Law- Trademarks &Domain Names Related issues- Dispute Resolution in Cyberspace.

UNIT	TITLE	PERIODS
V	**CYBER SECURITY**	9

Network and website Security Risks- Hacking- E-business Risk management issues- Firewall- Security framework- Cryptocurrency- Blockchain –Technology Stack :Protocol, Currency- Crowd Funding- Bitcoin Prediction Markets- Smart Property- Smart Contract- Decentralized Governance Services- E Payments- Digital Token based E payment systems- E Wallet- Online financial services in India- Law to Protect online financial service.

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1:	Develop the cyber security measures using Information technology Act.
CO2:	Apply the copyright law for using software packages.
CO3:	Create interface with computer related ethical laws for intellectual properties in cyberspace.
CO4:	Analyze the impact of Cyber-crimes and frauds.
CO5:	Examine the legal framework of cyber laws.
CO6:	Evaluate the security risks and its mitigation.

TEXT BOOKS:

1.	Justice Yatindra Singh, Cyber Laws, Universal Law Publishing Co, New Delhi, (2012).
2.	Verma S, K, Mittal Raman, Legal Dimensions of Cyber Space, Indian Law Institute, New Delhi, (2004)
3.	S. R. Bhansali, Information Technology Act, 2000, University Book House Pvt. Ltd., Jaipur (2003).
4.	Blockchain, Blueprint for a new Economy , Melanie Swan, 2017 –O'Reilly
5.	SudhirNaib, The Information Technology Act, 2005: A Handbook, OUP, New York, (2011)

REFERENCE BOOKS:

1.	Upadhyaya and A. Upadhyaya, Material Science and Engineering, Anshan Publications, 2007
2.	Vasu Deva, Cyber Crimes and Law Enforcement, Commonwealth Publishers, New Delhi, (2003).
3.	Essential Cyber Security Science, Josiah Dykstra, 2017 –O'Reilly

191ITE504T	BLOCKCHAIN TECHNOLOGY	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Data Structure, Cryptography and Network Security

COURSE OBJECTIVES:

1.	Introduction to Concept and Basics of Blockchain technologies
2.	Understanding the Design of Blockchain technologies
3.	Understanding Bitcoins
4.	Understand Problem Solving Methodologies
5.	Develop applications using Blockchain Technology

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

Basics - Blockchain history– Architecture- Structure of a Block-Block Header-Data Transactions in a Block - Permission less Model Vs Permissioned Model - Blockchain 2.0 and Smart Contracts – Nakamoto Consensus-Ethereum - Ethereum Virtual Machine (EVM) - Wallets for Ethereum – Solidity.

UNIT	TITLE	PERIODS
II	**DESIGN PRINCIPLES**	9

Abstract Models for Blockchain - GARAY model - RLA Model -Hash Functions -Distributed Consensus-Permission-less Consensus-Digital Money-Cryptocurrency Types -Applications- Distributed Ledgers- Hyper ledger Fabric

UNIT	TITLE	PERIODS
III	**ENCRYPTION AND BITCOIN**	9

Cryptographic basics for cryptocurrency - a short overview of Hashing, signature schemes, encryption schemes and elliptic curve cryptography -MD5 and SHA256 Algorithms-Public Key Cryptography-RSA Algorithm-Bitcoin Basics-Bitcoin Anonymity- The Bitcoin Transaction Lifecycle -Transaction Flooding-Mining-Block Flooding-Block Propagation- Merkle Tree.

UNIT	TITLE	PERIODS
IV	**PROBLEM SOLVING ALGORITHMS**	9

RAFT Consensus-Multiple Leader Candidate Problem-Byzantine Generals Problem- Lamport-Shostak-Pease Algorithm -The consensus problem - Asynchronous Byzantine Agreement -Practical Byzantine Fault Tolerant Model -Practical Byzantine Fault Tolerant Algorithm –Three Phase Commit Protocol-View Change-Correctness

UNIT	TITLE	PERIODS
V	**APPLICATIONS**	9

Blockchain for Enterprise-Actors in a Blockchain Solution-Components in a Blockchain Solution-Hyperledger Fabric V1 Architecture-Membership and Identity Management-Hyperledger Fabric Network Setup-Blockchain in Financial Services-Revolutionizing Global Trade-Blockchain in Supply Chain-Blockchain in other industries-Blockchain in Government-Fabric SideDB-Secured MPC over Blockchain

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will learn:

CO1:	Infer the basic concepts of Blockchain Technology
CO2:	Analyze the various types of Blockchain models.
CO3:	Adapt the suitable block chain techniques in problem solving.
CO4:	Design the encryption algorithm used in Blockchain based applications.
CO5:	Apply the various hashing techniques to improve security.
CO6:	Identify the various application areas of Blockchain.

TEXT BOOKS:

1.	Kevin Werbach, The Blockchain and the new architecture of Trust, MIT Press, 2018.
2.	Joseph J. Bambara and Paul R. Allen, Blockchain – A practical guide to developing business, law, and technology solutions, McGraw Hill, 2018.
3.	Blockchain for Beginners – Bryan Ford

REFERENCE BOOKS:

1.	https://swayam.gov.in/nd1_noc19_cs63/preview
2.	https://www.springer.com/gp/book/9783030030346
3.	https://www.hyperledger.org/resources
4.	https://arxiv.org/pdf/1801.10228
5.	https://en.wikipedia.org/wiki/Digital_signature

191ITE505T	PRINCIPLES OF CLOUD COMPUTING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Operating System

COURSE OBJECTIVES:

1.	To learn about the concept of cloud and utility computing.
2.	To have knowledge on the various issues in cloud computing.
3.	To be familiar with the lead players in cloud.
4.	To appreciate the emergence of cloud as the next generation computing paradigm.
5.	To understand different algorithms for cloud implementation.

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

Introduction to Cloud Computing – Roots of Cloud Computing – Desired Features of Cloud Computing – Challenges and Risks – Benefits and Disadvantages of Cloud Computing.

UNIT	TITLE	PERIODS
II	**VIRTUALIZATION**	9

Introduction to Virtualization Technology – Load Balancing and Virtualization – Understanding Hypervisor – Seven Layers of Virtualization – Types of Virtualization – Server, Desktop, Application Virtualization.

UNIT	TITLE	PERIODS
III	**CLOUD ARCHITECTURE, SERVICES AND STORAGE**	9

NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - laaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage.

UNIT	TITLE	PERIODS
IV	**RESOURCE MANAGEMENT AND SECURITY**	9

Inter Cloud Resource Management – Resource Provisioning Methods – Security Overview – Cloud Security Challenges – Data Security –Application Security – Virtual Machine Security.

UNIT	TITLE	PERIODS
V	**CASE STUDY**	9

Google App Engine(GAE) – GAE Architecture – Functional Modules of GAE – Amazon Web Services(AWS) – GAE Applications – Cloud Software Environments – Eucalyptus – Open Nebula – Open Stack

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1:	Compare the key benefits and limitations of various cloud providers for effective cloud service.
CO2:	Create cloud based application using Virtualization technique.
CO3:	Choose the appropriate architecture and service models for cloud implementation.
CO4:	Analyze the core issues of cloud computing in resource provisioning and management.
CO5:	Examine various cloud technologies for real time applications.
CO6:	Design appropriate algorithms for cloud resource management.

REFERENCE BOOKS:

1.	Buyya R., Broberg J., Goscinski A., "Cloud Computing: Principles and Paradigm", First Edition, John Wiley & Sons, 2011.
2.	George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice)", O'Reilly, 2009.
3.	Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
4.	Raj Kumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, "Mastering Cloud Computing", Tata McGraw Hill, 2013.
5.	Rittinghouse, John W., and James F. Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2017.
6.	Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach", Tata McGraw Hill, 2009.

191ITE506T	DESIGN AND DEVELOPMENT OF CLOUD	Periods per week				Credits
		L	T	P	R	
		3	**0**	**0**	**0**	**3**

PREREQUISITES:

Web Application Development

COURSE OBJECTIVES:

1.	Design and develop elegant and flexible cloud software solutions.
2.	Evaluate the security issues related to the development of cloud applications.
3.	Manage and deploy a cloud based application.
4.	Research and critique a topic related to Software development in the cloud.
5.	Analyze a real world problem and develop a cloud based software solution.

UNIT	TITLE	PERIODS
I	**DESIGNING CLOUD BASED APPLICATIONS**	**9**

Role of business analyst, requirements gathering, UML, use of state diagrams, wire frame prototypes, use of design tools such as Balsamiq. Selecting front end technologies and standards, Impact of growth in mobile computing on functional design and technology decisions.

UNIT	TITLE	PERIODS
II	**CLOUD APPLICATION DEVELOPMENT**	**9**

Technical architecture considerations – concurrency, speed and unpredictable loads. Agile development, team composition (including roles/responsibilities), working with changing requirements and aggressive schedules. Understanding Model View Controller (MVC). Advanced understanding of "views", location, and the presentation layer: Advanced Ajax and JQuery. Presenting to different browsers and devices.

UNIT	TITLE	PERIODS
III	**STORING OBJECTS IN THE CLOUD**	**9**

Session management. Advanced database techniques using MySQL and SQL Server, blob storage, table storage. Working with Third Party APIs: Overview of interconnectivity in cloud ecosystems. Working with Twitter API, Flickr API, Google Maps API. Advanced use of JSON and REST.

UNIT	TITLE	PERIODS
IV	**CLOUD APPLICATIONS AND SECURITY ISSUES**	**9**

Understanding cloud based security issues and threats (SQL query injections, common hacking efforts), SSL, encrypted query strings, using encryption in the database. Authentication and identity. Use of oAuth. OpenID; Understanding QA and Support: Common support issues with cloud apps: user names and passwords, automated emails and spam, browser variants and configurations.

UNIT	TITLE	PERIODS
V	**USE CASES AND CASE STUDY**	**9**

Design, develop and deploy an advanced cloud app using framework and platform of choice to demonstrate an understanding of database, presentation and logic. Application should demonstrate integration with third party API, sensitivity to geography of user (language, currency, and time and date format), authentication of user, security, and awareness of client device/browser. **Case Studies**: Salesforce, Basecamp, Xero.com, Dropbox.

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will learn:

CO1:	Apply the core concepts of cloud in application development.
CO2:	Assess the processes involved in creating a cloud based application.
CO3:	Design a database objects using advanced database techniques in cloud.
CO4:	Analyze the various Security issues in cloud application.
CO5:	Develop web and mobile applications in cloud.
CO6:	Deploy the web applications in relevant cloud platform.

REFERENCE BOOKS:

1.	Jim Webber, Savas Parastatidis, Ian Robinson, "REST in Practice" O'Reilly Media; 1 edition, [ISBN: 978-0596805821] 2010.
2.	Eugenio Pace, Dominic Betts, Scott Densmore, Ryan Dunn, Masashi Narumoto, MatiasWoloski, "Developing Applications for the Cloud on the Microsoft Windows Azure Platform" Microsoft Press; 1 edition, [ISBN: 9780735656062] 2010.
3.	Dan Wellman, "jQuery UI 1.6" Packt Publishing [ISBN: 9781847195128] 2009.
4.	Peter Lubbers, Brian Albers, Frank Salem, Ric Smith, "Pro HTML5 Programming" A press, [ISBN: 9781430227908] 2010.
5.	Lee Babin, "Beginning Ajax with PHP" A press; 1 edition, [ISBN: 9781590596678] 2006.
6.	Richard York, "Beginning JavaScript and CSS development with jQuery", Wiley Pub. Indianapolis, IN [ISBN: 9780470227794] 2009.
7.	Edward Benson, "The art of Rails", Wiley Pub. Indianapolis, IN [ISBN: 9780470189481] 2008.

191ITE507T		Periods per week	Credits

		SOFTWARE TESTING	L	T	P	R	
			3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	To understand and learn the basics of testing concepts.
2.	To understand and learn testing strategies and their importance.
3.	To know the levels of testing in developing a software.
4.	Will be exposed to the quality related issues.
5.	Will be familiar to test automation techniques.

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

Basic definitions-software testing principles- Role of tester in a Software Development Organization - testing as a process- Overview of Testing maturity model- Defects - Origins of Defect - Defect Classes-The Defect Repository- Defect Examples, Developer/Tester Support for Developing a Defect Repository.

UNIT	TITLE	PERIODS
II	**TEST CASE DESIGN STRATEGIES**	9

Testing Design Strategies – Using Black Box - Random testing- Requirements based testing - Equivalent Class Partitioning - Boundary Value Analysis - State Transition Testing - Cause-Effect Graphing Based Testing - Error Guessing - White-Box Testing – coverage and control flow graphs- Path Testing - Loop Testing - Data Flow Testing - Mutation Testing.

UNIT	TITLE	PERIODS
III	**LEVERS OF TESTING**	9

Need for Levers of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests – The Test Harness – Integration tests – Designing Integration Tests – Integration Test Planning – Scenario testing – Acceptance testing – Performance testing – Regression Testing – Internationalization testing – Ad-hoc testing – Alpha, Beta Tests – Testing OO systems – Usability and Accessibility testing – Compatibility testing – Testing the documentation.

UNIT	TITLE	PERIODS
IV	**TEST MANAGEMENT**	9

People and organizational issues– organization structures for testing teams – testing services - Test Planning - Test Plan Components - Test Plan Attachments - Locating Test Items – test management –Reporting the Test Results - The role of three groups in Test Planning and Policy Development - The test specialist - Skills needed by a test specialist- Building a Testing Group - The Structure of Testing Group.

UNIT	TITLE	PERIODS
V	**TEST AUTOMATION**	9

Software test automation – skill needed for automation – scope of automation – Design and architecture for automation – Requirements for a test tool – challenges in automation – Test metrics and measurements – Project, progress and productivity metrics.

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1:	Apply the basic concepts and principles in software testing.
CO2:	Analyze the various classes of defects present in the software.
CO3:	Design test cases using appropriate test case design strategies.
CO4:	Choose appropriate level of testing to test the software.
CO5:	Create test planning and development components by test specialist.
CO6:	Evaluate automated test reports using metrics and measurements.

TEXT BOOKS:

1.	Ilene Burnstein, Practical Software Testing, Springer Verlag International Edition, Springer (India) Pvt Ltd, 2012
2.	Ron Patton, "Software Edition, Testing", Second Sams Publishing, Pearson Education, 2007.
3.	Srinivasan Desikan and Gopalaswamy Ramesh, "Software Testing – Principles and Practices", Pearson Education, 2006.

191ITE508T	PRINCIPLES OF COMPILER DESIGN	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	To enrich the knowledge in various phases of compiler and its use.
2.	To learn the various parsing techniques.
3.	To understand intermediate code generation and run-time environment.
4.	To learn to implement front-end and back-end of the compiler.
5.	To provide practical programming skills necessary for constructing a compiler

UNIT	TITLE	PERIODS
I	**INTRODUCTION TO COMPILERS**	9

Phases of a compiler – Cousins of the Compiler-Compiler construction tools-Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Regular Expressions to Automata – Minimizing DFA- lex.

UNIT	TITLE	PERIODS
II	**SYNTAX ANALYSIS**	12

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

UNIT	TITLE	PERIODS
III	**INTERMEDIATE CODE GENERATION**	8

Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate Languages: Syntax Tree, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking.

UNIT	TITLE	PERIODS
IV	**RUN-TIME ENVIRONMENT AND CODE GENERATION**	8

Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, Heap Management – Issues in Code Generation – Design of a simple Code Generator.

UNIT	TITLE	PERIODS
V	**CODE OPTIMIZATION**	8

Principal Sources of Optimization – Peep- Hole optimization – DAG- Optimization of Basic Blocks - Global Data Flow Analysis – Efficient Data Flow Algorithm.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will learn:	
CO1:	Outline the fundamentals of compiler and use the knowledge of finite automata to design lexical analyzer.
CO2:	Apply different types of parsing techniques to design syntax analyzer.
CO3:	Formulate Intermediate Code for the expression.
CO4:	Utilize the LEX and YACC tools.
CO5:	Adapt code optimization techniques to improve the performance in terms of speed & space.
CO6:	Design an appropriate data structure to handle the storage requirements for the code generation.

TEXT BOOKS:

1.	Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers: Principles, Techniques and Tools‖, Second Edition, Pearson Education, 2009.

REFERENCE BOOKS:

1.	Randy Allen, Ken Kennedy, and Optimizing Compilers for Modern Architectures: A Dependence based Approach, Morgan Kaufmann Publishers, 2002.
2.	Steven S. Muchnick, Advanced Compiler Design and Implementation‖, Morgan Kaufmann Publishers – Elsevier Science, India, Indian Reprint 2003.
3.	Keith D Cooper and Linda Torczon, Engineering a Compiler‖, Morgan Kaufmann Publishers Elsevier Science, 2004.
4.	Raghavan, Principles of Compiler Design‖, Tata McGraw Hill Education Publishers, 2010.
5.	Allen I. Holub, Compiler Design in C‖, Prentice-Hall Software Series, 1993.

SYLLABUS OF

PROFESSIONAL ELECTIVE - II

COURSES

191ITE601T	NO SQL	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Data Base Management System

COURSE OBJECTIVES:

1.	To understand the concepts NoSQL.
2.	To understand the relation database concepts using NoSQL.
3.	To learn transaction process.
4.	To learn big data management tools.
5.	To learn Hbase and NoSQL database development tools.

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

Overview, and History of NoSQL Databases - Types of NoSQL Database - The Emergence of NoSQL- Key Points- NOSQL products - Comparison of relational databases to NoSQL data stores, use and deployment - Migrating from RDBMS to NoSQL - Challenges in NoSQL approach- Applications.

UNIT	TITLE	PERIODS
II	**NO SQL DATA MODELS**	9

NoSQL Data models: Aggregate Model - Document Data Model- Key Value Data Model - Columnar Data Model - Graph Based Data Model - Replication and sharding - MapReduce on databases - Distribution Models - Single Server Sharding - Master-Slave Replication - Peer-to-Peer Replication - Combining Sharding and Replication.

UNIT	TITLE	PERIODS
III	**NOSQL DATABASES**	9

NOSQL Storage Architecture - NoSQL Key/Value databases using MongoDB - CRUD operations with MongoDB, Querying, Modifying and Managing NoSQL Data stores, Indexing and ordering datasets (MongoDB) - NoSQL in CLOUD, Parallel Processing with Map Reduce, Big Data with Hive.

UNIT	TITLE	PERIODS
IV	**NOSQL DATABASE DEVELOPMENT TOOLS**	9

NoSQL databases using Apache HBASE- Architecture of HBASE- Column-oriented NoSQL databases using Apache Cassandra: Data Store- Features- Consistency- Logging, Graph NoSQL databases using Neo4: NoSQL database development tools - Graph Databases - Features, Consistency, Transactions, Availability, Query Features, and Scaling – Comparison.

UNIT	TITLE	PERIODS
V	**CASE STUDY**	9

Content Management Systems - Blog Platforms- Web Analytics or Real-Time Analytics- E-Commerce Applications - Complex Transactions -Shopping Cart Data.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1:	Identify the basics of NoSQL.
CO2:	Analyze the different types of NoSQL data models.
CO3:	Design the schema using NoSQL databases.
CO4:	Construct various queries using MongoDB
CO5:	Choose the suitable NoSQL database for designing real time database applications
CO6:	Create applications using NoSQL database development tools

TEXT BOOKS:

1.	NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence , Sadalage, P. & Fowler, Pearson Education Publication

REFERENCE BOOKS:

1.	A Guide to Modern Databases and the NoSQL Movement, Redmond, E. &Wilson, 1st Edition

191ITE602T	MACHINE LEARNING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Data Warehousing and Data Mining

COURSE OBJECTIVES:

1.	To understand the need for machine learning for various problem solving
2.	To study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning
3.	To understand the latest trends in machine learning
4.	To understand different classification techniques.
5.	To design appropriate machine learning algorithms for problem solving

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

Learning Problems – Perspectives and Issues – Concept Learning – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

UNIT	TITLE	PERIODS
II	**NEURAL NETWORKS AND GENETIC ALGORITHMS**	9

Neural Network Representation – Problems – Perceptions – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming.

UNIT	TITLE	PERIODS
III	**BAYESIAN AND COMPUTATIONAL LEARNING**	9

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naive Bayes Classifier – Bayesian Belief Network – EM Algorithm .

UNIT	TITLE	PERIODS
IV	**INSTANT BASED LEARNING**	9

K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.

UNIT	TITLE	PERIODS
V	**ADVANCED LEARNING**	9

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will learn:

CO1:	Analyze the basic concepts of machine learning.

CO2:	Build the decision tree algorithm to overcome the problem of over fitting.
CO3:	Design back propagation and genetic algorithms for problem solving.
CO4:	Evaluate various classification techniques for data analysis.
CO5:	Apply instance based learning for solving complex problems.
CO6:	Develop real time applications using machine learning algorithms.

| **TEXT BOOKS:** |
| **1.** | Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013. |

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

191ITE603T	NETWORK PROGRAMMING, PROTOCOLS AND STANDARDS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	To learn the foundation of various techniques for Network Programming
2.	To understand the protocols of TCP/IP protocol suite
3.	To get an insight into network standards
4.	To understand various wired and wireless standards
5.	To understand the Socket Programming

UNIT	TITLE	PERIODS
I	**NETWORK LAYER PROTOCOLS**	9

IPv4:Address Space – Notations - Classful Addressing- Classless Addressing– Network Address Translation- IPv6- Structure- Address Space- Packet Format- Extension Headers – Unicast Routing- Optimization- Distance Vector Routing- RIP- Link State Routing – OSPF – BGP – Multicasting – Multicast Routing- Routing Protocols- Applications.

UNIT	TITLE	PERIODS
II	**NETWORK AND SOCKET PROGRAMMING**	9

Internet – Client Server Model – Streams – Internet Address, Using Sockets – Constructing and connecting sockets – Getting information about a socket – Setting socket options - Using Server sockets – Constructing Server sockets – Server socket options.

UNIT	TITLE	PERIODS
III	**URL AND HTTP**	9

URL's and URI's - HTTP Methods- HTTP Transaction- Persistent Versus Non persistent Connection- Proxy Server – URL Connections- Client (Browser)- Server – Cookies- Web Documents - Static Documents - Dynamic Documents- Active Documents.

UNIT	TITLE	PERIODS
IV	**TCP AND UDP SOCKETS**	9

Functions, Services and Header Formats of TCP and UDP, UDP Protocol-UDP clients and Servers- Datagram Packet Class – Datagram Socket class – Socket options.

UNIT	TITLE	PERIODS
V	**NETWORK STANDARDS**	9

Wired Standards – Wireless Standards: WPA- Architecture –, 802.11a, 802.11b, 802.11g, 802.11i, 802.11n.

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1:	Analyze the performance of routing algorithms in IPv4 and IPv6.
CO2:	Implement socket programming for network applications.
CO3:	Create URL Connections to access data streams from web server.
CO4:	Develop network model for applications using network standards.
CO5:	Develop the knowledge on transport layer protocols.
CO6:	Apply wired and wireless standards in network.

TEXT BOOKS:

1.	Elliotte Rusty Harold, Java Network Programming, O'Reilly Media, 2013
2.	Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013

REFERENCE BOOKS:

1.	Behrouz A. Forouzan, TCP/IP Protocol Suite, McGraw-Hill Publication, 2011
2.	W. Richard Stevens, Unix Network Programming-The Sockets Networking API, Pearson, 2013

191ITE604T	ETHICAL HACKING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	To understand and analyze Information security threats & countermeasures
2.	To perform security auditing & testing
3.	To understand issues relating to ethical hacking
4.	To study & employ network defense measures
5.	To understand penetration and security testing issues

UNIT	TITLE	PERIODS
I	**ETHICAL HACKING OVERVIEW & VULNERABILITIES**	9

Understanding the importance of security, Concept of ethical hacking and essential Terminologies- Threat, Attack, Vulnerabilities, Target of Evaluation, Exploit. Phases involved in hacking.

UNIT	TITLE	PERIODS
II	**FOOT PRINTING & PORT SCANNING**	9

Foot printing - Introduction to foot printing, Understanding the information gathering methodology of the hackers, Tools used for the reconnaissance phase. Port Scanning - Introduction, using port scanning tools, ping sweeps, Scripting Enumeration-Introduction, Enumerating windows OS & Linux OS.

UNIT	TITLE	PERIODS
III	**SYSTEM HACKING**	9

Aspect of remote password guessing, Role of eavesdropping ,Various methods of password cracking, Keystroke Loggers, Understanding Sniffers ,Comprehending Active and Passive Sniffing, ARP Spoofing and Redirection, DNS and IP Sniffing, HTTPS Sniffing.

UNIT	TITLE	PERIODS
IV	**HACKING WEB SERVICES & SESSION HIJACKING**	9

Web application vulnerabilities, application coding errors, SQL injection into Back-end Databases, cross-site scripting, cross-site request forging, authentication bypass, web services and related flaws, protective http headers Understanding Session Hijacking, Phases involved in Session Hijacking, Types of Session Hijacking, Session Hijacking Tools.

UNIT	TITLE	PERIODS
V	**HACKING WIRELESS NETWORKS**	9

Introduction to 802.11, Role of WEP, Cracking WEP Keys, Sniffing Traffic, and Wireless DOS attacks, WLAN Scanners, WLAN Sniffers, Hacking Tools, and Securing Wireless Networks.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will learn:

CO1:	Distinguish between vulnerabilities, threats and attacks.
CO2:	Evaluate various security auditing & testing techniques.
CO3:	Analyze various information gathering methodologies.
CO4:	Create a program for hacking web services applications.
CO5:	Compare and contrast various ethical hacking tools.
CO6:	Recommend ethical hacking tools for Wireless Networks.

REFERENCE BOOKS:

1.	Kimberly Graves, "Certified Ethical Hacker", Wiley India Pvt Ltd, 2010
2.	Michael T. Simpson, "Hands-on Ethical Hacking & Network Defense", Course Technology, 2010
3.	Rajat Khare, "Network Security and Ethical Hacking", Luniver Press, 2006
4.	Ramachandran V, BackTrack 5 Wireless Penetration Testing Beginner's Guide (3rd ed.). Packt Publishing, 2011
5.	Thomas Mathew, "Ethical Hacking", OSB publishers, 2003

191ITE605T	CLOUD ARCHITECTURE AND APPLICATION DEVELOPMENT	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	Analyze the components of cloud computing showing how business agility in an organization can be created
2.	Evaluate the deployment of web services from cloud architecture
3.	Critique the consistency of services deployed from a cloud architecture
4.	Compare and contrast the economic benefits delivered by various cloud models based on application requirements, economic constraints and business requirements.
5.	Critically analyze case studies to derive the best practice model to apply When developing and deploying cloud based application

UNIT	TITLE	PERIODS
I	**CLOUD COMPUTING FUNDAMENTALS**	**8**

Cloud computing definition – private - public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing - public vs private clouds - role of virtualization in enabling the cloud - Business Agility: Benefits and challenges to Cloud architecture - Application availability - performance - security and disaster recovery - Next generation Cloud Applications.

UNIT	TITLE	PERIODS
II	**CLOUD APPLICATIONS**	**6**

Technologies and the processes required when deploying web services - Deploying a web service from inside and outside cloud architecture - advantages and disadvantages.

UNIT	TITLE	PERIODS
III	**MANAGEMENT OF CLOUD SERVICES**	**12**

Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics: Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs (e.g. Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Red hat).

UNIT	TITLE	PERIODS
IV	**APPLICATION DEVELOPMENT**	**10**

Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, Google App.

UNIT	TITLE	PERIODS
V	**CLOUD IT MODEL**	**9**

Analysis of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service, applications and development platform deployment so as to improve the

total cost of ownership.

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Design a basic cloud using fundamental knowledge of cloud computing paradigms
CO2:	Analyze the various components of Cloud service architecture.
CO3:	Apply the basic services of cloud to improve business agility.
CO4:	Choose the best market service providers in cloud computing.
CO5:	Design innovative technologies in cloud data centers.
CO6:	Compare and contrast the economic benefits delivered by various cloud service provider.

REFERENCE BOOKS:	
1.	Dimitris N. Chorafas, "Cloud Computing Strategies" CRC Press; 1 edition [ISBN 1439834539], 2010.
2.	Gautam Shroff, "Enterprise Cloud Computing Technology Architecture Applications" Cambridge University Press; 1 edition, [ISBN: 978-0521137355]2010.
3.	Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach"McGraw-Hill Osborne Media; 1 edition [ISBN: 0071626948], 2009.

191ITE606T	CLOUD DATA STREAMING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	Understanding the basic of stream computing.
2.	Comprehend the architecture of stream analytics.
3.	Building data flow management pipelines for streams.
4.	How to Process streaming data.
5.	Learn about different approaches for storing storming data

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

Streaming Data – Sources – Difference between Streaming Data and Static Data. Overview of Large Scale Stream Processing Engines – Issues in Stream Processing.

UNIT	TITLE	PERIODS
II	**STREAMING ANALYTICS ARCHITECTURE**	9

Phases in Streaming Analytics Architecture - Vital Attributes - High Availability – Low Latency –Horizontal Scalability-Fault Tolerance - Service Configuration and Management – Apache ZooKeeper.

UNIT	TITLE	PERIODS
III	**DATA FLOW MANAGEMENT**	9

Distributed Data Flows – At Least One Delivery – Apache Kafka – Apache Flume – Zero MQ -Messages, Events, Tasks and File Passing.

UNIT	TITLE	PERIODS
IV	**PROCESSING & STORING STREAMING DATA**	9

Distributed Stream Data Processing: Co-ordination, Partition and Merges, Transactions. Duplication Detection using Bloom Filters - Apache Spark Streaming Examples Choosing a storage system –No SQL Storage Systems.

UNIT	TITLE	PERIODS
V	**DELIVERING STREAMING METRICS**	9

Visualizing Data – Mobile Streaming Apps –Times Counting and Summation – Stochastic Optimization – Delivering Time Series Data.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will learn:

CO1:	Apply the basics of stream computing to improve cloud data storage.

CO2:	Analyze the use of key components in stream analytics architecture.
CO3:	Design data flow management techniques and tools for various Data streams.
CO4:	Examine various storage systems for data streaming.
CO5:	Analyze various methods of data streaming in real time application.
CO6:	Evaluate the results of various data streaming metrics in application development.

REFERENCE BOOKS:	
1.	Bill Franks, "Taming The Big Data Tidal Wave Finding Opportunities In Huge Data
2.	Streams With Advanced Analytics", Wiley, 2012.24 IT2015 SRM(E&T)
3.	Byron Ellis, "Real-Time Analytics: Techniques to Analyze and Visualize Streaming Data", Wiley, 1st edition, 2014.
4.	Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman, "Mining of Massive Datasets",
5.	Cambridge University Press, 2014.
6.	Paul C Zikopoulos, Chris Eaton, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGraw-Hil, 1st edition, 2011.
7.	Rittinghouse, John W., and James F. Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2017.
8.	Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach", Tata McGraw Hill, 2009.
9.	Kafka.apache.org
10.	Flume.apache.org
11.	Zookeeper.apache.org
12.	Spark.apache.org
13.	Zeromq.org

191ITE607T		Periods per week	Credits

	INTERNET OF THINGS	L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	To understand Smart Objects and IoT Architectures
2.	To learn about various IoT-related protocols
3.	To build simple IoT Systems using Arduino and Raspberry Pi.
4.	To understand data analytics and cloud in the context of IoT
5.	To develop IoT infrastructure for popular applications

UNIT	TITLE	PERIODS
I	FUNDAMENTALS	9

Evolution of Internet of Things - Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack – Sensors, Actuators, Smart Objects and Connecting Smart Objects.

UNIT	TITLE	PERIODS
II	PROTOCOLS	9

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks.

UNIT	TITLE	PERIODS
III	DESIGN AND DEVELOPMENT	9

Design Methodology - Embedded computing logic - Microcontroller, System on Chips - IoT system building blocks - Arduino - Board details, IDE programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.

UNIT	TITLE	PERIODS
IV	DATA ANALYTICS AND SUPPORTING SERVICES	9

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network Analytics – Django – AWS for IoT – System Management with NETCONF-YANG.

UNIT	TITLE	PERIODS
V	CASE STUDIES/INDUSTRIAL APPLICATIONS	9

Cisco IoT system - IBM Watson IoT platform – Manufacturing - Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – Grid Blocks Reference Model - Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will be able to:	
CO1:	Analyze the usage of sensors and actuators.
CO2:	Compare various IoT protocols in terms of physical and MAC layers.
CO3:	Design a simple IoT system using Rasperry Pi/Arduino
CO4:	Choose appropriate data analytics services for IoT systems.
CO5:	Model AWS cloud service for IoT system.
CO6:	Design an IoT system for smart city.

TEXT BOOKS:

1.	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, —IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017

REFERENCE BOOKS:

1.	Arshdeep Bahga, Vijay Madisetti, —Internet of Things – A hands-on approach‖, Universities Press, 2015.
2.	Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things‖, Springer, 2011
3.	Jan Ho¨ ller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014
4.	Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2 nd Edition, O'Reilly Media, 2011.
5.	Olivier Hersent, David Boswarthick, Omar Elloumi , —The Internet of Things – Key applications and Protocols‖, Wiley, 2012 (for Unit 2).
6.	https://www.arduino.cc/
7.	https://www.ibm.com/smarterplanet/us/en/?ca=v_smarterplanet

191ITE608T	HUMAN COMPUTER INTERACTION	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	Learn the foundations of Human Computer Interaction.
2.	Be familiar with the design technologies for individuals and persons with disabilities.
3.	Be aware of mobile HCI.
4.	Learn the guidelines for web app development.
5.	Learn the foundations of Human Computer Interaction.

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

The Human: Introduction: I/O channels –   Human Memory – Reasoning and problem solving;   The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.

UNIT	TITLE	PERIODS
II	**DESIGN PROCESS & RULES**	9

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – User support.

UNIT	TITLE	PERIODS
III	**MODELS AND THEORIES**	9

Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Face-to-face communication. **Case study**: GOMS saves money, Implementing workflow in Lotus Notes Tomorrow's hospital – using participatory design, Looking real – Avatar Conference.

UNIT	TITLE	PERIODS
IV	**MOBILE HCI**	9

Mobile Ecosystem: Platforms, Operating systems, Application frameworks- Developing a Mobile Strategy, Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile Design: Elements of Mobile Design, Tools, Mobile 2.0.

UNIT	TITLE	PERIODS
V	**MOBILE WEB DEVELOPMENT AND WEB APPS**	9

Mobile 2.0, Web Standards, Designing for Multiple Mobile Browsers, Device Plans, Markup, Making Money in Mobile: Working with Operators & App Store, Add Advertising, Device & Desktop Testing, Usability Testing.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will learn:

CO1:	Outline the essential elements and frameworks of human computer interaction.
CO2:	Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
CO3:	Select appropriate features for a specific screen layout.
CO4:	Choose a suitable layout of widgets and display elements for a GUI window.
CO5:	Design a user interface for a mobile application.
CO6:	Evaluate user interfaces and detect usability problems.

TEXT BOOKS:

1.	Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004 (UNIT I, II & III).
2.	Brian Fling, "Mobile Design and Development", First Edition, O"Reilly Media Inc., 2009 (UNIT –IV & V).

SYLLABUS OF

PROFESSIONAL ELECTIVE - III

COURSES

191ITE701T	DEEP LEARNING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Computational Intelligence, Data Warehousing and Data Mining.

COURSE OBJECTIVES:

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

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

Introduction to Machine Learning- Linear Models (SVMs and Perceptrons, logistic regression) - Introduction to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates.

UNIT	TITLE	PERIODS
II	**DEEP NETWORKS**	9

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

UNIT	TITLE	PERIODS
III	**DIMENSIONALITY REDUCTION**	9

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

UNIT	TITLE	PERIODS
IV	**OPTIMIZATION AND GENERALIZATION**	9

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

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

ImageNet- Detection-Audio Wave Net-Natural Language Processing Word2Vec - Joint Detection Bioinformatics-Face Recognition- Scene Understanding- Gathering Image Captions.

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1:	Apply the basics of machine learning concepts to train a neural network.
CO2:	Design algorithms using deep neural networks for solving real time problems.
CO3:	Analyze optimization and generalization techniques in deep learning for solving applications.
CO4:	Create a convolutional neural network using batch optimization and hyper parameter optimization techniques.
CO5:	Develop deep learning applications such as facial recognition using computational and neuroscience.
CO6:	Build real time applications to incorporate deep learning

REFERENCE BOOKS:

1.	Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.
2.	Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.
3.	Ian Good fellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
4.	Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.

191ITE702T	KNOWLEDGE ENGINEERING	Periods per week				Credits
		L	T	P	R	3
		3	0	0	0	

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	To learn about proposition logic and predicate logics.
2.	To acquire knowledge about modal and non-monotonic logics.
3.	To understand object-oriented abstractions for various expert systems.
4.	To understand various planning strategies for problem solving.
5.	To explain the basic knowledge representation and problem solving techniques of Artificial Intelligence.

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

Knowledge Representation and Reasoning – First order Logic – Syntax, Semantics Pragmatics – Expressing Knowledge – Levels of Representation – Knowledge Acquisition and Sharing – Sharing Ontologies – Language Ontologies –Language Patterns – Tools for Knowledge Acquisition.

UNIT	TITLE	PERIODS
II	**RESOLUTION AND REASONING**	9

Proportional Case – Handling Variables and Quantifiers – Dealing with Intractability – Reasoning with Horn Clauses - Procedural Control of Reasoning – Rules in Production– Description Logic - Issues in Engineering -Vivid Knowledge – Beyond Vivid.

UNIT	TITLE	PERIODS
III	**REPRESENTATION**	9

Object Oriented Representations – Frame Formalism – Structured Descriptions – Meaning and Entailment - Taxonomies and Classification – Inheritance – Networks – Strategies for Defeasible Inheritance – Formal Account of Inheritance Networks.

UNIT	TITLE	PERIODS
IV	**DEFAULTS, UNCERTAINTY AND EXPRESSIVENESS**	9

Defaults – Introduction – Closed World Reasoning – Circumscription – Default Logic Limitations of Logic – Fuzzy Logic – Non-montonic Logic – Theories and World – Semiotics – Auto epistemic Logic - Vagueness – Uncertainty and Degrees of Belief – Non categorical Reasoning – Objective and Subjective Probability.

UNIT	TITLE	PERIODS
V	**ACTIONS AND PLANNING**	9

Explanation and Diagnosis – Purpose – Syntax, Semantics of Context – First Order Reasoning – Modal Reasoning in Context – Encapsulating Objects in Context – Agents – Actions – Situational Calculus – Frame Problem – Complex Actions – Planning – Strips – Planning as Reasoning – Hierarchical and Conditional Planning.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will learn:

CO1:	Compare the various components of knowledge base.
CO2:	Apply the concept of Ontology for knowledge representation.
CO3:	Solve problems using logical reasoning.
CO4:	Choose appropriate strategies for representing the knowledge.
CO5:	Analyze uncertainties associated with the knowledge representation.
CO6:	Model the contextual information for better interpretation of knowledge.

REFERENCE BOOKS:

1.	Arthur B. Markman, "Knowledge Representation", Lawrence Erlbaum Associates, 1998
2.	Brachman, Hector Levesque "Knowledge Representation and Reasoning"The Morgan Kaufmann Series in Artificial Intelligence 2004.
3.	John F. Sowa, "Knowledge Representation: Logical, Philosophical, and Computational Foundations", 2000.
4.	Simon Kendal, Malcolm Creen, An Introduction to Knowledge Engineering, Springer, 2007
5.	Thomas B.Cross, Knowledge Engineering 2010, Techtionary Corporation, 2010.

191ITE703T	MOBILE AND WIRELESS SECURITY	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Mobile Computing, Computer Networks

COURSE OBJECTIVES:

1.	To understand the fundamentals of mobile cellular networks and IEEE wireless networks
2.	To learn the basic security fundamentals
3.	To understand the security issues in Wi-Fi and Wi-Max
4.	To explore the security issues in Next generation mobile networks
5.	To understand the security issues and key management in ad-hoc networks.
6.	To study the hacking techniques in IEEE 802.11

UNIT	TITLE	PERIODS
I	**INTRODUCTION TO MOBILE AND WIRELESS NETWORKS**	9

Introduction to mobile cellular networks - Cellular network basic concepts IEEE wireless networks, WLAN: IEEE - 802.11 WMAN mobile: IEEE 802.20 - Mobile Internet networks - Security in the digital age - Threats and risks to Telecommunication systems - From wireline vulnerabilities to vulnerabilities in wireless communications.

UNIT	TITLE	PERIODS
II	**WI-FI SECURITY**	9

Attacks on wireless networks - IEEE 802.11 Security mechanisms: WEP (Wired Equivalent Privacy) and Shortcomings - Security in 802.1x: Authentication - The 802.11i security architecture: Radio security policies - Authentication in wireless networks - WiMAX Security - Security evolution in WiMAX standards - WiMAX low layers - Security according to the IEEE-802.16e: Standard Authentication with PKMv2-RSA, PKMv2-EAP.

UNIT	TITLE	PERIODS
III	**EMERGING TECHNOLOGIES**	9

Security in Next Generation Mobile Networks – The SIP – VoIP: security flaws Making VoIP secure - IP Multimedia Subsystem (IMS): IMS architecture and security - 4G security: Confidentiality - Security of IP-Based Mobile Networks: Security issues related to mobility - Mobility with MIPv6: IPv6 mobility mechanisms - Mobile IPv6 bootstrapping Mobility - Mobile IPv4 - Mobility with MOBIKEIP mobility with HIP.

UNIT	TITLE	PERIODS
IV	**SECURITY IN AD HOC NETWORKS**	9

Motivations and application fields - Routing protocols- Attacks to routing protocols - Security mechanisms - Key Management in Ad Hoc Networks - The threshold cryptography technique - Self-managed PKI - Key agreement technique within MANETs - Cryptographic identifiers - The Resurrecting Duckling technique - Group key management within ad hoc networks - Comparison metrics Approaches for Group key management.

UNIT	TITLE	PERIODS
V	**ETHICAL HACKING TECHNIQUES**	9

Hacking - Scanning and Enumerating 802.11 Networks -Windows Sniffing/Injection Tools - Attacking 802.11 Wireless Networks Security Through Obscurity - Attacking WPA-Protected 802.11 Networks - Breaking Authentication: WPA-PSK- Breaking Authentication: WPA Enterprise Attack 802.11 Wireless Clients - Attacking the Application Layer - Dynamically Generating Rogue APs and Evil Servers with Karmetas ploit-Direct Client Injection Techniques.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will be able to:	
CO1:	Develop the knowledge on mobile, threats in wireless networks and wireless security.
CO2:	Illustrate the security mechanism in Wi-Fi and WiMAX.
CO3:	Analyze security issues in Next generation mobile networks.
CO4:	Apply key management in ad-hoc networks.
CO5:	Defend against webserver attacks, including wireless and mobile hacking.
CO6:	Design secured network application considering all possible threats.

TEXT BOOKS:

1.	Hakima Chaouchi, Maryline Laurent-Maknavicius, "Wireless and Mobile Network Security Security Basics, SecurityinOn-the shelf and Emerging Technologies", John Wiley & SonsInc, 2009.

REFERENCE BOOKS:

1.	Johnny Cache, Joshua Wright, VincentLiu, "Hacking Exposed Wireless: Wireless Security Secrets& Solutions", Second Edition, McGraw-Hill, 2010.
2.	LeiChen, JiahuangJi, ZihongZhang," Wireless Network Security : The oriesand Applications", Higher Education Press,2013

191ITE704T	SECURITY GOVERNANCE RISK AND COMPLIANCE	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	To develop skills so as to provide thorough knowledge and insight into the corporate governance framework
2.	To develop skills so as to provide thorough knowledge and insight into the spectrum of risks faced by businesses.
3.	To acquire the knowledge on effective information security systems
4.	To develop the ability to implement an effective systems to ensure compliance management.
5.	To acquire the knowledge of ethics in business

UNIT	TITLE	PERIODS
I	**GOVERNANCE**	9

Introduction to IT Governance– Conceptual Frame work of Corporate Governance–Definition of Corporate Governance, need, Elements, Evolution of Governance, Legislative Frame work of Corporate Governance – Principles and Periodic Disclosures, Basic committee on Corporate Governance, Models and Guidelines covering some aspects of IT Governance –Board committees, need, committee management, selection and appointment, Audit committee - Corporate Governance and Stakeholders – Evolution of stakeholder theory, stakeholder engagement, stakeholder analysis.

UNIT	TITLE	PERIODS
II	**RISK MANAGEMENT**	9

IT Risk Management Life Cycle - Risk Analysis- Risk Measurement–Risk Mitigation –Risk Elimination-Risk Management Committee – Clarification and Investigation –Role of Internal audit–Risk audit – Risk Related Disclosures.

UNIT	TITLE	PERIODS
III	**INFORMATION SECURITY**	9

Information Security Overview - Privacy Overview - Security and Privacy of Consumer Financial Information- Security and Privacy of Information Belonging to Children and Educational Records- Security and Privacy of Health Information- Corporate Information Security and Privacy Regulation - Federal Government Information Security and Privacy Regulation- State Laws Protecting Citizen Information and Breach Notification Laws.

UNIT	TITLE	PERIODS
IV	**COMPLIANCE MANAGEMENT**	9

Significance of Compliance and it Types - Corporate Compliance Management and its Significance- Effective Compliance Program:-Essentials and Challenges - Corporate Compliance Management: - Scope and Process- Checklist for setting up a Good Compliance Program- Internal Compliance Reporting Mechanism (ICRM).

UNIT	TITLE	PERIODS
V	**ETHICS**	9

Ethics-Business Ethics and its Advantages- Context and Relevance of Business Ethics In Today's Business- Five

Bottom Lines of The Future- Organization Structure and Ethics- Ethical Dilemma- Steps to resolving an Ethical Dilemma- Big Data and its Impact- Values and Actions - Aligning Values and actions: Methods and Tools- Alignment Methodology Framework.

		TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will learn:

CO1:	Develop the knowledge on IT Governance and corporate governance framework.
CO2:	Assess the risks faced by various businesses.
CO3:	Implement various techniques for information security systems.
CO4:	Apply ethical values in business.
CO5:	Develop the knowledge in governance risk and compliance tool.
CO6:	Evaluate the process to ensure compliance management.

TEXT BOOKS:

1.	Iannarelli, J. G., & O'Shaughnessy, M. O. (2015). Information governance and security:
2.	Protecting and managing your company's proprietary information. Waltham, MA: Butterworth Heinemann, Elsevier
3.	Van Wyk, K. R., Graff, M. G., Peters, D. S., & Burley, D. L. (2015). Enterprise software security: A confluence of disciplines. Upper Saddle River, NJ: Pearson Education.
4.	Legal Issues in Information Security, Joanna Lyn Grama, 2015. Jones & Bartlett Learning, Second Edition, ISBN: 978-1-284-05474-3.
5.	Ethics of Big Data, Kord Davis, 2012. O'Reilly Media, ISBN: 978-1449311797

191ITE705T	CLOUD BIG DATA ESSENTIALS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Object Oriented Programming, Database Management System

COURSE OBJECTIVES:

1.	Understand the Big Data Platform and its Use cases
2.	Provide an overview of Apache Hadoop
3.	Provide HDFS Concepts and Interfacing with HDFS
4.	Understand Map Reduce Jobs
5.	Provide hands on Hadoop Eco System

UNIT	TITLE	PERIODS
I	**INTRODUCTION TO BIG DATA AND HADOOP**	9

Types of Digital Data - Introduction to Big Data - Big Data Analytics - History of Hadoop - Apache Hadoop - Analyzing Data with Unix tools - Analyzing Data with Hadoop- Hadoop Streaming - Introduction to Infosphere Big Insights and Big Sheets.

UNIT	TITLE	PERIODS
II	**HDFS (HADOOP DISTRIBUTED FILE SYSTEM)**	9

The Design of HDFS - HDFS Concepts - Command Line Interface - Hadoop file system interfaces - Data flow - Data Ingest with Flume and Scoop and Hadoop archives - Hadoop I/O: Compression - Serialization.

UNIT	TITLE	PERIODS
III	**MAP REDUCE**	9

Anatomy of a Map Reduce Job Run – Failures - Job Scheduling - Shuffle and Sort - Task Execution - Map Reduce Types and Formats - Map Reduce Features.

UNIT	TITLE	PERIODS
IV	**HADOOP ECO SYSTEM**	9

Pig: Introduction to PIG - Execution Modes of Pig - Comparison of Pig with Databases - Grunt, -pig Latin- User Defined Functions- Data Processing operators. Hive: Hive Shell- Hive Services- Hive Metastore- Comparison with Traditional Databases- HiveQL, Tables, Querying Data and User Defined Functions. Hbase: HBasics – Concepts – Clients – Example - Hbase versus RDBMS.

UNIT	TITLE	PERIODS
V	**CASE STUDY -CLOUD ENVIRONMENT**	9

AWS - GAE – EUCALYPTUS, Health care-Telecom,-Privacy preserving Data analytics-Smart Homes Data analytics in intelligent transport system- Analytics in banking sector.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1:	Apply different use cases in big data.
CO2:	Develop the knowledge on Apache Hadoop.
CO3:	Build Hadoop Distributed File System for data storage system.
CO4:	Develop big data application using MapReduce and HDFS.
CO5:	Implement different Hadoop Eco system techniques for file management.
CO6:	Design big data application for real world problems.

TEXT BOOKS:

1.	Tom White "Hadoop: The Definitive Guide" Third Edition, O'reily Media, 2012.
2.	Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

REFERENCE BOOKS:

1.	Anand Raja Raman and Jef rey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012.
2.	Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
3.	Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
4.	Glen J. Myat, "Making Sense of Data", John Wiley & Sons, 2007
5.	Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
6.	Michael Mineli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
7.	Pete Warden, "Big Data Glossary", O'Reily, 2011.
8.	Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press

191ITE706T	CLOUD STRATEGY PLANNING AND MANAGEMENT	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Principles of Cloud Computing, Software Engineering

COURSE OBJECTIVES:

1.	Understand the concepts and technological advances fueling the rapid adoption of cloud computing today.
2.	Identify the roles and issues of cloud computing in the business process.
3.	Provides the students with the skills and knowledge required to plan and manage a Cloud Computing strategy within an organization.
4.	Understand the strategic value of Cloud Computing using IT Governance and Compliance.
5.	Learn about cloud computing and Service Oriented Architecture (SOA) can deliver business agility.

UNIT	TITLE	PERIODS
I	**ACHIEVING BUSINESS VALUE FROM IT TRANSFORMATION**	9

Cloud Architecture and strategy–Business Process Management, Porter's Value chain model, Business Process Re-engineering-Developing Business Strategy-Investigate business strategy models - Advantages - SWOT/PEST.

UNIT	TITLE	PERIODS
II	**STRATEGIC IT LEADERSHIP**	9

Roles of the strategic IS/IT leader -the Chief Information Officer and Chief Technology Officer (CTO) - planning - Managing –IT Strategic development In organization.

UNIT	TITLE	PERIODS
III	**CLOUD COMPUTING BASED IT STRATEGY**	9

Develop an IT strategy - deliver strategic business objectives - IT Project planning - IaaS, SaaS, PaaS -delivering a successful strategic IT Planning in IaaS.

UNIT	TITLE	PERIODS
IV	**SOA AND BUSINESS AGILITY**	9

Service Oriented Architecture (SOA) in Private/Public Cloud. Services, Databases and Applications on demand .enterprise Architecture - traditional frameworks- Zachman, Open Group Architecture Framework (TOGAF).

UNIT	TITLE	PERIODS
V	**BENEFIT REALIZATION AND IT GOVERNANCE**	9

Managing resources (people, process, technology)- benefit from Private/Public Cloud- IT services (IaaS, PaaS,SaaS-Gartner's 5 pillars of benefit realization- IT governance - delivery of IT Strategy from Cloud IT Services - Sarbanes Oxley (CobiT) .

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will learn:	
CO1:	Apply various strategies of cloud computing to improve business performance.
CO2:	Develop different IT strategies to achieve standard business objectives.
CO3:	Analyze the role of cloud to improve business process.
CO4:	Select strategic values of cloud computing using IT governance and compliance.
CO5:	Compare the benefits of business realization using cloud IT services.
CO6:	Assess various plan for IT Strategic development to improve the standardization of process.

REFERENCE BOOKS:	
1.	Andy Mulholland, Jon Pyke, Peter Finger, "Enterprise Cloud Computing - A Strategy Guide for Business and Technology Leaders", Meghan Kiffer [ISBN: 0929652290], 2010.
2.	Arnold J Cummins, "Easiest Ever Guide to Strategic IT Planning" http://strategicitplanningguide.com/
3.	Charles Babcock, "Management Strategies for the Cloud Revolution", 1st Ed., Tata McGraw/Hill [ISBN: 0071740759], 2010.
4.	David S. Linthicum, "Cloud Computing and SOA Convergence in Your Enterprise", Addison Wesley [ISBN: 0136009220], 2009.
5.	Mark I. Williams, "A Quick Start Guide to Cloud Computing: Moving Your Business into the Cloud" Kogan Page [ISBN: 0749461306], 2010.
6.	Website: "Whitepapers and news for the CIO" www.cio.com.
7.	Website: "Gartner Research Website" www.gartner.com

191ITE707T	ROBOTICS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Computational Intelligence

COURSE OBJECTIVES:

1.	Study the concepts of Artificial Intelligence.
2.	Learn the methods of solving problems using Artificial Intelligence.
3.	Introduce the concepts of Expert Systems and machine learning.
4.	Learn about planning and reasoning artificial intelligence.
5.	Solve the risk in artificial intelligence.

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

History, state of the art, Need for AI in Robotics. Thinking and acting humanly, intelligent agents, structure of agents. PROBLEM SOLVING: Solving problems by searching –Informed search and exploration–Constraint satisfaction problems– Adversarial search, knowledge and reasoning– knowledge representation – first order logic.

UNIT	TITLE	PERIODS
II	**PLANNING**	9

Planning with forward and backward State space search – Partial order planning – Planning graphs– Planning with propositional logic – Planning and acting in real world.

UNIT	TITLE	PERIODS
III	**REASONING**	9

Uncertainty – Probabilistic reasoning–Filtering and prediction–Hidden Markov Models–Kalman filters– Dynamic Bayesian Networks, Speech recognition, Making Decisions.

UNIT	TITLE	PERIODS
IV	**LEARNING**	9

Forms of learning – Knowledge in learning – Statistical learning methods – reinforcement learning, communication, perceiving and acting, Probabilistic language processing, Perception.

UNIT	TITLE	PERIODS
V	**AI IN ROBOTICS**	9

Robotic perception, localization, mapping- configuring space, planning uncertain movements, dynamics and control of movement, Ethics and risks of artificial intelligence in robotics.

		TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will be able to:	
CO1:	Identify amendable problem solutions using AI methods.
CO2:	Select appropriate AI methods to solve a real time problems.
CO3:	Apply various reasoning techniques in decision making.
CO4:	Design various learning algorithms for effective automation.
CO5:	Deploy the various AI algorithms to customize the system.
CO6:	Design empirical evaluation of different algorithms.

TEXT BOOKS:

1.	Stuart Russell, Peter Norvig, "Artificial Intelligence: A modern approach", Pearson Education, India2003.
2.	Negnevitsky, M, "Artificial Intelligence: A guide to Intelligent Systems", Harlow: Addison-Wesley, 2002.

REFERENCE BOOKS:

1.	David Jefferis, "Artificial Intelligence: Robotics and Machine Evolution", Crabtree Publishing Company, 1992.

191ITE708T	GENETIC ALGORITHMS	Periods per week				Credits
		L	T	P	R	
		3	**0**	**0**	**0**	**3**

PREREQUISITES:
NIL

COURSE OBJECTIVES:

1.	Foundation for understanding Genetic Algorithm
2.	Understanding the Mathematical foundations in genetic algorithms
3.	Implementation of genetic algorithm
4.	Understand advanced operators and techniques in Genetic Search
5.	Develop applications of genetics based machine learning

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

Genetic Algorithms –Traditional Optimization – Goals of Optimization – Genetic Algorithm vs Traditional Methods- a Simple GA- a Genetic Algorithm by Hand.

UNIT	TITLE	PERIODS
II	**MATHEMATICAL FOUNDATIONS AND PROBLEM SOLVING**	9

Evolving Computer Programs-Data Analysis and Prediction-Evolving Neural Networks-The Fundamental Theorem-The Two-Armed and k-armed Bandit Problem- the Building Block Hypothesis – The Minimal Deceptive Problem-Royal Roads

UNIT	TITLE	PERIODS
III	**IMPLEMENTATION**	9

Data Structures- Reproduction, Crossover and Mutation- Fitness Scaling- Coding's- Discretization- Genetic Algorithm applications of Historical Interest-De Jong and Function Optimization – Current Applications of Genetic Algorithms.

UNIT	TITLE	PERIODS
IV	**ADVANCED OPERATORS AND TECHNIQUES**	9

Dominance, Diploid and Abeyance- Inversion and other reordering operators- Micro-operators-Duplication and Deletion-Niche and Speciation-Multi objective Optimization-Knowledge Based Techniques- Genetic Algorithms and Parallel Processors.

UNIT	TITLE	PERIODS
V	**GENETICS BASED MACHINE LEARNING**	9

Genetic Based Machine Learning- Classifier System-Rule and Message System-The Bucket Brigade-A Simple Classifier System in Pascal-The Rise of GBML-First Classifier System-Smith's Poker Player-Current Applications

	TOTAL PERIODS:	45

COURSE OUTCOMES:
Upon completion of this course, student will learn:

CO1:	Outline the basics of genetic algorithm.
CO2:	Make use of various mathematical foundations for problem solving
CO3:	Analyze the different techniques used in Genetic Algorithm
CO4:	Design domain specific applications using genetic algorithm
CO5:	Compare the various operators in Genetic Search.
CO6:	Apply genetic based machine learning techniques to solve problems

TEXT BOOKS:

1.	David E. Goldberg – "Genetic Algorithms in search, Optimization and Machine Learning", Pearson Education
2.	Mitchell Melanie, An Introduction to Genetic Algorithms, MIT Press, 1998, ISBN 0-262-63185-7

REFERENCE BOOKS:

1.	Rawlins.G Fundamental principles of deception in genetic search. Foundations Of Genetic Algorithms Morgan Kaufmann.
2.	http://www.iitg.ac.in/rkbc/ce515/ce515.htm
3.	https://link.springer.com/article/10.1007/BF00175354
4.	Mitchell, An Introduction to Genetic Algorithms. MIT Press, 1998 (paper)

SYLLABUS OF

PROFESSIONAL ELECTIVE - IV

COURSES

191ITE711T	NATURAL LANGUAGE PROCESSING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Principles of Compiler Design

COURSE OBJECTIVES:

1.	To understand the representation and processing of morphology.
2.	To understand the Part-of Speech Taggers
3.	To appreciate various techniques used for speech synthesis and recognition
4.	To understand different aspects of natural language syntax.
5.	To know various methods used for processing syntax and disambiguating word senses
6.	To gain knowledge of the various representations of semantics.

UNIT	TITLE	PERIODS
I	**MORPHOLOGY**	9

Introduction –Regular Expressions and Automata- Non-Deterministic FSAs. Transducers –English Morphology - Finite-State Morphological Parsing - Porter Stemmer - Tokenization- Detection and Correction of Spelling Errors. N-grams – Perplexity - Smoothing - Interpolation – Back off.

UNIT	TITLE	PERIODS
II	**PART-OF SPEECH PROCESSING**	9

Part-of- Speech Tagging – English Word Classes - Tag sets - Rule-Based - HMM - Transformation-Based Tagging - Evaluation and Error Analysis. Hidden Markov and Maximum Entropy Models.

UNIT	TITLE	PERIODS
III	**SPEECH PROCESSING**	9

Phonetics – Articulatory Phonetics - Phonological Categories - Acoustic Phonetics and Signals - Speech Synthesis – Text Normalization – Phonetic and Acoustic Analysis - Diphone Waveform synthesis – Evaluation- Automatic Speech Recognition –Architecture - Hidden Markov Model to Speech - MFCC vectors - Acoustic Likelihood Computation - Evaluation. Triphones – Discriminative Training - Modeling Variation.

UNIT	TITLE	PERIODS
IV	**SYNTAX ANALYSIS**	9

Formal Grammars of English – Constituency - Context-Free Grammars –Grammar Rules – Treebanks - Finite-State and Context-Free Grammars - Dependency Grammars. Syntactic Parsing – Parsing as Search - Ambiguity - Dynamic Programming Parsing Methods –CKY- Earley and Chart Parsing- Partial Parsing Evaluation.

UNIT	TITLE	PERIODS
V	**SEMANTIC AND PRAGMATIC INTERPRETATION**	9

Representation of Meaning – Desirable Properties - Computational Semantics -Word Senses - Relations Between Senses – WorldNet - Event Participants- Proposition Bank -Frame Net -– Metaphor. Computational Lexical Semantics – Word Sense Disambiguation- Supervised Word Sense Disambiguation - Dictionary and Thesaurus Methods- Word Similarity.

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1:	Outline the various linguistic components of sentences.
CO2:	Identify the parts-of speech in the sentences.
CO3:	Develop formal grammar to analyze and identify the text.
CO4:	Apply machine learning algorithm for speech processing.
CO5:	Adapt machine learning techniques in NLP.
CO6:	Build a tagger to semantically tag words using Word Net.

REFERENCE BOOKS:

1.	Jurafsky and Martin, "Speech and Language Processing", Pearson Prentice Hall, Second Edition, 2008.
2.	Christopher D. Manning and Hinrich Schütze, "Foundations of Statistical Natural Language Processing", MIT Press, 1999.
3.	Stevan Bird, "Natural Language Processing with Python", Shroff, 2009.
4.	James Allen, "Natural Language Understanding", Addison Wesley, Second Edition, 2007.
5.	Nitin Indurkhya, Fred J. Damerau, "Handbook of Natural Language Processing", (Chapman & Hall/CRC Machine Learning & Pattern Recognition), Second Edition, 2010.
6.	Alexander Clark, Chris Fox, Shalom Lappin, "The Handbook of Computational Linguistics and Natural Language Processing", Wiley-Blackwell, 2012.

191ITE712T	BUSINESS INTELLIGENCE	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	To be exposed with the basic rudiments of business intelligence system
2.	To understand the modeling aspects behind Business Intelligence
3.	To understand of the business intelligence life cycle and the techniques used in it
4.	To be exposed with different data analysis tools and techniques
5.	To understand Visualization techniques.

UNIT	TITLE	PERIODS
I	**BUSINESS INTELLIGENCE**	9

Introduction to BI-Effective and timely decisions – Data, information and knowledge – Role of mathematical models – Business intelligence architectures: Business Intelligence cycle – Enabling factors in business intelligence projects – Development of a business intelligence system – Ethics and business intelligence.

UNIT	TITLE	PERIODS
II	**KNOWLEDGE DELIVERY**	9

The business intelligence user types, Standard reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing the Presentation for the Right Message.

UNIT	TITLE	PERIODS
III	**EFFICIENCY MEASURES**	9

Efficiency measures – The CCR model: Definition of target objectives - Peer groups – Identification of good operating practices; cross efficiency analysis – virtual inputs and outputs – Other models. Pattern matching – cluster analysis, outlier analysis.

UNIT	TITLE	PERIODS
IV	**BUSINESS INTELLIGENCE APPLICATIONS**	9

Data mining for business applications like credit card fraud detection-Clickstream mining - Market Segmentation-retail industry –telecommunication industry –banking & finance CRM.

UNIT	TITLE	PERIODS
V	**FUTURE OF BUSINESS INTELLIGENCE**	9

Future of business Intelligence – Emerging Technologies, Machine Learning, Predicting the Future,BI Search & Text Analytics – Advanced Visualization – Rich Report, Future beyond Technology.

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will learn:

CO1:	Explain the fundamentals of business Intelligence.
CO2:	Choose predictive analytics techniques for real time applications.
CO3:	Apply Business Intelligence tools for data analysis
CO4:	Analyze the efficiency of data analysis models.
CO5:	Explore dataset and visualize data for decision making.
CO6:	Build Business Intelligent system for predictive analytics.

TEXT BOOKS:

1.	Efraim Turban, Ramesh Sharda, Dursun Delen, "Decision Support and Business Intelligence Systems", 9th Edition, Pearson 2013.

REFERENCE BOOKS:

1.	Larissa T. Moss, S. Atre, "Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making", Addison Wesley, 2003.
2.	Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for Decision Making", Wiley Publications, 2009.
3.	David Loshin Morgan, Kaufman, "Business Intelligence: The Savvy Manager's Guide", Second Edition, 2012.
4.	Cindi Howson, "Successful Business Intelligence: Secrets to Making BI a Killer App", McGraw-Hill, 2007.
5.	Ralph Kimball , Margy Ross , Warren Thornthwaite, Joy Mundy, Bob Becker, "The Data Warehouse Lifecycle Toolkit", Wiley Publication Inc.,2007.

191ITE713T	MALWARE ANALYSIS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Basic knowledge of Computer Networks and various types of attacks

COURSE OBJECTIVES:

1.	Understand the fundamentals of static and dynamic analysis.
2.	Gain knowledge about running malware in virtual environment.
3.	Explore popular plug-ins that make writing IDA scripts easier, allow collaborative reverse engineering.
4.	Study about disassembly constructs and its structures.
5.	Understand how to best approach the subject of Android malware threats and analysis.

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

Introduction to malware- OS security concepts- malware threats-evolution of malware- malware types viruses, worms- rootkits- Trojans-bots-spyware- adware- logic bombs- malware analysis- static malware analysis--dynamic malware analysis.

UNIT	TITLE	PERIODS
II	**STATIC ANALYSIS**	9

X86 Architecture- Main Memory, Instructions, Opcodes and Endianness, Operands, Registers, Simple Instructions, The Stack, Conditionals, Branching, Rep Instructions, C Main Method and Offsets. Antivirus Scanning- Fingerprint for Malware- Portable Executable File Format- The PE File Headers and Sections- The Structure of a Virtual Machine, Reverse Engineering- x86 Architecture, recognizing c code constructs in assembly, c++ analysis- Analyzing Windows programs-Anti-static analysis techniques obfuscation-packing, metamorphism- polymorphism.

UNIT	TITLE	PERIODS
III	**DYNAMIC ANALYSIS**	9

Live malware analysis, dead malware analysis- analyzing traces of malware- system-calls, api-calls, registries, network activities-Anti-dynamic analysis techniques anti-vm-runtime-evasion techniques, , Malware Sandbox, Monitoring with Process Monitor, Packet Sniffing with Wireshark, Kernel vs. User-Mode Debugging, OllyDbg, Breakpoints, Tracing, Exception Handling, Patching.

UNIT	TITLE	PERIODS
IV	**MALWARE FUNCTIONALITY**	9

Downloader- Backdoors- Credential Stealers-Persistence Mechanisms- Privilege Escalation- Covert malware launching- Launchers- Process Injection- Process Replacement-Hook Injection- Detours, APC injection.

UNIT	TITLE	PERIODS
V	**MALWARE DETECTION TECHNIQUES**	9

Signature-based techniques- malware signatures-packed malware signature- metamorphic and polymorphic malware signature- Non-signature based techniques- similarity-based techniques- machine-learning methods-invariant inferences.

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1:	Apply the OS security concepts to detect malware threats.
CO2:	Design the tools and methodologies used to perform static and dynamic analysis on unknown executables.
CO3:	Analyze various executable formats, Windows internals and API, and analysis techniques.
CO4:	Interpret new anti-analysis techniques and unpack, extract, decrypt, or bypass in future malware samples.
CO5:	Develop code graphing using cross references and function calls.
CO6:	Examine social, economic, and historical context to detect the occurance of malware.

TEXT BOOKS:

1.	Michael Sikorski and Andrew Honig, Practical malware analysis The Hands-On Guide to Dissecting Malicious Software. ISBN-10: 159327-290-1, ISBN-13: 978-1-59327-290-6, 2012 2
2.	Filiol, Computer viruses: from theory to applications, Eric Springer Science & Business Media, 2006.

REFERENCE BOOKS:

1.	Xuxian Jiang and Yajin Zhou ,Android Malware , Springer ISBN 978-1-4614-7393-0, 2005
2.	Michael Davis, Sean Bodmer, Aaron Lemasters ,Hacking exposed™ malware & rootkits: malware & rootkits security secrets & Solutions, McGraw-Hill, ISBN: 978-0-07-159119-5, 2010
3.	Victor Marak ,Windows Malware Analysis Essentials , Packt Publishing, 2015
4.	https//:www.malware-analyzer.com
5.	http://resources.infosecinstitute.com/malware-analysis-basic-dynamictechniques/#gref
6.	http:://www.remux.org

191ITE714T	SECURE CODING AND PRINCIPLES	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	To study the need for secure systems
2.	To understand the security principles and architecture.
3.	To design Secure Threat Modeling.
4.	To Study the concept of determining Appropriate Access Control.
5.	To understand the automation of testing tools for secure systems.

UNIT	TITLE	PERIODS
I	**INTRODUCTION TO SECURE SYSTEMS**	9

The Need for Secure Systems -Applications on the Wild- Wild Web -The Need for Trustworthy Computing -Getting Everyone's Head in the Game -Using Tact to Sell Security to the Organization -Using Subversion -Some Ideas for Instilling a Security Culture -Get the Boss to Send an E-Mail -Nominate a Security Evangelist-The Attacker's Advantage and the Defender's Dilemma.

UNIT	TITLE	PERIODS
II	**SECURITY PRINCIPLES**	9

Architecture - What Is Security Architecture - Principles of Security Architecture - Case Study: The Java Sandbox - Design - Secure by Design, by Default, and in Deployment -Secure by Design-Secure by Default -Secure in Deployment-Security Principles.

UNIT	TITLE	PERIODS
III	**THREAT MODELING**	9

Why Does Good Design Matter - Secure Design Steps - Special Design Issues - Bad Practices – Secure Design Through Threat Modeling -Assemble the Threat-Modeling Team -Decompose the Application -Determine the Threats to the System.

UNIT	TITLE	PERIODS
IV	**DETERMINING APPROPRIATE ACCESS CONTROL**	9

Good Practices - Bad Practices - Why ACLs Are Important-A Diversion: Fixing the Registry Code -What Makes Up an ACL?-A Method of Choosing Good ACLs-Effective Deny ACEs -Creating ACLs-Creating ACLs in Windows NT - Creating ACLs in Windows 2000-Creating ACLs with Active Template Library.

UNIT	TITLE	PERIODS
V	**CASE STUDY**	9

Case Studies - Automation and Testing - Good General Practices - Good Practices Through the Lifecycle - Risk Assessment Methodologies- Case Studies.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will learn:

CO1:	Develop basic secure software system by standard practices.
CO2:	Design security architecture using security principles.
CO3:	Evaluate Secure Threat Model for protecting the system from vulnerabilities.
CO4:	Create appropriate access control mechanisms in Windows.
CO5:	Apply the suitable testing tool for automating the system.
CO6:	Analyze the risks using risk assessment methodologies for secure systems

TEXT BOOKS:

1.	Mark G. Graff, Kenneth R. van Wyk,"Secure Coding: Principles & Practices", O'Reilly, Pub Date: June 2003.

REFERENCE BOOKS:

1.	Michael Howard and David LeBlanc, "WRITING SECURE CODE", Microsoft Press, A Division of Microsoft Corporation, Microsoft 2 Edition.

191ITE715T	IOT -ARCHITECTURE PROTOCOLS AND SECURITY	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Internet of Things, Computer Networks

COURSE OBJECTIVES:

1.	To learn about what IoT is and how it works.
2.	Protocols that contributed to the emergence of IoT
3.	Design and program IoT devices
4.	Secure the elements of an IoT device
5.	Understand the importance of security in IoT devices.

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

Introduction to IoT- Characteristics -Physical design- Logical design-Functional blocks-Communication models and APIs.

UNIT	TITLE	PERIODS
II	**ARCHITECTURE AND PROTOCOLS**	**9**

IoT Reference Model -Functional View-IoT standards and Protocols- Bluetooth- Wi-Fi- Zigbee- MQTT IoT- CoAP-DSS-RFID-sigfoX.

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

IoT design Methodology – Implementing IoT- Introduction to Arduino Programming – Integration of Sensors and Actuators with Arduino- Python Packages for IoT- Introduction to Raspberry Pi

UNIT	TITLE	PERIODS
IV	**SECURITY OVERVIEW**	**9**

IoT Security Challenges-Hardware Security Risks - Hardcoded/Default Passwords -Resource Constrained Computations -Legacy Assets Connections - Devices Physical Security, Software Security Risks -Software Vulnerabilities -Data Interception - Identification of Endpoints -Tamper Detection.

UNIT	TITLE	PERIODS
V	**APPLICATIONS**	**9**

Domain specific applications of IoT -Home automation- Industry applications- Surveillance applications-Other IoT applications

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will be able to:	
CO1:	Analyze the basic concept of IoT functional blocks.
CO2:	Design the IoT reference models using various standard protocols.
CO3:	Create interoperability among IoT devices using Arduino.
CO4:	Evaluate security mechanism in IoT applications.
CO5:	Apply various hardware and software solutions to handle IoT security issues.
CO6:	Develop domain specific IoT applications.

REFERENCE BOOKS:	
1.	Dimitrios Serpanos and Tilman Wolf, "Internet-of-Things (IoT) Systems: Architectures, Algorithms, Methodologies", Springer
2.	Perry Lea," Internet of Things for Architects: Architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics, and security" Packet Publishing.

191ITE716T	CLOUD SECURITY	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	Understand about the basic concepts of security systems
2.	Learn about various cryptographic protocol to design cloud security System
3.	Learn about the security issues related to multi-tenancy
4.	Understand about compliance issues that arise from cloud computing
5.	Learn different methods to improve virtualization security

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

Confidentiality, privacy, integrity, authentication, non-repudiation, availability, access control, defence in depth, least privilege, User authentication in the cloud; Cryptographic Systems- Symmetric cryptography, stream ciphers, block ciphers, modes of operation, public-key cryptography, hashing, digital signatures, public-key infrastructures, key management, X.509 certificates, Open SSL.

UNIT	TITLE	PERIODS
II	**MULTI-TENANCY ISSUES**	9

Isolation of users/VMs from each other. Virtualization System Security Issues, ESX file system security, storage considerations, backup and recovery; Virtualization System Vulnerabilities- Management console vulnerabilities, management server vulnerabilities, administrative VM vulnerabilities, guest VM vulnerabilities, hypervisor vulnerabilities, hypervisor escape vulnerabilities, configuration issues, malware (botnets etc).

UNIT	TITLE	PERIODS
III	**VIRTUALIZATION SYSTEM-SPECIFIC ATTACKS**	9

Guest hopping, attacks on the VM (delete the VM, attack on the control of the VM, code or file injection into the virtualized file structure), VM migration attack, hyper-jacking.

UNIT	TITLE	PERIODS
IV	**VIRTUALIZATION-BASED SECURITY**	9

IBM security virtual server protection, virtualization-based sandboxing; Storage Security- HIDPS, log management, Data Loss Prevention. Location of the Perimeter.

UNIT	TITLE	PERIODS
V	**LEGAL AND COMPLIANCE ISSUES**	9

Responsibility, ownership of data, right to penetration test, local law where data is held, examination of modern Security Standards (eg PCIDSS), how standards deal with cloud services and virtualization, compliance for the cloud provider vs. compliance for the customer.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will learn:

CO1:	Categorize various cryptographic techniques for Cloud Security
CO2:	Compare and contrast various types of vulnerabilities
CO3:	Evaluate the security issues related to multi-tenancy
CO4:	Apply different technologies for virtualization based security Enhancement
CO5:	Appraise compliance issues that arise from cloud computing
CO6:	Analyze the Legal issues in offering cloud security.

REFERENCE BOOKS:

1.	Tim Mather, Subra Kumaraswamy, ShahedLatif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance" O'Reilly Media; 1 edition [ISBN: 0596802765], 2009.
2.	Ronald L. Krutz, Russell Dean Vines, "Cloud Security" [ISBN: 0470589876], 2010.
3.	John Rittinghouse, James Ransome, "Cloud Computing" CRC Press; 1 edition [ISBN: 1439806802], 2009.
4.	J.R. ("Vic") Winkler, "Securing the Cloud" Syngress [ISBN: 1597495921] 2011.
5.	Vmware "VMware Security Hardening Guide" White Paper, June 2011.
6.	Cloud Security Alliance 2010, "Top Threats to Cloud Computing" Microsoft 2013.
7.	Timothy Grance; Wayne Jansen; NIST "Guidelines on Security and Privacy in Public Cloud Computing", 2011.
8.	Evelyn Brown NIST "Guide to Security for Full Virtualization Technologies", 2011.

191ITE717T		Periods per week	Credits

	3D PRINTING AND DESIGN	L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	To Understand the basic concepts of 3D Printing Technology
2.	To Understand the principles and process involved in 3D printing
3.	To know the methods of inkjet printing
4.	To know the process and methods involved in laser technology
5.	To implement 3D models for various industrial applications

UNIT	TITLE	PERIODS
I	INTRODUCTION	9

Design considerations – Material, Size, Resolution, Process; Modelling and viewing - 3D; Scanning; Model preparation – Digital; Slicing; Software; File formats.

UNIT	TITLE	PERIODS
II	PRINCIPLE	9

Processes – Extrusion, Wire, Granular, Lamination, Photo polymerization; Materials - Paper, Plastics, Metals, Ceramics, Glass, Wood, Fiber, Sand, Biological Tissues, Hydrogels, Graphene; Material Selection - Processes, applications, limitations.

UNIT	TITLE	PERIODS
III	INKJET TECHNOLOGY	9

Printer - Working Principle, Positioning System, Printhead, Printbed, Frames, Motion control; Printhead Considerations – Continuous Inkjet, Thermal Inkjet, Piezoelectric Drop-On-Demand; Material Formulation for jetting; Liquid based fabrication – Continousjet, Mulitjet; Powder based fabrication – Colorjet;

UNIT	TITLE	PERIODS
IV	LASER TECHNOLOGY	9

Light Sources – Types, Characteristics; Optics – Deflection, Modulation; Material feeding and flow – Liquid, powder; Printing machines – Types, Working Principle, Build Platform, Printbed Movement, Support structures.

UNIT	TITLE	PERIODS
V	INDUSTRIAL APPLICATIONS	9

Product Models, manufacturing – Printed electronics, Biopolymers, Packaging, Healthcare, Food, Medical, Biotechnology, Displays; Open source; Future trends.

		TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will be able to:	
CO1:	Elaborate the 3D printing workflow
CO2:	Analyze the types of 3D Printing, materials and their applications
CO3:	Apply the basics principles of 3D printing in various materials
CO4:	Identify suitable methods for designing inkjet printers
CO5:	Choose appropriate method for modeling laser technology.
CO6:	Design 3D printing models for various industrial applications

TEXT BOOKS:

1.	Ian M. Hutchings, Graham D. Martin, "Inkjet Technology for Digital Fabrication", John Wiley & Sons, 2013.
2.	Christopher Barnatt, "3D Printing: The Next Industrial Revolution", Create Space Independent Publishing Platform, 2013.

REFERENCE BOOKS:

1.	Ibrahim Zeid, "Mastering CAD CAM" Tata McGraw-Hill Publishing Co.2007
2.	Joan Horvath, "Mastering 3D Printing", APress, 2014
3.	Chua, C.K., Leong K.F. and Lim C.S., "Rapid prototyping: Principles and applications", second edition, World Scientific Publishers, 2010

191ITE718T	PARALLEL PROGRAMMING USING OPENCL	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	Get the knowledge of parallel programming and computing
2.	Analysis of the performance of algorithms that is parallelizable
3.	Implementation of algorithms in OpenCL.
4.	Understand various OpenCL models.
5.	Demonstrate some real time applications using OpenCL.`

UNIT	TITLE	PERIODS
I	**INTRODUCTION TO PARALLEL PROGRAMMING**	9

Concurrency and parallel programming Model- Threads and Shared Memory-Message Passing Communication-Different Grains of Parallelism- Data Sharing and Synchronization-Structure.

UNIT	TITLE	PERIODS
II	**INTRODUCTION TO OPENCL**	9

OpenCL Standard- Specification- Kernels and OpenCL Execution Model OpenCL SDK kit-Platform and Devices-Host Device Interaction-Command Queues-Memory Objects-Execution Environment- Memory model- Writing kernel.

UNIT	TITLE	PERIODS
III	**OPENCL DEVICE ARCHITECTURE**	9

HARDWARE TRADE-OFFS -Super scalar execution –VLIW- SIMD and Vector Processing-Hardware Multithreading-Muti-core Architectures-Cache hierarchies and Memory Systems-The Architectural Design Space-CPU Design- GPU Architecture APU.

UNIT	TITLE	PERIODS
IV	**OPENCL CONCURRENCY**	9

Creating workgroups- Queuing synchronization – Global Synchronization-Memory Consistency in OpenCL-Host side Memory model- Manipulating Buffer Objects-Device side memory model-Device-Side Relaxed Consistency

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

Video -Introduction- Getting video frames- Processing video in OpenCL- Multiple videos with special effects-Mixed Particle Simulation – GPU implementation - CPU implementation.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will learn:

CO1:	Develop the knowledge on Parallel Programming.
CO2:	Analyse the performance of parallelizable algorithms.
CO3:	Implement algorithms in OpenCL.
CO4:	Build workgroups using OpenCL.
CO5:	Evaluate the efficiency of CPU and GPU using OpenCL.
CO6:	Develop real-time applications using OpenCL.

TEXT BOOKS:

1.	Benedict R.Gaster, Lee Howes David kaeli Perhaad Mistry Dana Schaa,"Heterogeneous Computing with OpenCL"
2.	Introduction to OpenCL Programming, Training Guide, May 2010.

REFERENCE BOOKS:

1.	Kirk.D and W. Hwu, ―Programming Massively Parallel Processorsǁ,Morgan Kaufmann,
2.	David A. Patterson and John L. Hennessy, ―Computer Organization and Design: The Hardware/Software Interface", Elsevier.
3.	Michael J.Quinn, "Parallel Computing ", 2nd edition, Tata McGraw-Hill Publishing company Limited

SYLLABUS OF

PROFESSIONAL ELECTIVE - V

COURSES

191ITE801T	BIO INSPIRED COMPUTING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Artificial Intelligence

COURSE OBJECTIVES:

1.	To learn bio-inspired theorem and algorithms.
2.	To Understand random walk and simulated annealing.
3.	To learn genetic algorithm and differential evolution.
4.	To learn swarm optimization and ant colony for feature selection.
5.	To understand bio-inspired application in image processing.

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

Introduction to algorithm - Newton ' s method - optimization algorithm - No-Free- Lunch Theorems - Nature-Inspired Mata heuristics -Analysis of Algorithms -Nature Inspires Algorithms -Parameter tuning and parameter control.

UNIT	TITLE	PERIODS
II	**RANDOM WALK AND ANNEALING**	9

Random variables - Isotropic random walks - Levy distribution and flights - Markov chains - step sizes and search efficiency - Modality and intermittent search strategy - importance of randomization- Eagle strategy-Annealing and Boltzmann Distribution - parameters -SA algorithm - Stochastic Tunneling.

UNIT	TITLE	PERIODS
III	**GENETIC ALGORITHMS AND DIFFERENTIAL EVOLUTION**	9

Introduction to genetic algorithms and - role of genetic operators - choice of parameters - GA varients - schema theorem - convergence analysis - introduction to differential evolution - varients - choice of parameters - convergence analysis – implementation.

UNIT	TITLE	PERIODS
IV	**SWARM OPTIMIZATION AND FIREFLY ALGORITHM**	9

Swarm intelligence - PSO algorithm - accelerated PSO - implementation - convergence analysis - binary PSO - The Firefly algorithm - algorithm analysis - implementation - Varients- Ant colony optimization toward feature selection.

UNIT	TITLE	PERIODS
V	**APPLICATIONS IN IMAGE PROCESSING**	9

Bio-Inspired Computation and its Applications in Image Processing: An Overview - Fine- Tuning Enhanced Probabilistic Neural Networks Using Meta-heuristic-driven Optimization - Fine-Tuning Deep Belief Networks using Cuckoo Search - Ground Glass Opacity Nodules Detection and Segmentation using Snake Model - Mobile Object Tracking Using Cuckoo Search.

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1:	Analyze the algorithms of Bio inspired computing.
CO2:	Design bio-inspired algorithms.
CO3:	Build the random walk and simulated annealing algorithm.
CO4:	Evaluate swarm intelligence and ant colony for feature selection.
CO5:	Apply genetic algorithms in real time application.
CO6:	Create bio-inspired techniques in image processing.

TEXT BOOKS:

1.	Eiben, A.E., Smith, James E,"Introduction to Evolutionary Computing", Springer 2015.
2.	Helio J.C. Barbosa, "Ant Colony Optimization - Techniques and Applications", Intech 2013

REFERENCE BOOKS:

1.	Xin-She Yang, Jaao Paulo papa, "Bio-Inspired Computing and Applications in Image Processing", Elsevier 2016.
2.	Xin-She Yang, "Nature Inspired Optimization Algorithm, Elsevier First Edition 2014.
3.	Yang, Cui, XIao, Gandomi, Karamanoglu,"Swarm Intelligence and Bio-Inspired Computing", Elsevier First Edition 2013.

191ITE802T	DATABASE SECURITY	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	Understand the fundamentals of security relates to information.
2.	Analyse how the security is maintained in information systems.
3.	Understand the concept of security models in database.
4.	Implementation of virtual private database.
5.	Learn the procedures of database auditing.
6.	Implementation of data mining algorithms for PPDM.

UNIT	TITLE	PERIODS
I	**SECURITY ARCHITECTURE FUNDAMENTALS**	9

Introduction-Information Systems-Database Management Systems-Information Security Architecture- Database Security -Asset Types and value-Security Methods-Operating System Security Fundamentals: Introduction-Operating System Overview -Security Environment-Security Components-Authentication Methods-User Administration-Password Policies-Vulnerabilities-Email Security-Internet security.

UNIT	TITLE	PERIODS
II	**AUTHENTICATION AND PASSWORD SECURITY**	9

Administration of Users-Introduction-Authentication-Creating Users-SQL Server User-Removing, Modifying Users-Default users-Remote Users-Database Links-Linked Servers-Remote Servers-Practices for Administrators and Managers-Profiles, Password Policies, Privileges and Roles: Introduction-Defining and Using Profiles-Designing and Implementing Password Policies-Granting and Revoking User Privileges-Creating, Assigning and Revoking User Roles.

UNIT	TITLE	PERIODS
III	**SECURITY MODELS AND VIRTUAL PRIVATE DATABASE**	9

Introduction-Types of Users-Security Models -Application Types-Application Security Models-Data Encryption-Virtual Private Databases: Introduction-Overview of VPD-Implementation of VPD using Views-Application Context in Oracle-Implementing Oracle VPD-Viewing VPD Policies-VPD using views-Application contexts using Data Dictionary-Policy Manager Implementing Row and Column level Security with SQL Server

UNIT	TITLE	PERIODS
IV	**AUDITING DATABASE ACTIVITIES**	9

Introduction-Oracle Database-Activities-Creating DLL Triggers with Oracle-Auditing Database Activities with Oracle-Auditing Server Activity with SQL Server 2000-Auditing Server-Activity with Oracle-Security and Auditing-Case study: Project security and auditing.

UNIT	TITLE	PERIODS
V	**PRIVACY PRESERVING DATA MINING TECHNIQUES**	9

Introduction-Data Mining Techniques-Privacy Preserving Data Mining Algorithms-General Survey-Data Mining

Techniques-Randomization Methods-Group Based Anonymization-Distributed Privacy Preserving Data Mining-Curse of Dimensionality-Application of Privacy Preserving Data Mining-Case study: on PPDM.

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will learn:

CO1:	Analyze fundamentals of security architecture for information security system.
CO2:	Evaluate the authentication and password security in database using policies and privileges.
CO3:	Build a model for database security.
CO4:	Implement VPD views and policies in various databases.
CO5:	Assess database and server audit activities in oracle and SQL Server.
CO6:	Apply various privacy preserving data mining techniques using PPDM algorithms.

REFERENCE BOOKS:

1.	Hassan A. Afyouni, "Database Security an Auditing", Third Edition, Cengage Learning, 2009.
2.	Ron Ben Natan,"Implementing Database Security and Auditing", Elsevier Digital Press, 2005.
3.	Charu C. Aggarwal, Philip S Yu, "Privacy Preserving Data Mining": Models and Algorithms, Kluwer Academic Publishers, 2008.

191ITE803T	SOFTWARE DEFINED NETWORKS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	To learn the fundamentals of software defined networks.
2.	To understand the separation of the data plane and the control plane.
3.	To understand the various Data Centers of SDN.
4.	To study about the SDN Programming.
5.	To study about the various applications of SDN.

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

History of Software Defined Networking (SDN) – Modern Data Center – Traditional Switch Architecture – Why SDN – Evolution of SDN – How SDN Works – Centralized and Distributed Control and Date Planes.

UNIT	TITLE	PERIODS
II	**OPEN FLOW & SDN CONTROLLERS**	9

Open Flow Specification – Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor-Based Overlays – SDN via Opening up the Device – SDN Controllers – General Concepts.

UNIT	TITLE	PERIODS
III	**DATA CENTERS**	9

Multitenant and Virtualized Multitenant Data Center – SDN Solutions for the Data Center Network – VLANs – EVPN – VxLAN – NVGRE.

UNIT	TITLE	PERIODS
IV	**SDN PROGRAMMING**	9

Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs – Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications.

UNIT	TITLE	PERIODS
V	**SDN FRAMEWORK**	9

Juniper SDN Framework – IETF SDN Framework – Open Daylight Controller –Floodlight Controller – Bandwidth Calendaring – Data Center Orchestration.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will be able to:	
CO1:	Analyze the evolution of software defined networks.
CO2:	Evaluate the flexibility and scalability of using SDN in innovation and network management.
CO3:	Apply the various Data Centers in SDN.
CO4:	Elaborate the use of SDN in the current networking scenario.
CO5:	Design and develop various applications in SDN.
CO6:	Develop different controllers using SDN Frameworks.

TEXT BOOKS:	
1.	Paul Goransson and Chuck Black, ―Software Defined Networks: A Comprehensive Approach, First Edition, Morgan Kaufmann, 2014.
2.	Thomas D. Nadeau, Ken Gray, ―SDN: Software Defined Networks, O'Reilly Media, 2013.

REFERENCE BOOKS:	
1.	Siamak Azodolmolky, ―Software Defined Networking with Open Flow, Packet Publishing, 2013
2.	Vivek Tiwari, ―SDN and Open Flow for Beginners‖, Amazon Digital Services, Inc., 2013
3.	Fei Hu, Editor, ―Network Innovation through Open Flow and SDN: Principles.

191ITE804T	FORENSICS AND INCIDENT RESPONSE	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Cryptography and Network Security

COURSE OBJECTIVES:

1.	Learn the security issues network layer and transport layer.
2.	Be exposed to security issues of the application layer.
3.	Learn computer forensics.
4.	Be familiar with forensics tools.
5.	Learn to analyze and validate forensics data

UNIT	TITLE	PERIODS
I	**NETWORK LAYER SECURITY & TRANSPORT LAYER SECURITY**	9

IPSec Protocol - IP Authentication Header - IP ESP - Key Management Protocol for IPSec. Transport layer Security: SSL protocol, Cryptographic Computations – TLS Protocol.

UNIT	TITLE	PERIODS
II	**E-MAIL SECURITY & FIREWALLS**	9

PGP - S/MIME - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - SET for E-Commerce Transactions.

UNIT	TITLE	PERIODS
III	**DIGITAL FORENSICS**	9

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques - Incident and incident response methodology - Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.

UNIT	TITLE	PERIODS
IV	**EVIDENCE COLLECTION AND FORENSICS TOOLS**	9

Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools.

UNIT	TITLE	PERIODS
V	**ANALYSIS AND VALIDATION**	9

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will learn:	
CO1:	Apply the basics of computer forensics and its terminologies using protocols.
CO2:	Analyze the security issues in network and transport layer by firewalls.
CO3:	Build Cyber Forensics technique to find the digital forensics.
CO4:	Evaluate the units and network traffic using forensics tools.
CO5:	Compare and validate forensics data in cyber security.
CO6:	Evaluate the Investigations techniques to handle ethical issues.

TEXT BOOKS:

1.	Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003.
2.	Nelson, Phillips, Enfinger, Steuart, "Computer Forensics and Investigations", Cengage Learning, India Edition, 2008.

REFERENCE BOOKS:

1.	Christopher Steuart, Bill Nelso, Amelia Phillips, "Guide Computer Forensics and Investigations", Cengage Learning, India, Fourth Edition, 2013.
2.	Marjie T.Britz, "Computer Forensics and Cyber Crime": An Introduction", 3rd Edition, Prentice Hall, 2013.

191ITE805T	EDGE COMPUTING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Internet of Things, Principles of Cloud Computing

COURSE OBJECTIVES:

1.	Understand the concepts of IoT
2.	Understand the IoT and M2M communication.
3.	Understand the protocols and standards of IoT
4.	Understand the Fog computing Architecture and its components
5.	Understand the integration of Fog and Cloud Computing
6.	Solve various Edge analytics.

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

Technologies in IoT- IoT Applications- Smart Home, Wearable, Connected Cars, Industrial IoT- Smart Cities- Introduction to Edge Computing- Need for Edge Computing- Improved Performance, Compliance, Data Privacy and Data Security- Challenges in Edge/Fog Computing

UNIT	TITLE	PERIODS
II	**ARCHITECTURE**	9

Data Acquisition, Data Aggregation and Data Analysis- IoT Protocols- COAP, MQTT- XMPP, AMQP, Low power Lossy Network routing-4G- Sigfox, NeUL- LoRaWAN-5G

UNIT	TITLE	PERIODS
III	**FOG COMPUTATIONAL MODEL**	9

Fog Simulators- iFogSim –Fog Torch- Cisco IoX and Fog Application- NS3- Software Defined Multi-Tier Fog Architecture- PVFOg simulator

UNIT	TITLE	PERIODS
IV	**BIG DATA**	9

Data Types in Big data- Characteristics of BIG DATA- Benefits of Big Data- Layered Big Data Architecture- Data Ingestion, Data collection, Data Processing Layer- Data storage, Data Query and Visualization Layer -Edge Computing for Big Data. - Case study 2: Edge analytics for Water Quality Monitoring

UNIT	TITLE	PERIODS
V	**CASE STUDY**	9

Machine Learning in Edge for automation in Irrigation system- Case Study 4: IoT-Edge for Smart Energy Management - Case Study 5: IoT- Edge for water demand forecasting

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1:	Analyze the basic concepts of IoT and edge computing.
CO2:	Apply M2M protocol in IoT Applications
CO3:	Design the Architecture of Fog computing and its components
CO4:	Create IoT standards and protocols to solve real time problems
CO5:	Build the IoT Applications using Fog and Cloud computing
CO6:	Develop an application using edge and fog computing.

REFERENCE BOOKS:

1.	Ashton Kevin, (2009), "That Internet of Things Thing," RFID Journal, pp. 4986.
2.	Airehrour, J. Gutierrez and S. K. Ray, (2016), "Secure routing for internet of things: A survey," Journal of Network and Computer Applications, 66, pp. 198–213.
3.	Flavio Bonomi, Rodolfo Milito, Jiang Zhu and Sateesh Addepalli, (2012), "Fog Computing and Its Role in the Internet of Things," Proceedings of the first edition of the MCC workshop on Mobile cloud computing, pp. 13–16.
4.	Maria Rita Palattella et al., (2013), "Standardized protocol stack for the internet of (important) things," IEEE Communications Surveys and Tutorials, 15(3), pp. 1389–1406.
5.	Reem Abdul Rahman and Babar Shah, (2016), "Security analysis of IoT protocols: A focus in CoAP," 2016 3rd MEC International Conference on Big Data and Smart City, ICBDSC 2016, pp. 172–178.

191ITE806T	ENERGY MANAGEMENT FOR IOT DEVICES	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Internet of Things, Embedded Systems

COURSE OBJECTIVES:

1.	Understand the various energy sources and energy harvesting based sensor networks.
2.	Learn about the various Piezoelectric materials and Non-linear techniques
3.	Understand electromagnetic energy harvesting techniques.
4.	Understand the various Power sources for WSN
5.	Learn about the applications of Energy harvesting systems

UNIT	TITLE	PERIODS
I	**ENERGY HARVESTING SYSTEMS**	9

Introduction – Energy sources – Sensor networks – Photovoltaic cell technologies – Generation of electric power in semiconductor PV cells.

UNIT	TITLE	PERIODS
II	**PIEZO-ELECTRIC ENERGY HARVESTING**	9

Piezoelectric materials – Transducers – Harvesters – Micro Generators – Performance enhancement Strategies.

UNIT	TITLE	PERIODS
III	**ELECTROMAGNETIC ENERGY HARVESTING AND NON-LINEAR TECHNIQUES**	9

Basic principles – Micro fabricated coils and magnetic materials – Scaling – Power Maximations – micro and macro scale implementations.

Non-linear techniques – vibration control & steady state cases.

UNIT	TITLE	PERIODS
IV	**ENERGY HARVESTING WIRELESS SENSORS**	9

Power sources for WSN – Power generation – conversion – examples – case studies. Harvesting microelectronic circuits – power conditioning and losses.

UNIT	TITLE	PERIODS
V	**SELECTED APPLICATIONS OF ENERGY HARVESTING SYSTEMS**	9

Case studies: implanted medical devices – Bio-MEMS based applications – Harvesting for RF sensors- ID tags – Powering wireless SHM sensor nodes- Efficient Energy Management for the Internet of Things in Smart Cities.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will learn:

CO1:	Analyze the methods used to derive energy from external sources.
CO2:	Apply the strategies for enhancing the performance of Piezo-electric energy harvesters
CO3:	Design micro and macro scale energy harvesting systems
CO4:	Build the power sources for Wireless Sensor Networks
CO5:	Compare the power limit and losses in Microelectronic devices
CO6:	Create IoT based real time Applications based on energy management issues.

REFERENCE BOOKS:	
1.	Carlos Manuel Ferreira Carvalho, Nuno Filipe Silva VeríssimoPaulino, "CMOS Indoor Light Energy Harvesting System for Wireless Sensing Applications", springer
2.	Danick Briand, Eric Yeatman, Shad Roundy, "Micro Energy Harvesting"

191ITE807T	PERVASIVE COMPUTING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	Understand the fundamental elements of pervasive computing.
2.	Learn the design process of Pervasive Computing Environments and its solutions. Familiarize hardware, software and the aspects involved in pervasive computing.
3.	Comparative study of protocols, languages, models & technologies involved.
4.	Learn WAP and voice technology.
5.	Understand the fundamental elements of pervasive computing.

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

Pervasive Computing-Pervasive Computing: Past- Present and Future Pervasive computing- Pervasive Computing-Business- Application examples- Retail- Airline check-in and booking- Healthcare- Tracking- Car information system-Sales Force Automation- E-mail access via WAP and voice- Device Technology Hardware- Human machine interface- Bio metrics- Operating systems- Java for pervasive devices.

UNIT	TITLE	PERIODS
II	**WEB APPLICATION CONCEPTS AND PROTOCOLS**	9

Listening – Device connectivity -Protocols: wireless- mobile phone technologies- Mobile internet protocol Synchronization and replication protocol- distributed services and message and transaction protocols- Security-Device Management- Web Application Concepts- WWW Architecture and Protocols- Transcoding - Client Authentication via Internet.

UNIT	TITLE	PERIODS
III	**WAP & VOICE TECHNOLOGY**	9

WAP and Beyond- Introduction- Components of the WAP architecture- WAP infrastructure- WAP security issues-Wireless Markup Language - WAP push Products-Mode- Voice Technology.

Basics of Speech recognition- Voice Standards- Speech Applications- Speech and Pervasive Computing- security.

UNIT	TITLE	PERIODS
IV	**PDA & PERVASIVE WEB APPLICATION ARCHITECTURE**	9

Device Categories- PDA operation Systems- Device Characteristics- Software Components

Standards- Mobile Applications- PDA Browsers- Pervasive Web Application architecture-Background- Scalability and availability- Development of Pervasive Computing web applications Pervasive application architecture.

UNIT	TITLE	PERIODS
V	**CASE STUDIES**	9

Real Time Application in Pervasive Computing-Smart Card- based Authentication via internet and ordering goods Access from WAP- Access from personal digital assistants- and Access via voice.

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1:	Interpret the basic concepts of pervasive computing and its applications.
CO2:	Identify the distributed environment and their services in wireless protocols.
CO3:	Assess voice standards and related issues in WAP technology.
CO4:	Compare the various Web application protocol and its technologies
CO5:	Develop a pervasive web application for PDA operating system.
CO6:	Create real time applications using WAP and voice technology

TEXT BOOKS:

1.	Jochen Burkhardt, Horst Henn, Stefan Hepper, Thomas Schaech & Klaus Rindtorff- "Pervasive Computing, Technology and Architecture of Mobile Internet Applications", Pearson Education- 2012. ISBN-13: 978-0201722154.

REFERENCE BOOKS:

1.	Frank Adelstein, Sandeep KS Gupta, Golden Richard III, Loren Schwiebert, "Fundamentals of Mobile and Pervasive Computing", McGraw Hill edition- 2006. ISBN-13**:** 978-0071412377
2.	Uwe Hansmann, L. Merk, M. Nicklous, T. Stober, U. Hansmann, "Pervasive Computing (Springer Professional Computing)", 2003- Springer Verlag-ISBN: 3540002189.

191ITE808T	OS FOR SMART DEVICES	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	To study the basics of RTOS and Android OS.
2.	To Design and Develop Android Application for Mobile device using Android SDK.
3.	The study the storage and backup process of data in an Android OS.
4.	To understand the basics and the importance of iOS.
5.	To design and develop iOS applications using iOS SDK and XCode.

UNIT	TITLE	PERIODS
I	**INTRODUCTION TO ANDROID OS**	9

Introduction to the Linux kernel - Android Compiling and booting the Linux kernel -Android - Overview -Android - Environment Setup- - Architecture-Android - Application Components-Android Resources Organizing & Accessing-Android - Activities--Android - Services-Android - Broadcast Receivers-Android - Content Providers-Fragments-Android - Intents and Filters.

UNIT	TITLE	PERIODS
II	**ANDROID FRAMEWORK**	9

Android framework for applications - Introduction to application development - Android packages -User interface-UI layouts-UI controls-Event handling-styles and themes-Custom components-location based services-Android support for all the common wireless mechanisms: GSM, CDMA, UMTS, LTE, Bluetooth, WiFi, NFC.-Android - PHP/MYSQL.

UNIT	TITLE	PERIODS
III	**IOS ARCHITECTURE AND APPLICATION**	9

History of iOS – iOS Tools -iOS SDK -iOS Environment Setup-iOS architecture- iOS objective C-iOS iPhone application-UI element-universal application-iOS camera management- Location handling-SQLite database-sending E-mail-Audio and video-file handling-accessing maps-In -App purchase-iAd Integration-game kit-storyboards.

UNIT	TITLE	PERIODS
IV	**IOS UI LAYOUTS AND DESIGN**	9

Android - UI Layouts-UI Controls-Event Handling-Custom Components-Drag and Drop-Notifications-Location Based Services-Sending Email-Sending SMS-Phone Calls-Publishing Android Application-Alert Dialog-Animations-Audio Capture-Audio Manager-Bluetooth-Camera-Clipboard--Data Backup-Developer Tools- Emulator-Facebook Integration-Gestures-Google Maps-Image Effects-Image Switcher-Internal Storage-JSON Parser.

UNIT	TITLE	PERIODS
V	**SMART DEVICES AND CASE STUDY**	9

Smart devices -Types of smart devices- Characteristics- Environments-Design principles- Essentials of smart building technology ; Case Study - smart home devices- Open source mobile OS –Tizen-Plasma mobile-post market OS-pure OS/Librem-Lune OS.

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will learn:

CO1:	Interpret the architecture of Android and iOS.
CO2:	Design android framework for smart devices.
CO3:	Illustrate the mechanism of storing and retrieving data in Android and iOS.
CO4:	Create game applications using mobile OS.
CO5:	Develop mobile applications for smart devices using android UI.
CO6:	Analyze various smart devices in real time applications.

TEXT BOOKS:

1.	Wei-Meng Lee- Wrox, Beginning Android Application Development- -First Edition.
2.	Jennifer KyrninJennifer Kyrnin, HTML 5 Mobile Application Development- SAMS publications- First Edition.

REFERENCE BOOKS:

1.	Corbet Rubini, Kroah-Hartman, "Linux Device Drivers", O'reilly, 2016.
2.	Herma K., "Real Time Systems – Design for distributed Embedded Applications", Kluwer Academic, 1997
3.	Marko Gargenta,"Learning Android ", O'reilly 2011.

SYLLABUS OF

PROFESSIONAL ELECTIVE - VI

COURSES

91ITE811T	DATA VISUALIZATION TECHNIQUES	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	To introduce visual perception and core skills for visual analysis.
2.	To understand visualization for time-series analysis, ranking and deviation analysis.
3.	To understand visualization for distribution, correlation and multivariate analysis.
4.	To understand issues and best practices in information dashboard design.
5.	To develop skills to design visualizations.

UNIT	TITLE	PERIODS
I	**VISUAL ANALYSIS**	9

Information visualization – Effective data analysis – Traits of meaningful data – Visual perception –making abstract data visible – Building blocks of information visualization – Analytical interaction – analytical navigation – Optimal quantitative scales – Reference lines and regions – Trellises and crosstabs – Multiple concurrent Views – Focus and context – Details on demand – Over-Plotting reduction – Analytical patterns – Pattern examples.

UNIT	TITLE	PERIODS
II	**TIME-SERIES, RANKING, AND DEVIATION ANALYSIS**	9

Time-series analysis – Time-series patterns – Time-series displays – Time-series best practices – part-to-whole and ranking patterns – Part-to-whole and ranking displays – Best practices – Deviation analysis – Deviation analysis displays – Deviation analysis best practices.

UNIT	TITLE	PERIODS
III	**DISTRIBUTION, CORRELATION, AND MULTIVARIATE ANALYSIS**	9

Distribution analysis – Describing distributions – Distribution patterns – Distribution displays – Distribution analysis best practices – Correlation analysis – Describing correlations – Correlation patterns – Correlation displays – Correlation analysis techniques and best practices – Multivariate analysis – Multivariate patterns – Multivariate displays – Multivariate analysis techniques and best practices.

UNIT	TITLE	PERIODS
IV	**INFORMATION DASHBOARD DESIGN I**	9

Information dashboard – Introduction– Dashboard design issues and assessment of needs – Considerations for designing dashboard-Visual perception – Achieving eloquence.

UNIT	TITLE	PERIODS
V	**INFORMATION DASHBOARD DESIGN II**	9

Advantages of Graphics _Library of Graphs – Designing Bullet Graphs – Designing Sparklines – Dashboard Display Media –Critical Design Practices – Putting it all together- Unveiling the dashboard.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1:	Analyze the principles of visual perception
CO2:	Apply visualization for time-series analysis, ranking and deviation analysis.
CO3:	Evaluate the multivariate correlation analysis.
CO4:	Build various visualization techniques
CO5:	Design information dashboard.
CO6:	Create the real time applications based on data visualization.

REFERENCE BOOKS:

1.	Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008.
2.	Edward R. Tufte, "The visual display of quantitative information", Second Edition, Graphics Press, 2001.
3.	Evan Stubbs, "The value of business analytics: Identifying the path to profitability", Wiley, 2011.
4.	Gert H. N. Laursen and Jesper Thorlund, "Business Analytics for Managers: Taking business intelligence beyond reporting", Wiley, 2010.
5.	Nathan Yau, "Data Points: Visualization that means something", Wiley, 2013.
6.	Stephen Few, "Information dashboard design: Displaying data for at-a-glance monitoring", second edition, Analytics Press, 2013.
7.	Stephen Few, "Now you see it: Simple Visualization techniques for quantitative analysis", Analytics Press, 2009.
8.	Tamara Munzner, Visualization Analysis and Design, AK Peters Visualization Series, CRC Press, Nov. 2014

191ITE812T	DATA SCIENCE	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	Able to apply fundamental algorithmic ideas to process data
2.	Understand the Data Analytics lifecycle
3.	Able to construct predictive models to classify new data set
4.	Learn to apply hypotheses and data into actionable predictions
5.	Document and communicate the results effectively to different stakeholders
	Effectively communicate the findings using visualization techniques

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

Data science process-The roles in a data science project-Stages in data science project-Define, Collect, Build, Evaluate, Present and Deploy-Working with data from files-Structured data, other data formats and Transforming data in R-Working with relational databases and NoSQL databases- Managing data-Cleaning data-Sampling for modeling and validation-Training and test set split.

UNIT	TITLE	PERIODS
II	**DATA ANALYTICS LIFECYCLE**	9

Data sources-Data Preparation-Learning about the data, conditioning-Model Planning-Data exploration, Model selection-Model Building-Common tools for model building-Communicate Results-Analysis over the different models-Operationalize- Moving the model to deployment environment- Analytics Plan- Key deliverables of analytics project.

UNIT	TITLE	PERIODS
III	**ANALYTICS USING R**	9

Introduction to R-R Graphical user interfaces-Data Import and Export-Attributes and Data Types-Vectors-Arrays and Matrices-Data Frames-Lists-Factors-Contingency Tables-Descriptive statistics-Model building, Evaluation and Deployment-Hypotheses Testing- Null hypotheses and Alternative hypotheses- Difference of means Student t-test, Welch's t-test- Wilcoxon Rank-Sum test- Type I and II errors.

UNIT	TITLE	PERIODS
IV	**MACHINE LEARNING MODELS**	9

Choosing and evaluating model-Schematic model construction and evaluation-Mapping problems to machine learning- Solving classification problems, working without known targets- Evaluating classification models- Accuracy, precision, Recall, sensitivity and specificity- Unsupervised methods- Cluster analysis. Evaluating clustering models-Intra cluster distance, cross cluster distance.

UNIT	TITLE	PERIODS
V	**DATA VISUALIZATION**	9

Introduction to data analysis- Visualization before Analysis- Dirty data- Visualizing a single variable- Examining multiple variables- Dot chart and Bar plot- Box and Whisker plot- Hexbinplot for large datasets- Scatterplot matrix-

Analyzing a variable over time- Knitr package- Deploying models- Deploying R HTTP services and exporting.

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will learn:

CO1:	Analyze the methods of processing and transforming data in R.
CO2:	Construct data analytics life cycle for key deliverables.
CO3:	Build clustering and classification models using R environment
CO4:	Apply statistical techniques and hypothesis for analytics using R.
CO5:	Develop machine learning models with accuracy, precision and sensitivity for cluster analysis.
CO6:	Create Dot Chart, bar chart, Whisker plot and Hexbin plot for large datasets.

REFERENCE BOOKS:

1.	David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big Data Analytics" , EMC Education Services,2015
2.	NinaZumel,JohnMount,"PracticalDataSciencewithR",ManningPublications,2014
3.	JureLeskovec,AnandRajaraman,JeffreyD.Ullman,"MiningofMassiveDatasets",Cambridge University Press,2014
4.	MarkGardener,"BeginningR-TheStatisticalProgrammingLanguage",JohnWiley&Sons,Inc,2012
5.	W.N.Venables,D.M.SmithandtheRCoreTeam,"AnIntroductiontoR",2013
6.	Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Das gupta, "Practical Data Science Cookbook", Packt Publishing Ltd.,2014

191ITE813T	CYBER SECURITY	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Cryptography and Network Security

COURSE OBJECTIVES:

1.	Understand the basics of cyber security policy and the importance.
2.	Study Cyber security vulnerabilities and cyber security safeguards management.
3.	Design and develop Securing web application, services and servers.
4.	Develop SSL or Firewall based solutions against security threats, employ access control
5.	To understand various protocols for network security to protect against the threats in the Networks.
6.	Understand the importance of Cyberspace and the law and cyber forensics

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage - Need for a Comprehensive Cyber Security Policy - Need for a Nodal Authority, Need for an International convention on Cyberspace.

UNIT	TITLE	PERIODS
II	**CYBER SECURITY VULNERABILITIES AND CYBER SECURITY SAFEGUARDS**	9

Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration - Complex Network Architectures - Open Access to Organizational Data - Weak Authentication - Unprotected Broadband communications - Poor Cyber Security Awareness. Cyber Security Safeguards- Overview -Access control – Audit – Authentication – Biometrics – Cryptography – Deception - Denial of Service Filters - Ethical Hacking - Firewalls - Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.

UNIT	TITLE	PERIODS
III	**SECURING WEB APPLICATION, SERVICES AND SERVERS**	9

Introduction - Basic security for HTTP Applications and Services - Basic Security for SOAP Services - Identity Management and Web Services - Authorization Patterns - Security Considerations - Challenges.

UNIT	TITLE	PERIODS
IV	**CRYPTOGRAPHY AND NETWORK SECURITY**	9

Introduction to Cryptography - Symmetric key Cryptography - Asymmetric key Cryptography - Message Authentication - Digital Signatures - Applications of Cryptography - Intrusion Detection and Prevention. Overview of Firewalls- Types of Firewalls - User Management - VPN Security -Security Protocols: - security at the Application Layer- PGP and S/MIME - Security at Transport Layer- SSL and TLS - Security at Network Layer-IPSec.

UNIT	TITLE	PERIODS
V	**CYBERSPACE LAW AND CYBER FORENSICS**	9

Introduction - Cyber Security Regulations - Roles of International Law - the state and Private Sector in Cyberspace - Cyber Security Standards. The INDIAN Cyberspace - National Cyber Security Policy 2013. Introduction to Cyber

Forensics - Handling Preliminary Investigations - Controlling an Investigation - Conducting disk-based analysis - Investigating Information-hiding - Scrutinizing E-mail - Validating E-mail header information - Tracing Internet access - Tracing memory in real-time. Case Study – Personal Security.

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1:	Apply cyber security policies and mechanisms to detect cyber terrorism.
CO2:	Analyze Cyber security vulnerabilities and Safeguards for threat Management.
CO3:	Design security technologies and policies to protect computers and digital information.
CO4:	Develop secure HTTP Web applications using SOAP services.
CO5:	Build firewalls for security at application and transport layer.
CO6:	Demonstrate the standards and cyber laws to enhance information security.

TEXT BOOKS:

1.	Dr. Jeetendra Pande, "Introduction to Cyber Security", 9th Edition, Uttarakhand Open University, 2017.
2.	Mayank Bhushan, Rajkumar singh Rathore, Aatif Jamshed, "Fundamentals of Cyber Security", BPB Publications.

REFERENCE BOOKS:

1.	Pankaj Sharma, "Information Security and Cyber Laws", Kataria, S. K., & Sons publication.
2.	Nina Godbole, Sunit Belapure,"Cyber Security", Wiley India Pvt. Ltd publication.

191ITE814T	DATA CENTRIC NETWORKS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Computer Networks

COURSE OBJECTIVES:

1.	To understand the concepts of data center networking technologies
2.	To Evaluate key concepts in modern Layer 2 & Layer 3 data center networks
3.	To analyze networking technologies in modern data centers.
4.	To Design, build and configure complex routed and switched networks
5.	To implement the networking solutions in a virtualized environment

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

Data centric networking from different perspectives- Content-Centric Networking (CCN)- Content Distribution Networks (CDN)- Requirements for modern data centers- Design for flexibility- Design for scalability- Design for environmental control- Design for electrical power- Design for Backup- Flooring in data centers.

UNIT	TITLE	PERIODS
II	**DATA CENTER ARCHITECTURES**	9

Introduction to data center architectures- Top of rack (TOR) network connectivity- End of rack (EOR) network connectivity- Solutions that reduce cabling in architecture- Solutions that reduce power in architecture- TIA/EIA-942. Structured cabling standards- Cable management- Bandwidth requirements- I/O connectivity.

UNIT	TITLE	PERIODS
III	**SERVER ARCHITECTURE**	9

Overview of server Architectures- Clustering – Scaling- Optimization- Stand-alone blades- Redundant Layer 2 and Layer 3 designs- Limitation of traditional server deployments- Case study.

UNIT	TITLE	PERIODS
IV	**INFRASTRUCTURE PROTOCOLS**	9

Introduction to Layer 2 Networks- IEEE 802.3ba standards- 40 Gbps and 100 Gbps Ethernet- IEEE 802.1D Spanning Tree Protocol (STP)- RSTP protocol- PVST protocol- MSTP protocol- TRILL protocols- IEEE 802.1Qbg Edge Virtual Bridging- Fiber Channel over Ethernet (FCoE) vs Internet.

UNIT	TITLE	PERIODS
V	**DATA CENTER TECHNOLOGIES**	9

Introduction to Layer 3 Networks- Layer 3 Data Center technologies- Locator Identifier Separation Protocol (LISP)- Layer 3 Multicasting- Protocols; IPv4, IPv6, MPLS, OSPF, IS-IS, BGP- OTV& VPLS layer 2 extension.

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will learn:	
CO1:	Examine the design issues of data centers.
CO2:	Analyze different data center architectures.
CO3:	Classify layer 2 and layer 3 protocols.
CO4:	Apply networking technologies in data centers.
CO5:	Develop various network solutions for data centers
CO6:	Design modern data centers to incorporate all dynamic routing protocols.

REFERENCE BOOKS:	
1.	Mouricio Arregoces,"Data Centre Fundamentals", CiscoPress,2003
2.	Silvano Gai, Claudio De Santi, "I/O Consolidation in the Data Center" Cisco Press; 1 edition [ISBN: 9781587058882].2009.
3.	Kevin Corbin, Ron Fuller, David Jansen, "NX-OSand Cisco Nexus Switching: Next-Generation Data Center Architectures"Cisco Press; 1 edition [ISBN: 9781587058929], 2010.
4.	Silvano Gai, Tommi Salli, RogerAndersson, "Cisco Unified Computing System" Cisco Press; 1edition, [ISBN: 9781587141935], 2010.
5.	NashDarukhanawalla, Patrice Bellagamba, "Interconnecting Data Centers Using VPLS"CiscoPress; 1edition, [ISBN: 9781587059926], 2009.
6.	Robert W.Kembel, Roger Cummings (Introduction), "The Fibre Channel Consultant" Northwest Learning Assoc; 3rdedition, [ISBN: 0931836840], 1998.
7.	Robert W Kembal"Fiber Channel Switched Fabric "Northwest Learning Associates, Inc. [ISBN: 0931836719], 2009.
8.	JohnL.Hufferd, "ISCSI", Addison-Wesley Boston [ISBN: 978-0201784190], 2003.

191ITE815T		Periods per week	Credits

	CLOUD VIRTUALIZATION	L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Operating System, Computer Networks

COURSE OBJECTIVES:

1.	Gain knowledge on the concept of virtualization that is fundamental to cloud computing.
2.	Identify various constraints and challenges in setting up a data center
3.	Provides an insight to the students on design guidance, configuration examples and best practices with respect to data center networking.
4.	Demonstrate Enterprise level virtualization and access control in virtual machines
5.	Perform Resource monitoring and execute backup and recovery of virtual machines
6.	Understand the new technologies and demonstrates how consolidation can be realized using a unified network approach

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters and Resource Management – Virtualization for data center automation.

UNIT	TITLE	PERIODS
II	**HARDWARE VIRTUALIZATION**	9

Types of hardware virtualization: Full virtualization - partial virtualization - para virtualization Desktop virtualization: Software virtualization – Memory virtualization - Storage virtualization – Data virtualization – Network virtualization.

UNIT	TITLE	PERIODS
III	**HYPERVISORS AND VIRTUAL MACHINES**	9

Server Virtualization: Understanding Server Virtualization, Types of server virtualization, Virtual machine basics, Types of virtual machines, Hypervisor concepts and types.

UNIT	TITLE	PERIODS
IV	**VIRTUALIZATION SOLUTIONS**	9

Understanding Microsoft's Virtualization solutions: Microsoft's Infrastructure Optimization Model, Virtualization and the Infrastructure Optimization Model, Benefits of Virtualization, Achieving the Benefits of Datacenter Virtualization, Achieving the Benefits of Client Virtualization, Achieving the Benefits of Cloud Virtualization.

UNIT	TITLE	PERIODS
V	**MIGRATING INTO A CLOUD**	9

Introduction-Challenges- Broad approaches to migrating into the cloud- need of migrate -deciding on cloud migration- the Seven-step model of migration into a cloud- Migration Risks and Mitigation- Enterprise cloud computing paradigm-relevant Deployment Models for Enterprise Cloud Computing.

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1:	Perceive the basics of cloud Virtualization in cloud computing.
CO2:	Analyze various design issues in data Centre.
CO3:	Apply the techniques of Provisioning, monitoring and management in virtual datacenter.
CO4:	Estimate the performance of Virtual Machines using optimization models.
CO5:	Design different data migration techniques for efficient resource utilization.
CO6:	Evaluate the various data recovery techniques for data protection.

TEXT BOOKS:

1.	Mickey Iqbal, "IT Virtualization Best Practices: A Lean, Green Virtualized Data Center Approach", MC Press [ISBN: 978-1583473542] 2010.
2.	Mike Laverick, "VMware vSphere 4 Implementation" Tata McGraw-Hill Osborne Media; 1 edition [ISBN: 978-0071664523], 2010.

REFERENCE BOOKS:

1.	Brian Perry, Chris Huss, Jeantet Fields, "VCP VMware Certified Professional on vSphere 4 Study Guide" Sybex; 1 edition [ISBN: 978-0470569610], 2009.
2.	Jason Kappel, Anthony Velte, Toby Velte, "Microsoft Virtualization with Hyper-V: Manage Your Datacenter with Hyper-V, Virtual PC, Virtual Server, and Application Virtualization" McGraw-Hill Osborne [ISBN: 978-0071614030], 2009.
3.	Jason W. McCarty, Scott Lowe, Matthew K. Johnson, "VMware vSphere Administration Instant Reference" Sybex; 1 edition [ISBN: 978- 0470520727], 2009.

191ITE816T	IOT SECURITY	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Internet of things

COURSE OBJECTIVES:

1.	Ability to understand the Security requirements in IoT.
2.	Understand the cryptographic fundamentals for IoT
3.	Ability to understand the authentication credentials and access control
4.	Understand the various types Trust models and Cloud Security.
5.	Learn the security principles and methodologies for Internet of Things

UNIT	TITLE	PERIODS
I	**IOT-SECURITY OVERVIEW**	9

IoT Reference Model- Introduction -Functional View, IoT Security Challenges-Hardware Security Risks - Hardcoded/Default Passwords -Resource Constrained Computations -Legacy Assets Connections - Devices Physical Security, Software Security Risks -Software Vulnerabilities -Data Interception - Identification of Endpoints - Tamper Detection, Lack of Industrial Standards.

UNIT	TITLE	PERIODS
II	**IOT- SECURITY &VULNERABILITY ISSUES**	9

IoT Security Requirements -Data Confidentiality -Data Encryption -Data Authentication -Secured Access Control – IoT-Vulnerabilities – Secret-Key, Authentication/Authorization for Smart Devices - Constrained System Resources - Device Heterogeneity -Fixed Firmware. IoT Attacks -Side-channel Attacks -Reconnaissance -Spoofing -Sniffing - Neighbour -Discovery -Rogue Devices-Man-in-Middle.

UNIT	TITLE	PERIODS
III	**SECURED PROTOCOLS FOR IOT**	9

Infrastructure-IPv6 -LowPAN , Identification-Electronic Product Code -uCode, Transport-Bluetooth - LPWAN, Data - MQTT -CoAP, Multi-layer Frameworks-Alljoyn,-IoTivity.

UNIT	TITLE	PERIODS
IV	**SECURING INTERNET OF THINGS ENVIRONMENT**	9

IoT Hardware -Test Device Range-Latency and Capacity -Manufacturability Test -Secure from Physical Attacks, IoT Software -Trusted IoT Application Platforms, -Secure Firmware Updating -Network Enforced Policy -Secure Analytics Visibility and Control.

UNIT	TITLE	PERIODS
V	**IOT ATTACKS -CASE STUDY**	9

MIRAI Botnet Attack -Iran's Nuclear Facility Stuxnet Attack –Tesla Crypto-jacking Attack -The TRENDnet Webcam Attack -The Jeep SUV Attack -The Owlet Wi-Fi Baby Heart Monitor Vulnerabilities -St.Jude_Hackable Cardiac Devices.

	TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will learn:	
CO1:	Asess the Risks and Challenges in IoT.
CO2:	Identify IoT security requirements and vulnerability threats.
CO3:	Analyze different IoT protocols and their security measures.
CO4:	Interpret how to secure an IoT environment in software and hardware.
CO5:	Infer the attacks associated with an IoT application using suitable security tools.
CO6:	Develop IoT applications using suitable security standards

REFERENCE BOOKS:	
1.	Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications
2.	Russell, Drew "Practical Internet of Things Security" (Kindle Edition) by Published 2016 by Packt Publishing ISBN13: 9781785889639.
3.	Fei Hu, "Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations" Published in 2016 ISBN: 9781498723183.
4.	Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer.
5.	https://www.postscapes.com/internet-of-things-protocols/
6.	https://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html
7.	https://www.iotforall.com/5-worst-iot-hacking-vulnerabiliti
8.	https://www.cisco.com/c/en/us/about/security-center/secure-iot-proposed-framework.html

191ITE817T		Periods per week	Credits

	VIRTUAL REALITY	L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	Gives knowledge of Virtual Reality systems.
2.	The concepts of Geometric modelling and Geometrical Transformations.
3.	Basic Virtual Reality systems functions (operations)
4.	Virtual Reality design considerations.
5.	Integration of Hardware and Software in Virtual Reality applications

UNIT	TITLE	PERIODS
I	**VIRTUAL REALITY & VIRTUAL ENVIRONMENT**	9

Introduction – Computer graphics - Real Time Computer graphics - Flight Simulation Virtual Environments - Requirements – Benefits of virtual reality – Introduction –The Virtual world space - Positioning the virtual observer - The perspective projection – Human vision - Stereo perspective projection –3Dclipping – Colour theory–Simple3D modelling.

UNIT	TITLE	PERIODS
II	**GEOMETRIC MODELLING GEOMETRICAL TRANSFORMATIONS**	9

Introduction – From 2D to 3D – 3D space curves - 3D boundary representation – Introduction – Frames of reference – Modelling transformations – Instances –Picking – Flying - Scaling the VE – Collision detection – Introduction – The virtual environment - The Computer environment - VR Technology – Model of interaction - VR System.

UNIT	TITLE	PERIODS
III	**VIRTUAL ENVIRONMENT**	9

Introduction – The dynamics of numbers – Linear and Non-linear interpolation - The animation of objects – Linear and non - Linear translation - Shape & object in between-Freeform deformation – particle system - Physical Simulation : Introduction – Objects falling in a graphical field – Rotating wheels – Elastic collisions – projectiles-simple pendulum – Springs – Flight dynamics of an aircraft.

UNIT	TITLE	PERIODS
IV	**VR HARDWARES & SOFTWARES**	9

Human factors: Introduction – the age - the ear – The somatic senses - VR Hardware: Introduction – sensor hardware – Head - Coupled displays – Aquatic hardware – Integrated VR systems - VR Software: Introduction – Modelling virtual world – Physical simulation - VR toolkits – Introduction to VRML.

UNIT	TITLE	PERIODS
V	**VR APPLICATION**	9

Medical Applications of VR – Education, Arts and Entertainment – Military VR Applications – Emerging Applications of VR – VR Applications in Manufacturing – Applications of VR in Robotics – Information Visualization.

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1:	Choose appropriate graphical modeling techniques.
CO2:	Model VR systems using graphical transformations.
CO3:	Compare linear and non linear virtual environment
CO4:	Analyze the challenges in designing Virtual Reality systems.
CO5:	Apply suitable Hardware and software for modeling Virtual world.
CO6:	Design a VR system for any real time application.

TEXT BOOKS:

1.	John Vince, "Virtual Reality Systems ", Pearson Education Asia, 2007
2.	Grigore C. Burdea, Philippe Coiffet, "Virtual Reality Technology", 2nd Edition, Wiley India, 2006.
3.	Adams, "Visualizations of Virtual Reality",Tata McGraw Hill, 2000.

REFERENCE BOOKS:

1.	Alan B Craig, William R Sherman and Jeffrey D Will, "Developing Virtual Reality Applications: Foundations of Effective Design", Morgan Kaufmann, 2009.
2.	William R.Sherman, Alan B.Craig: Understanding Virtual Reality – Interface, Application, Design", The Morgan Kaufmann Series, 2003.
3.	Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, "3D UserInterfaces, Theory and Practice", Addison Wesley, USA, 2005

191ITE818T	QUANTUM COMPUTING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

Calculus and linear algebra, probability and discrete mathematics.

COURSE OBJECTIVES:

1.	To introduce the basics of quantum mechanics.
2.	To understand qubits and quantum gates.
3.	To introduce the quantum algorithms.
4.	To develop the knowledge of quantum computation and quantum information.
5.	To describe the quantum error correction techniques.

UNIT	TITLE	PERIODS
I	**INTRODUCTION**	9

Introduction- Quantum bits, Bloch sphere representation of a qubit, multiple qubits. Background Mathematics and Physics- Hilbert space, Probabilities and measurements, Entanglement, Density operators and correlation.

UNIT	TITLE	PERIODS
II	**QUANTUM CIRCUITS**	9

Basics of quantum mechanics, Quantum Circuits: single qubit gates, multiple qubit gates, design of quantum circuits, Bell states, Quantum teleportation, Measurements in bases other than computational basis.

UNIT	TITLE	PERIODS
III	**QUANTUM ALGORITHMS**	9

Classical computation on quantum computers, Relationship between quantum and classical complexity classes, Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor factorization, Grover search, simulation of quantum systems.

UNIT	TITLE	PERIODS
IV	**QUANTUM COMPUTATION**	9

Models for computation, The analysis of computational problems, Quantum computers: physical realization- Guiding principles, Conditions for quantum computation, Harmonic oscillator quantum computer, Optical photon quantum computer.

UNIT	TITLE	PERIODS
V	**QUANTUM NOISE AND ERROR CORRECTION**	9

Classical noise and Markov processes, Quantum operations, Examples of quantum noise and quantum operations, Theory of quantum error-correction, Constructing quantum codes, Fault-tolerant quantum computation.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will learn:

CO1:	Develop multiple qubits using probability measurements for system behavior.
CO2:	Build quantum logic gates and circuits to perform computations.
CO3:	Apply the appropriate quantum computing algorithms to solve computational problems.
CO4:	Evaluate the models of quantum computing used in real time applications.
CO5:	Analyze the basic requirements of quantum computers.
CO6:	Design a simple quantum error-correcting code using Classical noise.

TEXT BOOKS:

1.	Nielsen, Michael A and Isaac L. Chuang. Cambridge, UK "Quantum Computation and Quantum Information", Cambridge University Press, 2010. ISBN: 978-1-107- 00217-3.
2.	Eleanor G. Rieffel and Wolfgang H. Polak, "Quantum Computing: A Gentle
3.	Introduction", The MIT Press Cambridge, Massachusetts London, England, 2011.

REFERENCE BOOKS:

1.	Dan C.Marinescu, Gabriela M.Marinescu, "Approaching Quantum Computing", Pearson Education, 2008-09.
2.	Vishal SahniLov K Grover, "Quantum Computing", Tata McGraw-Hill Publishing Company Limited, 2007. ISBN: 9780070657007.
3.	Pittenger A. O., "An Introduction to Quantum Computing Algorithms", 2000.
4.	Chris Bernhardt, "Quantum computing for everyone", MIT Press.

SYLLABUS OF

OPEN ELECTIVE I

COURSES

Course Code	Course Title	Periods per week				Credits
		L	T	P	R	
191ITO501T	DATA STRUCTURES USING PYTHON	3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To introduce the basics of Python programming language
2.	To introduce the concepts of ADTs
3.	To introduce the concepts of Hashing and Sorting
4.	To Learn linear data structures – lists, stacks, and queues
5.	To test objects and handle changing requirements.

UNIT	TITLE	PERIODS
1	INTRODUCTION TO PYTHON	9
Function Declaration - Import - Objects - Indenting as Requirement - Exceptions - Unbound Variables - Case Sensitive - Native Data Types - Booleans - Numbers - Lists - Tuples - Sets - Dictionaries - Comprehensions - List Comprehensions - Dictionary Comprehensions - Set Comprehensions.	
UNIT	TITLE	PERIODS
2	PYTHON PROGRAMMING ADVANCED FEATURES	9
Closures - List of Functions - List of Patterns - File of Patterns - Generators - Defining Classes - Instantiating Classes - Instance Variables - Iterators – Itertools - Assert - Generator Expressions.	
UNIT	TITLE	PERIODS
3	LINEAR DATA STRUCTURES – LIST	9
Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation –– singly linked lists- circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operation (Insertion, Deletion, Merge, Traversal).	
UNIT	TITLE	PERIODS
4	LINEAR DATA STRUCTURES – STACKS, QUEUES	9
Stack ADT – Evaluating arithmetic expressions- other applications- Queue ADT – circular queue implementation – Double ended Queues – applications of queues.	
UNIT	TITLE	PERIODS
5	SORTING, SEARCHING AND HASH TECHNIQUES	9
Sorting algorithms: Insertion sort - Selection sort - Shell sort - Bubble sort - Quick sort - Merge sort - Radix sort – Searching: Linear search –Binary Search Hashing: Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing	
	TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Outline the python data structures.
CO2:	Handle regular expressions.

CO3:	Apply the concept of abstract data types for linear data structures.
CO4:	Apply linear data structures such as lists, Stack and Queue with their related operations.
CO5:	Critically analyze the various sorting algorithms.
CO6:	Design novel algorithms for developing real time applications

TEXT BOOKS:	
1.	Allen Downey, Jeffrey Elkner, Chris Meyers, "How to Think Like a Computer Scientist - Learning with Python", Green Tea Press, 2002.
2.	Shriram K Vasudevan,Abhishek S Nagarajan, Karthick Nanmaran, "Data Structures using Python", First Edition, Oxford University Press 2021.

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.	John V. Guttag, "Introduction to Computation and Programming using Python", Prentice Hall of India, 2014.
4.	Mark Lutz, "Learning Python: Powerful Object-Oriented Programming", Fifth Edition, O'Reilly, Shroff Publishers and Distributors, 2013.

Course Code	Course Title	Periods per week				Credits
		L	T	P	R	
191ITO502T	**DATABASE MANAGEMENT SYSTEMS**	**3**	**0**	**0**	**0**	**3**

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	To learn the fundamentals of data models
2.	To learn conceptual modeling using ER diagrams.
3.	To study SQL queries and database programming
4.	To learn proper designing of relational database.
5.	To understand database security concepts

UNIT	TITLE	PERIODS
1	**Data Modeling**	**9**
	Purpose of Database System – Data independence - Data Models – Database System Architecture – Conceptual Data modeling: ER models - Enhanced-ER Model. Introduction to relational databases – Relational Model – Keys – ER-to-Relational Mapping. Modeling of a library management system.	

UNIT	TITLE	PERIODS
2	**Database Query**	**11**
	SQL: fundamentals – DDL – Specifying integrity constraints - DML – Basic retrieval queries in SQL-nested queries – correlated queries – joins - aggregate functions. Creating a table, populating data, adding integrity constraints, querying tables with simple and complex queries.	

UNIT	TITLE	PERIODS
3	**Database Programming**	**7**
	Database programming with function calls, stored procedures - views – triggers. Embedded SQL. ODBC connectivity with front end tools. Implementation using ODBC/JDBC- implementing functions, views, and triggers in MySQL / Oracle.	

UNIT	TITLE	PERIODS
4	**Normalization**	**9**
	Functional Dependencies – Design guidelines – Normal Forms: first, second, third – Boyce/Codd Normal Form – Normalization algorithms. Design of a banking database system / university database system.	

UNIT	TITLE	PERIODS
5	**Database Security**	**9**
	Database security issues – Discretionary access control – Role based access – Encryption and public key infrastructures – challenges. Case Study-ATM system.	
	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:	
CO1:	Interpolate Data models for database design.
CO2:	Populate and query a database using SQL.
CO3:	Implement procedures and functions to access data from database.

CO4:	Create triggers and embedded SQL programs.
CO5:	Apply normal forms for database design.
CO6:	Analyze the database security issues in real time scenario.

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

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

Course Code	Course Title	Periods per week				Credits
		L	T	P	R	
191ITO503T	**ARTIFICIAL INTELLIGENCE**	**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
1	**Introduction to AI**	**9**

Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem characteristics - Problem solving methods -Hill Climbing-Depth first and Breadth first, Constraints satisfaction – Related algorithms, Measure of performance and analysis of search algorithms.

UNIT	TITLE	PERIODS
2	**Knowledge Representation**	**9**

Game playing – Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge.

UNIT	TITLE	PERIODS
3	**Knowledge Inference**	**9**

Knowledge representation -Production based system, Frame based system. Inference – Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning – Certainty factors, Bayesian Theory-Bayesian Network-Dempster – Shafer theory.

UNIT	TITLE	PERIODS
4	**Learning**	**9**

Forms of Learning - Supervised Learning - Learning Decision Trees – Regression and Classification with Linear Models - Artificial Neural Networks - Support Vector Machines - Statistical Learning - Learning with Complete Data -- Reinforcement Learning.

UNIT	TITLE	PERIODS
5	**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:	Use the Knowledge representation techniques to deduce the AI solutions
CO3:	Develop solutions for Uncertainty problems by applying Fuzzy and Neuro Fuzzy Inference rules
CO4:	Implement various learning techniques
CO5:	Develop knowledge based expert systems.
CO6:	Outline the applications of AI

TEXT BOOKS:	
1.	Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", Mc GrawHill-2008. (Units-I, II, IV, & V).
2.	Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007. (Unit-III).

REFERENCE BOOKS:	
1.	Stuart Russel and Peter Norvig "AI – A Modern Approach", 2nd Edition, Pearson Education 2007 (Units-I, III, IV).
2.	Peter Jackson, "Introduction to Expert Systems", 3rd Edition, Pearson Education, 2007.
3.	Deepak Khemani "Artificial Intelligence", Tata Mc Graw Hill Education 2013.

SYLLABUS OF

OPEN ELECTIVE II

COURSES

Course Code	Course Title	Periods per week				Credits
		L	T	P	R	
191ITO601T	**CLOUD COMPUTING AND VIRTUALIZATION**	3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	To learn about the basic concept of cloud and utility computing.
2.	To understand the concept of virtualization.
3.	To have knowledge on the various issues in cloud computing.
4.	To be familiar with the lead players in cloud.
5.	To appreciate the emergence of cloud as the next generation computing paradigm

UNIT	TITLE	PERIODS
1	**CLOUD ARCHITECTURE AND MODEL**	9

Introduction to Cloud Computing – Roots of Cloud Computing – Desired Features of Cloud Computing – Challenges and Risks – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage

UNIT	TITLE	PERIODS
2	**VIRTUALIZATION**	9

Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization-Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices-Virtual Clusters and Resource management – Virtualization for Data-center Automation

UNIT	TITLE	PERIODS
3	**CLOUD INFRASTRUCTURE**	9

Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development–Design Challenges - Inter Cloud Resource Management – Resource ProvisioningandPlatformDeployment–GlobalExchangeofCloudResources.

UNIT	TITLE	PERIODS
4	**CLOUD SECURITY**	9

Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security –Security Governance – Risk Management – Security Monitoring – Security Architecture Design–Data Security–Application Security – Virtual Machine Security - Identity Management and Access Control–Autonomic Security

UNIT	TITLE	PERIODS
5	**CASE STUDIES**	9

Google App Engine(GAE) – GAE Architecture – Functional Modules of GAE – Amazon Web Services(AWS) – GAE Applications – Cloud Software Environments – Eucalyptus – Open Nebula – Open Stack.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1:	Compare the main concepts, strengths and limitations of cloud computing.
CO2:	Interpret the key enabling technologies that help in development of cloud.

CO3:	Develop the efficient storage system in cloud computing,
CO4:	Examine the basic techniques of Resource Provisioning in cloud resource management.
CO5:	Analyze various security issues in cloud computing.
CO6:	Design the GAE applications in google cloud..

TEXT BOOKS:

1.	Buyya R., Broberg J., Goscinski A., "Cloud Computing: Principles and Paradigm", First Edition, John Wiley & Sons, 2011.
2.	Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
3.	Rittinghouse, John W., and James F. Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2017.

REFERENCE BOOKS:

1.	Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, "Mastering Cloud Computing", Tata Mcgraw Hill, 2013.
2.	Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach", Tata Mcgraw Hill, 2009.
3.	George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice)", O'Reilly, 2009.

Course Code	Course Title	Periods per week				Credits
		L	T	P	R	
191ITO602T	**Advanced Python Programming**	**3**	**0**	**0**	**0**	**3**

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	To introduce Object Oriented Programming using an easy-to-use language.
2.	To have idea about regular expressions
3.	To test objects and handle changing requirements.
4.	To use iterators and generators.
5.	To understand various file operations

UNIT	TITLE	PERIODS
1	**Introduction to Python**	**9**

Function Declaration - Import - Objects - Indenting as Requirement - Exceptions - Unbound Variables - Case Sensitive - Scripts - Native Data Types - Booleans - Numbers - Lists - Tuples - Sets - Dictionaries - Comprehensions - List Comprehensions - Dictionary Comprehensions - Set Comprehensions.

UNIT	TITLE	PERIODS
2	**STRINGS**	**11**

Strings - Unicode - Formatting - String Methods - Bytes - Encoding - Regular Expressions - Verbose - Case Studies

UNIT	TITLE	PERIODS
3	**CLASSES**	**7**

Closures - List of Functions - List of Patterns - File of Patterns - Generators - Defining Classes - Instantiating Classes - Instance Variables - Iterators – Itertools - Assert - Generator Expressions.

UNIT	TITLE	PERIODS
4	FILES	**9**

Reading and Writing Text Files - Binary Files - Stream Objects - Standard Input, Output and Error.

UNIT	TITLE	PERIODS
5	**XML and SERIALIZATION**	**9**

XML - Atom Feed - Parsing HTML - Searching for Nodes - html - Generation - Serializing Objects - Pickle Files - Versions - Debugging - Serializing to JSON.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1:	Summarize the basic concepts of python.
CO2:	Apply the string methods to handle regular expressions for real time problems.
CO3:	Analyze the concepts of object oriented programming.
CO4:	Build Python Programs using generators and iterators

CO5:	Demonstrate file handling operations in Python.
CO6:	Develop real time applications using XML and Serialization.

TEXT BOOKS:	
1.	Mark Pilgrim, "Dive into Python 3", Apress, 2009.
2.	Allen Downey, Jeffrey Elkner, Chris Meyers, "How to Think Like a Computer Scientist - Learning with Python", Green Tea Press, 2002.

REFERENCE BOOKS:	
1.	Allen Downey, Jeffrey Elkner, Chris Meyers, "How to Think Like a Computer Scientist - Learning with Python", Green Tea Press, 2002.
2.	Mark Lutz, "Learning Python: Powerful Object-Oriented Programming", Fifth Edition, O'Reilly, Shroff Publishers and Distributors, 2013.

Course Code	Course Title	Periods per week				Credits
		L	T	P	R	
191ITO603T	COMPUTER NETWORKS	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
1	**INTRODUCTION**	9
Computer Networks – A perspective – Goals – Applications – Classification of Networks - Layered Architecture for Communication – Advantages – Examples - OSI Model – TCP/IP Model – Protocols and Protocol Data Units (PDUs).	
UNIT	TITLE	PERIODS
2	**DATA LINK LAYER**	8
Introduction – Link-Layer Addressing – DLC Services – Data-Link Layer Protocols – HDLC – PPP - Media Access Control.	
UNIT	TITLE	PERIODS
3	**LOCAL AREA NETWORKS (IEEE 802)**	9
Topology: Star – Ring – Bus – Channel Access Techniques: FDM and TDM – CSMA – CSMA/CD – Ethernet LAN (802.3) – Switched LAN - Token BUS LAN (802.4)– Token Ring LAN (802.5) – Industrial Networking: CAN Bus – Wi-Fi, WiMAX	
UNIT	TITLE	PERIODS
4	**INTERNETWORKING**	10
internet - Routers – Gateways – Internet Protocol (IP) – IP Addresses – Classification – Special IP Addresses – Transmission Control Protocol (TCP) – Internet Applications – Electronic mail : SMTP, Remote Login : Telnet.	
UNIT	TITLE	PERIODS
5	**NETWORK SECURITY**	9
Network Attacks – Firewalls – Packet Filtering – Encryption / Decryption Techniques – Public Key Cryptography – Digital Authentication – Digital Signatures	

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will be able to:	
CO1:	Understand the basic layers and its functions in computer networks.
CO2:	Evaluate the performance of a network.
CO3:	Analyze and design routing algorithms.

CO4:	Design protocols for various functions in the network.
CO5:	Understand the working of various application layer protocols
CO6:	Understand the basics of how data flows from one node to another.

TEXT BOOKS:	
1.	Behrouz A Foruzan, ―Data Communications and Networking‖, McGraw-Hill, New York, 2012.
2.	Behrouz A Foruzan, ― TCP/IP Protocol Suite‖, Tata McGraw-Hill, New Delhi, 2010.

REFERENCE BOOKS:	
1.	William Stallings, ―Data and Computer Communication‖, Pearson Education, New Delhi, 2009.
2.	Fred Halsall, ―Data Communications, Computer Networks and Open Systems‖, Pearson Education, Asia, 2001.
3.	Stanford H Rowe and Marsha L Schuh, ―Computer Networking‖, Pearson Education, New Delhi, 2005.
4.	Andrew.S Tanen Baum and David T.Wetherall, ―Computer Networks‖, Pearson Education, 2010

SYLLABUS OF

OPEN ELECTIVE III

COURSES

Course Code	Course Title	Periods per week				Credits
		L	T	P	R	
191ITO701T	**XML AND MARKUP LANGUAGE**	**3**	**0**	**0**	**0**	**3**

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	Construct the web page using XML
2.	To understand the basics of XML and CSS
3.	Implement the real time applications using XML technologies.
4.	Analyze the programming skills using XML.
5.	Evaluate the security issues in XML.

UNIT	TITLE	PERIODS
1	INTRODUCTION TO XML	9

XML: XML basics –Introduction –need for XML –Advantages –Working with an XML Document –Structure of an XML Document –DTD-XML Schema.

UNIT	TITLE	PERIODS
2	XML AND CSS	9

Working with XML Schema-Declaring Attributes –XML namespaces –Reusing Schema Components –Grouping elements and attributes.XML Style sheets: Introduction –CSS –eXtensible Style Sheet language –Formatting Data based on controls –Displaying data in a Tabular Format.

UNIT	TITLE	PERIODS
3	XML TECHNOLOGY	9

XML Technology: Transforming XML Documents with XSLT-Xpath -Xquery . Structuring with Schemas and DTD - XSLT Presentation Techniques - Transformation.

UNIT	TITLE	PERIODS
4	XML PROGRAMMING	9

XML PROGRAMMING**:** DOM API -JDOM API -XML Data Binding -SAX API -TypeSafe XML Programming Languages - XDUCE -XACT.

UNIT	TITLE	PERIODS
5	XML SECURITY	9

Security Overview - Canonicalization - XML Security Framework - XML Encryption - XML Digital Signature - XKMS Structure - Guidelines for Signing XML Documents - XML in Practice.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1:	Learn the basics and history of XML
CO2:	Write your own XML documents.
CO3:	Transform XML documents into documents of other types using XSLT.

CO4:	Write valid XML documents based on a DTD.
CO5:	Evaluate the security issues in XML
CO6:	Design and implement the document using XML

TEXT BOOKS:

1.	HTML and XML an Introduction", NIIT, Prentice Hall of India Pvt.Ltd.
2.	Anders Moller and Michael Schwartzbach, ―An Introduction to XML and Web Technologiesǁ, Pearson Education Limited, 2006.
3.	Deitel H M, Deitel P J, Nirto T R, Lin T M, XML How to Program, Pearson Edition, 2011.

REFERENCE BOOKS:

1.	Frank. P. Coyle, XML, Web Services and the Data Revolution, Pearson Education, 2007.
2.	David Hunter, Jeff Rafter, Joe Fawcett, Eric Van der Vlist, Danny Ayers, Jon Duckett, Andrew Watt, Linda McKinnon, Beginning XML , Fourth Edition, Wrox publication.

Course Code	Course Title	Periods per week				Credits
		L	T	P	R	
191ITO702T	**Machine Learning**	**3**	**0**	**0**	**0**	**3**

PREREQUISITES:

Probability and Statistics

COURSE OBJECTIVES:

1.	To understand the need for machine learning for various problem solving.
2.	To study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning
3.	To understand the latest trends in machine learning
4.	To design appropriate machine learning algorithms for problem solving.
5.	To develop skills of using recent machine learning software for solving practical problems.
6.	To gain experience of doing independent study and research.

UNIT	TITLE	PERIODS
1	INTRODUCTION	**9**
Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning.	

UNIT	TITLE	PERIODS
2	NEURAL NETWORKS AND GENETIC ALGORITHMS	**9**

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search.

UNIT	TITLE	PERIODS
3	BAYESIAN AND COMPUTATIONAL LEARNING	**9**

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity.

UNIT	TITLE	PERIODS
4	INSTANT BASED LEARNING	**9**

K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.

UNIT	TITLE	PERIODS
5	ADVANCED LEARNING	**9**

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution –Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning.

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:

On completion of the course, the students will be able to:

CO1:	Describe the basic concepts of machine learning.
CO2:	Incorporate the decision tree algorithm to overcome the problem of over fitting

CO3:	Apply back propagation and genetic algorithms to solve real time problems
CO4:	Use various classification techniques for data analysis.
CO5:	Apply instance based learning for machine learning applications.
CO6:	Analyze and choose suitable machine learning algorithms for real time problems.

TEXT BOOKS:

1.	Tom M. Mitchell, ―Machine Learning‖, McGraw-Hill Education (India) Private Limited, 2013.

REFERENCE BOOKS:

1.	Ethem Alpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning)‖, The MIT Press 2004.
2.	Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
3.	Stephen Marsland, ―Machine Learning: An Algorithmic Perspective‖, CRC Press, 2009.

Course Code	Course Title	Periods per week				Credits
		L	T	P	R	
191ITO703T	**Cyber Security**	**3**	**0**	**0**	**0**	**3**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Understand the basics of cyber security policy and the importance
2.	Study Cyber security vulnerabilities and cyber security safeguards management
3.	Design and develop Securing web application, services and servers
4.	Develop SSL or Firewall based solutions against security threats, employ access control
5,	To understand various protocols for network security to protect against the threats in the Networks
6.	Understand the importance of Cyberspace and the law and cyber forensics

UNIT	TITLE	PERIODS
1	**INTRODUCTION**	**9**

Overview of Cyber Security – Challenges and Constraints- Cyber Threats-Cyber Warfare-Cyber Crime-Cyber terrorism- Cyber Espionage - Need for a Comprehensive Cyber Security Policy - Need for a Nodal Authority- Need for an International convention on Cyberspace.

UNIT	TITLE	PERIODS
2	**CYBER SECURITY VULNERABILITIES AND CYBER SECURITY SAFEGUARDS**	**9**

Cyber Security Vulnerabilities-Overview, vulnerabilities in software,System administration - Complex Network Architectures - Open Access to Organizational Data - Weak Authentication-Cyber Security Safeguards- Overview - Access control – Audit –Authentication – Biometrics – Deception - Denial of Service Filters - Ethical Hacking.

UNIT	TITLE	PERIODS
3	**SECURING WEB APPLICATION, SERVICES AND SERVERS**	**9**

Introduction - Basic security for HTTP Applications and Services -Basic Security for SOAP Services - Identity Management and Web Services - Authorization Patterns - Security Considerations - Challenges.

UNIT	TITLE	PERIODS
4	**CRYPTOGRAPHY AND NETWORK SECURITY**	**9**

Introduction to Cryptography - Symmetric and Asymmetric key Cryptography - Message Authentication - Digital Signatures - Applications of Cryptography - Intrusion Detection and Prevention- Overview of Firewalls- Types of Firewalls - Security Protocols - security at the Application Layer:PGP and S/MIME - Security at Transport Layer: SSL and TLS

UNIT	TITLE	PERIODS
5	**CYBERSPACE LAW AND CYBER FORENSICS**	**9**

Introduction - Cyber Security Regulations - Roles of International Law - The INDIAN Cyberspace - National Cyber Security Policy 2013- Introduction to Cyber Forensics - Handling Preliminary Investigations - Controlling an Investigation - Conducting disk based analysis - Investigating Information hiding - Tracing Internet access- Case Study – Personal Security.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

Upon completion of this course, student will be able to:	
CO1:	Outline the basics of cyber security.
CO2:	Evaluate and classify Cyber security vulnerabilities and cyber Security Safeguards.
CO3:	Apply various security measures for web based applications and services
CO4:	Knowledge about basic cryptographic based techniques
CO5:	Understand, employ, design and implement appropriate security technologies.
CO6:	Demonstrate the use of standards and cyber laws to enhance information security

TEXT BOOKS:

1.	Dr. Jeetendra Pande, "Introduction to Cyber Security", 9th Edition, Uttarakhand Open University, 2017.
2.	Mayank Bhushan, Rajkumar singh Rathore, Aatif Jamshed, "Fundamentals of Cyber Security", BPB Publications.

REFERENCE BOOKS:

1.	Pankaj Sharma, "Information Security and Cyber Laws", Kataria, S. K., & Sons publication.
2.	Nina Godbole, Sunit Belapure,"Cyber Security", Wiley India Pvt. Ltd publication.