CURRICULUM & SYLLABUS

(REGULATIONS 2019)

FOR

B.E. – COMPUTER SCIENCE AND ENGINEERING

CHOICE BASED CREDIT SYSTEM

(Applicable to the students admitted from the Academic Year 2019-20 onwards)

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

SEMESTER I								
S.No	Course Code	Course Title	Category	Hours / Week				CREDITS
				L	T	P	R	
THEORY								
1.	191LEH101T	Technical English	HS	3	-	-	-	3
2.	191MAB101T	Engineering Mathematics I	BS	3	2	-	-	4
3.	191PYB101T	Engineering Physics	BS	3	-	-	-	3
4.	191CYB101T	Engineering Chemistry	BS	3	-	-	-	3
5.	191GES101T	Engineering Graphics	ES	2	-	4	-	4
6.	191GES102T	Problem Solving through Python Programming	ES	3	-	-	-	3
LABORATORY								
7.	191GEB111L	Physics and Chemistry Laboratory	BS	-	-	4	-	2
8.	191GES111L	Python Programming Laboratory	ES	-	-	3	1	2
MANDATORY COURSE								
9.	191GEM101L	Induction Training[&]	MC	-	-	2	-	1[&]
TOTAL				**17**	**2**	**13**	**1**	**24**

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

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

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

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

SEMESTER III								
S.No	Course Code	Course Title	Category	Hours / Week				CREDITS
				L	T	P	R	
THEORY								
1.	191MAB302T	Discrete Mathematics	BS	3	2	-	-	4
2.	191ECS321T	Digital Principles and System Design	ES	3	-	-	-	3
3.	191CSC301T	Software Engineering	PC	3	-	-	-	3
4.	191CSC302T	Object Oriented Programming with C++	PC	3	-	-	-	3
5.	191CSC303T	Data Structures	PC	3	-	-	-	3
6.	191CSC304T	Computer Architecture	PC	3	-	-	-	3
LABORATORY								
7.	191CSC311L	Data Structures Laboratory in C	PC	-	-	4	-	2
8.	191CSC312L	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.	191CSA311I	Internship / Industrial Training#	EEC	-	-	-	-	1#
11	191CSA301I	Industry Supported Course (Optional) ##	EEC	-	-	-	-	1##
ONLINE COURSE								
12		Online Course (Optional) $	PE	-	-	-	-	3$
TOTAL				**18**	**2**	**9**	**1**	**24**

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

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

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

$ Online courses of three credits each can be considered in lieu of Professional Elective – IV and Professional Elective – VI. A student earned only three credits can drop only Professional Elective – VI. Please refer 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.	191MAB403T	Probability And Number Theory	BS	3	2	-	-	4
2.	191CSC401T	Design and Analysis of Algorithms	PC	3	-	-	-	3
3.	191CSC402T	Operating Systems	PC	3	-	-	-	3
4.	191CSC403T	Database Management Systems	PC	3	-	-	-	3
5.	191CSC404T	Programming in Java	PC	3	-	-	-	3
LABORATORY								
6.	191CSC411L	Operating Systems Laboratory	PC	-	-	4	-	2
7.	191CSC412L	Database Management Systems Laboratory	PC	-	-	3	1	2
8.	191CSC413L	Java Programming Laboratory	PC	-	-	4	-	2
TOTAL CREDITS								**22**
MANDATORY COURSE								
9.	191GEM411L	NSS / NCC / YRC – Phase - II *	MC	-	-	2	-	1*
EMPLOYABILITY ENHANCEMENT COURSE								
10.	191CSA411I	Internship / Industrial Training#	EEC	-	-	-	-	1#
11.	191CSA401I	Industry Supported Course (Optional) ##	EEC	-	-	-	-	1##
ONLINE COURSE								
12.		Online Course (Optional) $	PE	3	-	-	-	3$
TOTAL				**18**	**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.	191CSC501T	Computer Networks	PC	3	2	-	-	4
2.	191CSC502T	Object Oriented Analysis and Design	PC	3	-	-	-	3
3.	191CSC503T	Data Mining	PC	3	-	-	-	3
4.		Professional Elective - I	PE	3	-	-	-	3
5.		Open Elective - I	OE	3	-	-	-	3
LABORATORY								
6.	191CSC511L	Computer Networks Laboratory	PC	-	-	3	1	2
7.	191CSC512L	Object Oriented Analysis and Design Laboratory	PC	-	-	2	-	1
HUMAN EXCELLENCE COURSE								
8.	191GEH511L	Yoga / Social Service – Phase -II**	HS	-	-	2	-	1
TOTAL CREDITS								**20**
EMPLOYABILITY ENHANCEMENT COURSE								
9.	191CSA511I	Internship / Industrial Training#	EEC	-	-	-	-	1#
10.	191CSA501I	Industry Supported Course (optional) ##	EEC	-	-	-	-	1##
ONLINE COURSE								
11.		Online Course (Optional) $	PE	3	-	-	-	3$
TOTAL				**18**	**2**	**7**	**1**	**20**

** Students have to complete the respective phase II.

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

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

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

SEMESTER VI								
S.No	Course Code	Course Title	Category	Hours / Week				CREDITS
				L	T	P	R	
THEORY								
1.	191CSC601T	Mobile Computing	PC	3	-	-	-	3
2.	191CSC602T	Artificial Intelligence	PC	3	-	-	-	3
3.	191CSC603T	Compiler Design	PC	3	2	-	-	4
4.		Professional Elective - II	PE	3	-	-	-	3
5.		Open Elective - II	OE	3	-	-	-	3
LABORATORY								
6.	191LEH611L	Interpersonal Skills / Listening and Speaking	HS	-	-	2	-	1
7.	191CSC611L	Application Development Laboratory (Mobile/Web)	PC	-	-	3	1	2
TOTAL CREDITS								**19**
MANDATORY COURSE								
8.	191GEM611L	NSS / NCC / YRC – Phase - III*	MC	-	-	2	-	1*
9.	191GEM601T	Foreign Language / Indian Constitution &	MC	3	-	-	-	3&
EMPLOYABILITY ENHANCEMENT COURSE								
10.	191CSA611I	Internship / Industrial Training #	EEC	-	-	-	-	1#
11.	191CSA601I	Industry Supported Course (optional) ##	EEC	-	-	-	-	1##
ONLINE COURSE								
12.		Online Course (Optional) $	PE	3	-	-	-	3$
TOTAL				**21**	**2**	**7**	**1**	**17**

* 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.	191MBH721T	Professional Ethics	HS	3	-	-	-	3
2.	191CSC701T	Data Science	PC	3	-	-	-	3
3.		Professional Elective - III	PE	3	-	-	-	3
4.		Professional Elective - IV	PE	3	-	-	-	3
5.		Open Elective - III	OE	3	-	-	-	3
6.	191CSA701T	Comprehension@	PE	-	-	-	-	3@
LABORATORY								
7.	191CSC711L	Data Science Laboratory	PC	-	-	3	1	2
EMPLOYABILITY ENHANCEMENT COURSE								
8.	191CSP711J	Project Work / Startup - Phase - I	EEC	-	-	-	4	2
9.	191CSA711I	Internship / Industrial Training #	EEC	-	-	-	-	1
TOTAL CREDITS								**20**
EMPLOYABILITY ENHANCEMENT COURSE								
10.	191CSA701I	Industry Supported Course (optional) ##	EEC	-	-	-	-	1##
TOTAL				**15**	**-**	**3**	**5**	**20**

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

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

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

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

SEMESTER VIII								
S.No	Course Code	Course Title	Category	Hours / Week				CREDITS
				L	T	P	R	
THEORY								
1.		Professional Elective - V	PE	3	-		-	3
2.		Professional Elective - VI	PE	3	-		-	3
EMPLOYABILITY ENHANCEMENT COURSE								
3.	191CSP811J	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	191MAB403T	Probability And Number Theory	IV	4
TOTAL CREDITS				**27**

ENGINEERING SCIENCE COURSES (ES)

S.No	Course Code	Course Title	Semester	Credits
1	191GES101T	Engineering Graphics	I	4
2	191GES102T	Problem Solving through Python Programming	I	3
3	191GES111L	Python Programming Laboratory	I	2
4	191GES201T	Basic Electrical and Electronics Engineering	II	3
5	191GES204T	Programming in C	II	3
6	191GES211L	Engineering Practices Laboratory	II	2
7	191GES213L	C Programming Laboratory	II	2
8	191ECS321T	Digital Principles and System Design	III	3
TOTAL CREDITS				22

PROFESSIONAL CORE COURSES (PC)

S.No	Course Code	Course Title	Semester	Credits
1	191CSC301T	Software Engineering	III	3
2	191CSC302T	Object Oriented Programming with C++	III	3
3	191CSC303T	Data Structures	III	3
4	191CSC304T	Computer Architecture	III	3
5	191CSC311L	Data Structures Laboratory in C	III	2
6	191CSC312L	Object Oriented Programming Laboratory	III	2
7	191CSC401T	Design and Analysis of Algorithms	IV	3
8	191CSC402T	Operating Systems	IV	3
9	191CSC403T	Database Management Systems	IV	3
10	191CSC404T	Programming in Java	IV	3
11	191CSC411L	Operating Systems Laboratory	IV	2
12	191CSC412L	Database Management Systems Laboratory	IV	2
13	191CSC413L	Java Programming Laboratory	IV	2
14	191CSC501T	Computer Networks	V	4
15	191CSC502T	Object Oriented Analysis and Design	V	3
16	191CSC503T	Data Mining	V	3
17	191CSC511L	Computer Networks Laboratory	V	2
18	191CSC512L	Object Oriented Analysis and Design Laboratory	V	1
19	191CSC601T	Mobile Computing	VI	3
20	191CSC602T	Artificial Intelligence	VI	3
21	191CSC603T	Compiler Design	VI	4
22	191CSC611L	Application Development Laboratory (Mobile / Web)	VI	2
23	191CSC701T	Data Science	VII	3
24	191CSC711L	Data Science Laboratory	VII	2
TOTAL CREDITS				**64**

PROFESSIONAL ELECTIVE COURSES (PE)

S.No	Course Code	Course Title	Semester	Credits
PROFESSIONAL ELECTIVE – I				
1	191CSE501T	Advanced JAVA Programming	V	3
2	191CSE502T	Software Testing and Quality Assurance	V	3
3	191CSE503T	Microprocessor and Micro Controller	V	3
4	191CSE504T	Natural Language Processing	V	3
5	191CSE505T	XML and Web Services	V	3
6	191CSE506T	Bio Inspired Computing	V	3
7	191CSE507T	Formal Languages and Automata Theory	V	3
PROFESSIONAL ELECTIVE – II				
1	191CSE601T	Visual Programming	VI	3
2	191CSE602T	Agile Methodologies	VI	3
3	191CSE603T	Cryptography and Network Security	VI	3
4	191CSE604T	Information Retrieval	VI	3
5	191CSE605T	Service Oriented Architecture	VI	3
6	191CSE606T	Blockchain Technologies	VI	3
7	191CSE607T	Wireless Sensor Networks	VI	3
PROFESSIONAL ELECTIVE – III				
1	191CSE701T	Programming in PHP	VII	3
2	191CSE702T	Software Requirements Engineering	VII	3
3	191CSE703T	Internet of Things	VII	3
4	191CSE704T	Business Intelligence and Analytics	VII	3
5	191CSE705T	Semantic Web Technology	VII	3
6	191CSE706T	Quantum Computing	VII	3
PROFESSIONAL ELECTIVE – IV				
1	191CSE711T	Computational Logics	VII	3
2	191CSE712T	Design Pattern	VII	3
3	191CSE713T	Advanced Computer Architecture	VII	3
4	191CSE714T	Cloud Computing Technologies	VII	3

S.No	Course Code	Course Title	Semester	Credits
5	191CSE715T	Machine Learning Techniques	VII	3
6	191CSE716T	C# and .NET Framework	VII	3
7	191CSE717T	3D Printing and Design	VII	3
PROFESSIONAL ELECTIVE – V				
1	191CSE801T	Game Programming	VIII	3
2	191CSE802T	Software Defined Networks	VIII	3
3	191CSE803T	TCP/IP Technologies	VIII	3
4	191CSE804T	Deep Learning	VIII	3
5	191CSE805T	Open Source Systems	VIII	3
6	191CSE806T	Robotics	VIII	3
PROFESSIONAL ELECTIVE – VI				
1	191CSE811T	Parallel Programming Using Open CL	VIII	3
2	191CSE812T	Human Computer Interface	VIII	3
3	191CSE813T	Cyber Forensics	VIII	3
4	191CSE814T	Knowledge Based Decision Support System	VIII	3
5	191CSE815T	Social Network Analysis	VIII	3
6	191CSE816T	Virtual Reality	VIII	3

LIST OF OPEN ELECTIVES

Semester V								
S.No	Course Code	Course Title	Category	Hours / Week				CREDITS
				L	T	P	R	
1	191CSO501T	Programming in C	OE	3	-	-	-	3
2	191CSO502T	Programming in C++	OE	3	-	-	-	3
3	191CSO503T	Software Engineering	OE	3	-	-	-	3
Semester VI								
1	191CSO601T	Programming in JAVA	OE	3	-	-	-	3
2	191CSO602T	User Interface Design	OE	3	-	-	-	3
3	191CSO603T	Internet of Things	OE	3	-	-	-	3
Semester VII								
1	191CSO701T	Web Designing	OE	3	-	-	-	3
2	191CSO702T	Big Data	OE	3	-	-	-	3
3	191CSO703T	Software Project Management	OE	3	-	-	-	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.No	Course Code	Course Title	Semester	Credits
1		Internship / Industrial Training	III to VII	1
2		Industry Supported Course(optional)	III to VII	--
3	191CSP711L	Project work / Startup Phase I	VII	2
4	191CSP811L	Project work / Startup 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		1	1	3		**12**
Basic Sciences(BS)	12	7	4	4					**27**
Engineering Sciences (ES)	9	10	3						**22**
Professional Core (PC)			16	18	13	12	5		**64**
Professional Electives (PE)					3	3	6	6	**18**
Open Electives (OE)					3	3	3		**09**
Employability Enhancement Courses (EEC)							3	10	**13**
Total Credit	**24**	**20**	**24**	**22**	**20**	**19**	**20**	**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:	Listening – Listen and comprehend lectures and talks in their area of specialization successfully
CO2:	Speaking- Speak appropriately and effectively in varied formal and informal contexts**.**
CO3:	Reading – Read technical texts and write area- specific texts effortlessly
CO4:	Writing- Write reports and winning job applications
CO5:	Speak convincingly and participate in Group Discussions
CO6:	Communicate effectively through emails and analyze issues, technical articles and involve in speed reading

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 (Common to all branches of Engineering and Technology)	Periods per week				Credits
		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:	Examine the consistency of given linear Homogeneous and Non-Homogeneous simultaneous equations by using rank method.

CO2:	Find Eigen values, Eigen vectors of square matrices to convert quadratic form in to canonical form
CO3:	Find 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:	Find area enclosed by simple closed curve using double integral and volume of solid by using triple integral

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:	Choose the material for required elastic properties
CO2:	Design ultrasonic devices for engineering and medical disciplines
CO3:	Design thermal devices for real life domestic applications
CO4:	Apply the principles of quantum mechanics to one dimensional motion of particles.
CO5:	Select the appropriate laser and optical fibers for industry, medicine and telecommunication applications.

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 calculationsand 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:	Identify an appropriate water treatment technique for the given water sample**.**
CO2:	Choose an appropriate method for polymer synthesis and fabrication of plastics.
CO3:	Select a suitable fuel for an application, based on the fuel properties
CO4:	Design the electrical power generation technology for nuclear, solar, wind and battery sources.
CO5:	Synthesize the nanomaterials for various applications.

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

REFERENCE BOOKS:	
1.	Dara S.S &S.S Umare, —A Text book of Engineering Chemistryǁ, S.Chand & Company Ltd., New Delhi, 2015.
2.	Palanna O.G, —Engineering Chemistryǁ, 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 (Common to all branches of Engineering and Technology)	Periods per week				Credits
		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:	Construct conic sections and cycloids
CO2:	Draw the projections of points, Straight lines and planes inclined to both the principal planes.
CO3:	Draw the projections of the simple solids like cylinder, cone, prisms and pyramids inclined to one of the principle planes.
CO4:	Draw the sectional views of simple solids, obtain true shape and develop the sectioned solids.
CO5:	Construct Orthographic views from pictorial views and the isometric view and isometric projection of simple and truncated solids in vertical position.

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:	Determine the elastic properties of materials using torsional Pendulum and non-uniform bending.
CO2:	Examine the optical properties of light waves using optical fiber, laser and spectrometer grating.
CO3:	Find the thermal conductivity of a bad conductor using Lee's Disc apparatus
CO4:	Analyze the water quality parameters like hardness, chloride and DO content
CO5:	Determine the molecular weight and classify the polymers.
CO6:	Estimate the strength of acids using different instrumental techniques.

REFERENCE BOOKS:	
1.	Dr. C. Ravichandran, —Engineering Chemistry Laboratory-Ill 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.	The course on Python programming laboratory is used to write, test and debug simple Python programs. Upon completion of the course, the students would be able to master the concepts of data types, loops, functions, list, tuples, dictionary, files and GUI.

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.

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:	Listening – listen/view and comprehend conversations and short talks delivered in English.
CO2:	Speaking- participate effectively in informal conversations; introduce themselves and their friends and express opinions in English.
CO3:	Reading – read articles of a general kind in magazines and newspapers.
CO4:	Writing- write short essays of a general kind and personal letters and emails in English
CO5:	Revise and edit effectively all written matter by organizing ideas cohesively, coherently, logically and using a wide vocabulary range.
CO6:	Understand current resources for locating secondary information, and also understand the strategies of effective primary data gathering.

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

REFERENCE BOOKS:	
1.	M. Ashraf Rizvi ‗Effective Technical Communication', Tata McGraw-Hill, New Delhi, 2005
2.	Richard Johnson - Sheehan, Technical Communication Today, Longman Publishing Group, 2011
3.	Golding S.R. ‗Common Errors in English Language', Macmillan, 1978

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		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 $w = z + c,\ cz,\ \frac{1}{z},\ z^2$ - Bilinear transformation.

UNIT	TITLE	PERIODS
V	COMPLEX INTEGRATION	12

Complex integral - Cauchy‘s integral theorem – Cauchy‘s integral formula – Taylor‘s and Laurent‘s series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use 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:	Gain knowledge on classical and quantum electron theories, and energy band structures
CO2:	Acquire knowledge on basics of semiconductor physics and its applications in various devices
CO3:	Get knowledge on magnetic properties of materials and their applications in data storage
CO4:	Get knowledge on Superconducting materials and their applications in various field
CO5:	Have the necessary understanding on the functioning of optical and Modern Engineering materials
CO6:	Understand the basics of Nano Materials and quantum structures and their applications in real time

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

REFERENCE BOOKS:	
1.	Arthur Beiser,Concepts of Modern Physics, 6th edn.,McGraw Hill 2003.
2.	S.O.Kasap, 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.	T.Pradeep, Nano: The Essentials, Mc Graw Hill Publishing Co. Ltd., 2007.

191GES201T	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Common to Auto., ME, CE, 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:	Apply principles of electric and electronic circuits to solve engineering problems.
CO2:	Explain the operating principles of measuring instruments.
CO3:	Explain the working principle and applications of electrical machines
CO4:	Analyze the characteristics of analog electronic devices
CO5:	Carry out proper maintenance of electrical equipment by understanding various standards, and use relevant electric/electronic protective devices safely.

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:	Compile 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.
3.	Balagurusamy E — Programming in ANSI C, McGraw Hill Publication, Eighth Edition, 2019.

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 Measure the electrical quantities
CO6:	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:	Develop C programs for simple applications making use of arrays and strings.
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.

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:	Analyze various threat to biodiversity for its conservation
CO2:	Select a suitable method to conserve natural resources for sustainable development.
CO3:	Apply necessary steps for pollution prevention and disaster management..
CO4:	Plan for a sustainable lifestyle to protect the environment
CO5:	Apply the technique to recover resources from the waste.

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

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

SYLLABUS OF

SEMESTER – III

COURSES

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

PREREQUISITES:
NIL

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

UNIT	TITLE	PERIODS
I	MATHEMATICAL LOGIC	L - 9, T – 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	L - 9, T – 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	L - 9, T – 3
Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.		
UNIT	TITLE	PERIODS
IV	ALGEBRAIC STRUCTURES	L - 9, T – 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	L - 9, T – 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:	Identify the consistency of the given propositions
CO2:	Use basic terminologies of counting principles to solve practical problems in CSE and IT
CO3:	Apply Graph theoretical ideas which are highly useful in networking and data structures.
CO4:	Recall the concepts of groups and fields which are used in coding theory.
CO5:	Produce results in Lattices and Boolean algebras analogues to results in group theory.

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. **Unit-II:** Sections: 4.1, 4.2, 5.1, 5.2, 5.3, 6.1, 6.2, 6.4, 6.5, 6.6 **Unit-III:** Sections: 8.1, 8.2, 8.3, 8.4, 8.5 **Unit-IV:** Sections: 11.1, 11.2, 11.3, 11.4, 11.5
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. **Unit-I:** Sections: 1-1, 1-2.1 to 1-2.4, 1-2.6, 1-2.8 to 1-2.12, 1-3.1 to 1-3.4, 1- 4.1 to 1-4.3, 1-5, 1-6 **Unit-V:** Sections: 4-1.1, 4-1.2, 4-1.5, 4-2.1

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

191CSC301T	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 understand fundamental concepts of requirements engineering and Analysis Modeling.
3.	To understand the various software design methodologies
4.	To learn various testing and maintenance measures

UNIT	TITLE	PERIODS
I	SOFTWARE PROCESS AND AGILE DEVELOPMENT	9
Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models – Introduction to Agility-Agile process-Extreme programming-XP Process.		
UNIT	TITLE	PERIODS
II	REQUIREMENTS ANALYSIS AND SPECIFICATION	9
Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary.		
UNIT	TITLE	PERIODS
III	SOFTWARE DESIGN	9
Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design - Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.		
UNIT	TITLE	PERIODS
IV	TESTING AND MAINTENANCE	9
Software testing fundamentals-Internal and external views of Testing-white box testing - basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing And Debugging –Software Implementation Techniques: Coding practices-Refactoring-Maintenance and Reengineering - BPR model - Reengineering process model-Reverse and Forward Engineering.		
UNIT	TITLE	PERIODS
V	PROJECT MANAGEMENT	9
Software Project Management: Estimation – LOC, FP Based Estimation, Make/Buy Decision COCOMO I & II Model – Project Scheduling – Scheduling, Earned Value Analysis Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection - Risk Management - Risk Identification-RMMM Plan-CASE TOOLS		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Choose the appropriate process model for software development
CO2:	Classify the requirements of the project development, as functional and non-functional
CO3:	Integrate the architectural styles for software design
CO4:	Apply the appropriate testing strategies for software verification and validation
CO5:	Estimate the risk and cost for effective project management

TEXT BOOKS:	
1.	Ian Sommerville, —Software Engineering‖, 9th Edition, Pearson Education Asia, 2011.
2.	Roger S. Pressman, —Software Engineering – A Practitioner's Approach‖, Seventh Edition, Mc Graw-Hill International Edition, 2010.

REFERENCE BOOKS:	
1.	Kelkar S.A., —Software Engineering‖, Prentice Hall of India Pvt Ltd, 2007.
2.	Pankaj Jalote, —Software Engineering, A Precise Approach‖, Wiley India, 2010.
3.	Rajib Mall, —Fundamentals of Software Engineering‖, Third Edition, PHI Learning Private Limited, 2009
4.	Stephen R.Schach, —Software Engineering‖, Tata McGraw-Hill Publishing Company Limited, 2007.

191CSC302T	OBJECT ORIENTED PROGRAMMING WITH C++	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To comprehend the fundamentals of object oriented programming in C++.
2.	To use object oriented programming to Develop Generic programming skills
3.	Apply appropriate data structures and solve complex problems
4.	Design problem into classes and develop a full working code
5.	Develop programs using files, templates and handle exceptions

UNIT	TITLE	PERIODS
I	INTRODUCTION TO C++	9
Object oriented programming concepts: Class – Object - Abstraction - Encapsulation – Polymorphism- inheritance- Data Hiding, Introduction to C++:Structure of C++ program, Data types, Operators and control statements, Input and output operators, Dynamic initialization, Reference variables, Classes and Objects: Class specification - Member function definition		
UNIT	TITLE	PERIODS
II	FUNCTIONS,CONSTRUCTORS AND DESTRUCTORS	10
Function prototype, Default arguments, Call by reference-Static data members and Static member functions - Function return type as objects - Friend function –Constructors and destructors: Basic concepts - Parameterized constructor - Copy constructor - Dynamic constructors.		
UNIT	TITLE	PERIODS
III	INHERITANCE AND POLYMORPHISM	9
Defining derived classes, Types of inheritance: Single inheritance- Multilevel inheritance- Multiple inheritance – Hierarchical inheritance – Hybrid inheritance- Constructors in derived and base class, Abstract classes, Virtual function.		
UNIT	TITLE	PERIODS
IV	OPERATOR OVERLOADING	8
Defining operator overloading, overloading unary and binary operators, Operator overloading using friend function, Rules for Overloading operators - Type conversion.		
UNIT	TITLE	PERIODS
V	FILES,TEMPLATES AND EXCEPTION HANDLING	9
File pointer and file processing, Sequential and random file access -Template function, Template classes - Exception handling mechanism – Case Study: online Reservation system		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Apply the concepts of object oriented programming using C++.
CO2:	Make use of functions and constructors for complex problems.
CO3:	Construct programs with inheritance and polymorphism.
CO4:	Implement operator overloading concept with type conversion.
CO5:	Develop programs using files, templates and exception handling
CO6:	Build real world applications using Object Oriented Concepts.

TEXT BOOKS:	
1.	Balaguruswamy E. “Object Oriented Programming with C++”, 6th edition, Tata McGraw Hill Education, 2015
2.	Bjarne Stroustrup ,”The C++ Programming Language”, 4th Edition, Addison Wesley, 2015
3.	Robert Lafore, “Object-Oriented Programming in C++”, Fourth Edition, Sams Publication, 2002

REFERENCE BOOKS:	
1.	Deitel, - C++ How to Program, 6th edition, PHI publication, 2008
2.	Herbert Schildt, —C++: The Complete Referencell, Tata McGraw Hill, New Delhi, 2009.
3.	Stanley B., Lippman, Josee Lajoie and Barbara E. Moo, —C++ Primer, Pearson Education, New Delhi, 2010.
4.	Yashwant Kanetkar, —Object Oriented Programming with C++, BPB Publications, New Delhi, 2004.

191CSC303T	DATA STRUCTURES	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 Learn Non-linear data structures - Trees, BST and B Trees
4.	To Learn and apply Graphs structures
5.	To understand sorting, searching and hashing algorithms

UNIT	TITLE	PERIODS
I	LINEAR DATA STRUCTURES – LIST	9
Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation — singly linked lists- circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal)		
UNIT	TITLE	PERIODS
II	LINEAR DATA STRUCTURES – STACKS, QUEUES	8
Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to postfix expression –Evaluation of Postfix expression-Queue ADT – Operations - Circular Queue - deQueue – applications of queues		
UNIT	TITLE	PERIODS
III	NON LINEAR DATA STRUCTURES – TREES	9
Tree ADT – tree traversals - Binary Tree ADT – expression trees – applications of trees – binary search tree ADT – AVL Trees - B Tree - Heap – Min Heap and Max Heap.		
UNIT	TITLE	PERIODS
IV	NON LINEAR DATA STRUCTURES – GRAPHS	10
Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal – Topological Sorting – Shortest-Path algorithm - Dijkstra's algorithm - Minimum spanning tree – Prim's and Kruskal's Algorithms –Bi-connectivity – Cut Vertex – Applications of graphs.		
UNIT	TITLE	PERIODS
V	SEARCHING, SORTING AND HASHING TECHNIQUES	9
Searching- Linear Search - Binary Search. Sorting - Bubble sort - Selection sort - Insertion sort - Quick Sort. Hashing- Hash Functions – Collision Resolution - Open Addressing– Chaining – Extendible Hashing.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Implement the abstract data types of Linear and Non Linear data structures
CO2:	Choose the appropriate linear data structures for real world applications
CO3:	Organize the data using suitable tree data structures.
CO4:	Solve the real world problems using graph data structures.
CO5:	Analyze sorting, searching and hashing algorithms for data access

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

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

191CSC304T	COMPUTER ARCHITECTURE	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To learn the basic structure and operations of a computer.
2.	To learn the arithmetic and logic unit and implementation of fixed-point and floating point arithmetic unit.
3.	To learn the basics of pipelined execution.
4.	To understand parallelism and multi-core processors.
5.	To understand the memory hierarchies, cache memories and virtual memories.
6.	To learn the different ways of communication with I/O devices.

UNIT	TITLE	PERIODS
I	BASIC STRUCTURE OF A COMPUTER SYSTEM	9
Functional Units – Basic Operational Concepts – Performance – Instructions: Language of the Computer – Operations, Operands – Instruction representation – Logical operations – decision making – MIPS Addressing		
UNIT	TITLE	PERIODS
II	ARITHMETIC FOR COMPUTERS	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.		
UNIT	TITLE	PERIODS
IV	PARALLELISIM	9
Parallel processing challenges – Flynn‘s classification – SISD, MIMD, SIMD, SPMD, and Vector Architectures – Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors – Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors.		
UNIT	TITLE	PERIODS
V	MEMORY & I/O SYSTEMS	9
Memory Hierarchy – memory technologies – cache memory – measuring and improving cache performance – virtual memory, TLB‘s – Accessing I/O Devices – Interrupts – Direct Memory Access – Bus structure – Bus operation – Arbitration – Interface circuits – USB.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Utilize various instruction formats for computer operations.
CO2:	Design of arithmetic and logic unit
CO3:	Build the data path with pipelining techniques
CO4:	Apply various parallel processing architectures for computational problems.
CO5:	Analyze the performance of various memory systems and I/O communication

TEXT BOOKS:	
1.	Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill, 2012.
2.	David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.

REFERENCE BOOKS:	
1.	John L. Hennessey and David A. Patterson, Computer Architecture – A Quantitative Approach, Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.
2.	John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012.
3.	William Stallings, Computer Organization and Architecture – Designing for Performance, Eighth Edition, Pearson Education, 2010.

191CSC311L	DATA STRUCTURES LABORATORY IN C	Periods per week				Credits
		L	T	P	R	
		0	0	4	0	2

PREREQUISITES:
NIL

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

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

TOTAL PERIODS:	60

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Write functions to implement linear data structure operations using C
CO2:	Solve problems using non-linear data structures
CO3:	Implement Graph and Traversal algorithms
CO4:	Develop searching and sorting algorithms.
CO5:	Develop programs using Hashing techniques

191CSC312L	OBJECT ORIENTED PROGRAMMING LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	**0**	**3**	**1**	**2**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To use object oriented programming to Develop Generic programming skills
2.	Apply appropriate data structures and solve complex problems
3.	Design problem into classes and develop a full working code
4.	Develop programs using files, templates and handle exceptions

LIST OF EXPERIMENTS:	
1.	Design C++ classes with static members, methods with default arguments, friend functions. (For example, design matrix and vector classes with static allocation, and a friend function to do matrix-vector multiplication)
2.	Implement complex number class with necessary operator overloadings and type conversions such as integer to complex, double to complex, complex to double etc.
3.	Implement Matrix class with dynamic memory allocation and necessary methods. Give proper constructor, destructor, copy constructor, and overloading of assignment operator.
4.	Overload the new and delete operators to provide custom dynamic allocation of memory.
5.	Develop a template of linked-list class and its methods.
6.	Develop templates of standard sorting algorithms such as bubble sort, insertion sort, merge sort, and quick sort.
7.	Design stack and queue classes with necessary exception handling.
8.	Define Point class and an Arc class. Define a Graph class which represents graph as a collection of Point objects and Arc objects. Write a method to find a minimum cost spanning tree in a graph.
9.	Develop with suitable hierarchy, classes for Point, Shape, Rectangle, Square, Circle, Ellipse, Triangle, Polygon, etc. Design a simple test application to demonstrate dynamic polymorphism and RTTI.
10.	Write a C++ program that randomly generates complex numbers (use previously designed Complex class) and writes them two per line in a file along with an operator (+, -, *, or /). The numbers are written to file in the format (a + ib). Write another program to read one line at a time from this file, perform the corresponding operation on the two complex numbers read, and write the result to another file (one per line).
11.	MINI PROJECT: Create a —Railway reservation system / Airline reservation system with the following modules – Booking – Availability checking – Cancellation

	TOTAL PERIODS:	**60**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Develop programs using functions and constructors in C++.
CO2:	Write programs using inheritance and polymorphism.
CO3:	Implement the concepts of operator overloading in C++.
CO4:	Develop programs using template for searching and sorting algorithms.
CO5:	Design applications for file manipulation and exception handling.
CO6:	Create an application program using the concepts implicated in C++.

SYLLABUS OF

SEMESTER – IV

COURSES

191MAB403T	PROBABILITY AND NUMBER THEORY	Periods per week				Credits
		L	T	P	R	
		3	2	0	0	4

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
2.	To understand the basic concepts of probability, one and two dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
3.	To understand the basic concepts in number theory .
4.	To examine the key questions in the Theory of Numbers.
5.	To give an integrated approach to number theory and provide a firm basis for further reading and study in the subject.

UNIT	TITLE	PERIODS
I	PROBABILITY AND RANDOM VARIABLES	L - 8, T - 4
Probability review – Baye's theorem, Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.		
UNIT	TITLE	PERIODS
II	TWO - DIMENSIONAL RANDOM VARIABLES	L - 8, T - 4
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables.		
UNIT	TITLE	PERIODS
III	DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS	L - 8, T - 4
Division algorithm – Base - b representations – Number patterns – Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM.		
UNIT	TITLE	PERIODS
IV	DIOPHANTINE EQUATIONS AND CONGRUENCES	L - 8, T - 4
Linear Diophantine equations – Congruence's – Linear Congruence's - Applications: Divisibility tests - Modular exponentiation-Chinese remainder theorem – 2 x 2 linear systems.		
UNIT	TITLE	PERIODS
V	CLASSICAL THEOREMS AND MULTIPLICATIVE FUNCTIONS	L - 8, T - 4
Wilson's theorem - Fermat's little theorem – Euler's theorem – Euler's Phi functions – Tau and Sigma functions.		

TOTAL PERIODS:	60

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Recall the concepts of probability to study discrete and continuous distribution.
CO2:	Compose the joint probability density function (PDF) of two new random variables by using the PDF of two given random variables and given transformation.
CO3:	Apply division algorithm and Euclidean algorithm to find the GCD of any two positive integers.
CO4:	Analyze linear congruence's to solve a system of linear congruence's.
CO5:	Revise classical theorems on number theory which help to solve linear congruence's.

TEXT BOOKS:	
1.	Koshy, T., ―Elementary Number Theory with Applications‖, Elsevier Publications, New Delhi, 2002.
2.	Ibe. O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.

REFERENCE BOOKS:	
1.	Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2004.
2.	Niven, I., Zuckerman.H.S., and Montgomery, H.L., ―An Introduction to Theory of Numbers‖, John Wiley and Sons , Singapore, 2004.
3.	San Ling and Chaoping Xing, ―Coding Theory – A first Course‖, Cambridge Publications, Cambridge, 2004..

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

PREREQUISITES:
NIL

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

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

TOTAL PERIODS:	**45**

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

TEXT BOOKS:	
1.	Anany Levitin, ”Introduction to the Design and Analysis of Algorithms”, Third Edition, Pearson Education,2012.
2.	Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algoritms / C++,Second Edition, University Press,2007.

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

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

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

PREREQUISITES:
NIL

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

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

UNIT	TITLE	PERIODS
V	CASE STUDY	9
Linux System - Basic Concepts; System Administration - Requirements for Linux System Administrator, Setting up a LINUX Multifunction Server, Domain Name System, Setting Up Local Network Services; Virtualization - Basic Concepts, VMware on Linux Host OS.		

TOTAL PERIODS:	**45**

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

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

REFERENCE BOOKS:	
1.	Andrew S. Tanenbaum, “Modern Operating Systems”, Second Edition, Addison Wesley, 2001.
2.	Charles Crowley, “Operating Systems: A Design-Oriented Approach”, Tata McGraw Hill Education”, 1996.
3.	Dhamdhere D. M., “Operating Systems: A Concept-Based Approach”, Second Edition, Tata McGraw-Hill Education, 2007.
4.	William Stallings, “Operating Systems – Internals and Design Principles”, 7th Edition, Prentice Hall, 2011

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

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

PREREQUISITES:
NIL

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

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

UNIT	TITLE	PERIODS
V	**ADVANCED TOPICS**	9
Distributed Databases: Architecture, Data Storage, Transaction Processing – Object-based Databases: Object Database Concepts, Object-Relational features, ODMG Object Model, ODL, OQL – XML Databases: XML Hierarchical Model, DTD, XML Schema, XQuery – Information Retrieval: IR Concepts, Retrieval Models, Queries in IR systems		

TOTAL PERIODS:	**45**

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

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

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

191CSC404T	PROGRAMMING IN JAVA	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

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

UNIT	TITLE	PERIODS
I	INTRODUCTION TO OOP AND JAVA FUNDAMENTALS	9
Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- Characteristics of Java – The Java Environment - Java Source File - Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods - Access specifiers - static members - Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages - JavaDoc comments.		
UNIT	TITLE	PERIODS
II	INHERITANCE AND INTERFACES	9
Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, extending interfaces - Differences between classes and interfaces - Object cloning - Inner classes, Array Lists – Strings		
UNIT	TITLE	PERIODS
III	EXCEPTION HANDLING AND I/O	9
Exceptions - exception hierarchy - throwing and catching exceptions – Built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files		
UNIT	TITLE	PERIODS
IV	MULTITHREADING AND GENERIC PROGRAMMING	9
Differences between multi-threading and multitasking -Thread life cycle - Creating threads - Synchronizing threads - Inter-thread communication - Daemon threads - Thread groups. Generic Programming – Generic classes – Generic methods – Bounded Types – Restrictions and Limitations.		

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

TOTAL PERIODS:	**45**

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

TEXT BOOKS:	
1.	Cay S. Horstmann, Gary cornell, “Core Java Volume –I Fundamentals”, 9th Edition, Prentice Hall, 2013.
2.	Herbert Schildt, “Java The complete reference”, 8th Edition, McGraw Hill Education, 2011.

REFERENCE BOOKS:	
1.	Danny Poo, Derek Kiong, Swarnalatha Ashok, “Object-Oriented Programming and Java”, 2nd Edition, Springer Publication, 2008.
2.	Paul Deitel, Harvey Deitel, “Java SE 8 for programmers”, 3rd Edition, Pearson, 2015.
3.	Steven Holzner, “Java 2 Black book”, Dreamtech press, 2011.
4.	Timothy Budd, “Understanding Object-oriented programming with Java”, Updated Edition, Pearson Education, 2000.

191CSC411L	OPERATING SYSTEMS LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	0	4	0	2

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To learn Unix commands and shell programming
2.	To implement various CPU Scheduling Algorithms
3.	To implement Process Creation and Inter Process Communication.
4.	To implement Deadlock Avoidance and Deadlock Detection Algorithms
5.	To implement Page Replacement Algorithms
6.	To implement File Organization and File Allocation Strategies

LIST OF EXPERIMENTS	
1.	Basics of UNIX commands
2.	Write programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir
3.	Write C programs to simulate UNIX commands like cp, ls, grep, etc.
4.	Shell Programming
5.	Write C programs to implement the various CPU Scheduling Algorithms
6.	Implementation of Semaphores
7.	Implementation of Shared memory and IPC
8.	Bankers Algorithm for Deadlock Avoidance
9.	Implementation of Deadlock Detection Algorithm
10.	Write C program to implement Threading & Synchronization Applications
11.	Implementation of the following Memory Allocation Methods for fixed partition
	a. First Fit
	b. Worst Fit
	c. Best Fit
12.	Implementation of Paging Technique of Memory Management
13.	Implementation of the following Page Replacement Algorithms
	a. FIFO
	b. LRU
	c. LFU

14.	Implementation of the various File Organization Techniques
15.	Implementation of the following File Allocation Strategies
	a. Sequential
	b. Indexed
	c. Linked

TOTAL PERIODS:	**60**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Create shell program for simple applications
CO2:	Develop programs for various CPU Scheduling Algorithms
CO3:	Implement Deadlock avoidance and Detection techniques
CO4:	Implement the concepts of Semaphore, Inter Process Communications and threads to solve real time applications
CO5:	Analyze the performance of various Page Replacement Algorithms
CO6:	Create File Organization and File Allocation Strategies in Operating Systems

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

PREREQUISITES:
NIL

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

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

TOTAL PERIODS:	**60**

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

WEBSITES:	
1.	spoken-tutorial.org

191CSC413L	JAVA PROGRAMMING LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	**0**	**4**	**0**	**2**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand Object Oriented Programming concepts and basics of JAVA.
2.	To build software development skills using java programming for real-world applications.
3.	To understand and apply the concepts of classes, packages, interfaces, array list, exception handling and file processing.
4.	To develop applications using generic programming and event handling.
5.	To design and build simple Graphical User Interfaces.

LIST OF EXPERIMENTS	
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:
	• First 100 units - Rs. 1 per unit
	• 101-200 units - Rs. 2.50 per unit
	• 201-500 units - Rs. 4 per unit
	• >501 units - 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.	Develop a Java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa), time converter (hours to minutes, seconds and vice versa) using packages.
3.	Develop a Java application with Employee class with Emp_name, Emp_id, Address, Mail_id, 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
	a. Append - add at end
	b. Insert - add at particular index
	c. Search
	d. List all string starts with given letter
6.	Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle. such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
7.	Write a Java program to implement user defined exception handling.
8.	Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.
9.	Write a Java program that implements a multi-threaded application 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 find the maximum value from the given type of elements using a generic function.
11.	Design a calculator using event-driven programming paradigm of Java with the following options.
	a. Decimal manipulations
	b. Scientific manipulations
12.	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 Simple application using Classes and Objects.
CO2:	Develop Java applications using Packages, Inheritance, Abstract Classes and Interfaces.
CO3:	Build Java application using Array list and Exception handling.
CO4:	Develop Java programs using Multithreading and I/O Streams.
CO5:	Develop Java application using generic functions and event handling.
CO6:	Create a real time application using Java concepts

SYLLABUS OF

SEMESTER – V

COURSES

191CSC501T	COMPUTER NETWORKS	Periods per week				Credits
		L	T	P	R	
		3	2	0	0	4

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 Transport layer.

UNIT		PERIODS
I	FUNDAMENDALS AND PHYSICAL LAYER	L - 9, T - 3
Networks – Network Types – Internet Architecture - Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching.		
UNIT		PERIODS
II	DATA-LINK LAYER & MEDIA ACCESS	L - 9, T - 3
Link layer Addressing - Services – Framing – Error Detection – Flow control – HDLC - Media access control – Ethernet (802.3) – Wireless LANs – IEEE 802.11 – Bluetooth.		
UNIT		PERIODS
III	NETWORK LAYER	L - 9, T - 3
Network Layer Services – Switch basics – Basic Internetworking (IP, CIDR, ARP, DHCP and ICMP) - IPV4 Addressing – IPV6 Protocol - Routing (RIP, OSPF, metrics) – Global Internet (Areas, BGP, IPv6), Multicast – addresses – multicast routing (DVMRP, PIM).		
UNIT		PERIODS
IV	TRANSPORT LAYER	L - 9, T - 3
Overview of Transport layer – UDP – Reliable byte stream (TCP) – Connection management – Flow control – Retransmission – TCP Congestion control – Congestion avoidance (DECbit, RED) – QoS – Application requirements.		
UNIT		PERIODS
V	APPLICATION LAYER	L - 9, T - 3
WWW and HTTP – FTP – Electronic Mail (SMTP, POP3, IMAP, MIME) –Telnet –SSH – DNS – SNMP.		

TOTAL PERIODS:	**60**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Assess the required functionality at each layer
CO2:	Analyze the flow of information in the network
CO3:	Apply the various routing algorithms.
CO4:	Appraise QoS principles based on Congestion Control methods.
CO5:	Analyze the working of various application layer protocols

TEXT BOOKS:	
1.	Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.
2.	Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Fifth Edition, Morgan Kaufmann Publishers, 2011.

REFERENCE BOOKS:	
1.	Andrew S. Tanenbaum, “Computer Networks”, Fifth Edition, Pearson Education, 2011.
2.	James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.
3.	Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
4.	William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
5.	Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.

191CSC502T	OBJECT ORIENTED ANALYSIS AND DESIGN	Periods per week				Credits
		L	T	P	R	
		3	**0**	**0**	**0**	**3**

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand the basics of Object Modeling
2.	To differentiate Unified Process from other approaches.
3.	Learn to design UML diagrams
4.	To apply various Design Patterns.
5.	Be exposed to various Testing Techniques.

UNIT		**PERIODS**
I	**UNIFIED PROCESS AND USE CASE DIAGRAMS**	**9**
Introduction to OOAD with OO Basics - Unified Process – UML diagrams – Use Case –Case study – the Next Gen POS system, Inception -Use case Modelling – Relating Use cases – include, extend and generalization –When to use Use cases		
UNIT		**PERIODS**
II	**STATIC UML DIAGRAM**	**9**
Class Diagram— Elaboration – Domain Model – Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class Hierarchies – Aggregation and Composition - Relationship between sequence diagrams and use cases – When to use Class Diagrams.		
UNIT		**PERIODS**
III	**DYNAMIC AND IMPLEMENTATION UML DIAGRAMS**	**9**
Dynamic Diagrams – UML interaction diagrams - System sequence diagram – Collaboration diagram – When to use Communication Diagrams - State machine diagram and Modelling –When to use State Diagrams - Activity diagram – When to use activity diagrams. **Implementation Diagrams** - UML package diagram - When to use package diagrams - Component and Deployment Diagrams – When to use Component and Deployment diagrams		
UNIT		**PERIODS**
IV	**APPLICATION OF DESIGN PATTERNS**	**9**
Design Patterns – **creational** – factory method – **structural** – Bridge – Adapter – **behavioural** – Strategy – observer -Applying GoF design patterns – Mapping design to code. **Applications:** Satellite Based Navigation-Traffic Management-Bank Management System-Crypt Analysis- Weather Monitoring System.		
UNIT		**PERIODS**

V	TESTING FUNDAMENTALS & MANAGEMENT	9
Principles of Testing-White box testing –Black Box Testing –Testing of Object Oriented Systems – Test Planning-Test Management-Test Process-Test Reporting-Structures for Multi-Product Companies- Effects of Globalization and Geographically Distributed teams on Product Testing.		

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Prioritize requirements through various Use case Modelling paradigms
CO2:	Design class diagrams with their relationships
CO3:	Construct dynamic and implementation diagrams for real time scenarios.
CO4:	Apply various structural and behavioral design patterns in applications
CO5:	Evaluate object oriented software using different testing strategies

TEXT BOOKS:	
1.	Craig Larman, “Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development”, Third Edition, Pearson Education, 2005.
2.	Srinivasan Desikan and Gopalaswamy Ramesh, —Software Testing – Principles and Practices, Pearson Education, 2006.

REFERENCE BOOKS:	
1.	Ali Bahrami - Object Oriented Systems Development - McGraw Hill International Edition – 1999.
2.	Erich Gamma, and Richard Helm, Ralph Johnson, John Vlissides, “Design patterns: Elements of Reusable Object-Oriented Software”, Addison-Wesley,1995.
3.	Martin Fowler, “UML Distilled: A Brief Guide to the Standard Object Modeling Language”, Third Edition, Addison Wesley, 2003.
4.	Simon Bennett, Steve Mc Robb and Ray Farmer, “Object Oriented Systems Analysis and Design Using UML”, Fourth Edition, Mc-Graw Hill Education, 2010.

191CSC503T	DATA MINING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand data mining principles and techniques and Introduce DM as a cutting edge business intelligence
2.	To study the overview of developing areas – web mining, text mining and ethical aspects of data mining
3.	To study algorithms for finding hidden and interesting patterns in data
4.	To understand and apply various classification and clustering
5.	To identify business applications and trends of data mining

UNIT	TITLE	PERIODS
I	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 Pre- processing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.		
UNIT	TITLE	PERIODS
II	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
III	CLASSIFICATION	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.		
UNIT	TITLE	PERIODS
IV	CLUSTERING TECHNIQUES	9
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 be able to:	
CO1:	Apply suitable pre processing and visualization techniques on data
CO2:	Formulate association rules by mining frequent patterns
CO3:	Categorize the data using classification algorithms.
CO4:	Organize the data using clustering methods
CO5:	Apply WEKA tool to provide solutions for real world problems.

TEXT BOOKS:	
1.	Jiawei Han, Micheline Kamber, “Data Mining: Concepts and Techniques”, Morgan Kaufmann, Third edition, 2011.

REFERENCE BOOKS:	
1.	Bruce Ratner, “Statistical and Machine - Learning Data Mining: Techniques for Better Predictive Modeling and Analysis of Big Data”, CRC Press, Second Edition, 2012.
2.	George M Marakas, “Modern Data Warehousing, Mining and Visualization: Core Concepts”, Prentice Hall, 2002
3.	Gupta G. K., “Introduction to Data Min Data Mining with Case Studies”, Eastern Economy Edition, Prentice Hall of India, Third Edition, 2014.
4.	Ian.H.Witten, Eibe Frank and Mark.A.Hall, “Data Mining: Practical Machine Learning Tools and Techniques”, Morgan Kaufmann, Third edition, 2011.
5.	Mehmed kantardzic, “Data mining: Concepts, Models, Methods, and Algorithms”, Wiley-Blackwell, Second Edition, 2011.

191CSC511L	COMPUTER NETWORKS LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	0	3	1	2

PREREQUISITES:
NIL

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

LIST OF EXPERIMENTS	
1.	Learn to use various networking commands and examine.
2.	Write a program to implement socket programming.
3.	Write a HTTP web client program to download a web page using TCP / UDP sockets.
4.	Write a program to implement DNS using TCP / UDP sockets.
5.	Write a program to implement Echo client and echo server and chat application using Transport layer protocol.
6.	Implementation of File Transfer using TCP / UDP.
7.	Study of Network simulator (NS)
8.	Simulation of Congestion / flow control Algorithms using NS.
9.	Performance of TCP and UDP using Simulation tool.
10.	Simulation of Distance Vector and Link state Routing algorithm.
11.	Implementation of IPv4 and IPv6
12.	Implementation of SMTP
13.	Implementation of error correction code (like CRC).
	TOTAL PERIODS: 60

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

191CSC512L	OBJECT ORIENTED ANALYSIS AND DESIGN LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	0	2	0	1

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To capture the requirements specification for an intended software system
2.	To Employ the UML notations to create effective and efficient system designs
3.	To map the design properly to code
4.	To test the developed software system thoroughly for all scenarios
5.	To improve the design by applying appropriate design patterns

LIST OF EXPERIMENTS	
	Draw standard UML diagrams using an UML modelling tool for a given case study. Test the developed code and validate whether the SRS is satisfied.
1.	Identify a software system that needs to be developed.
2.	Document the Software Requirements Specification (SRS) for the identified system. Identify use cases and develop the Use Case model.
3.	Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram
4.	Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams
5.	Draw relevant State Chart and Activity Diagrams for the same system.
6.	Implement the system as per the detailed design
7.	Test the software system for all the scenarios identified as per the usecase diagram
8.	Improve the reusability and maintainability of the software system by applying appropriate design patterns.
9.	Implement the modified system and test it for various scenarios
SUGGESTED DOMAINS FOR MINI-PROJECT	
1.	Book bank
2.	Hospital management system
3.	Exam registration
4.	Automobile sales system
5.	Electoral management system
6.	Airline/Railway reservation system
7.	Retail inventory control system
8.	Credit card processing
9.	Digital marketing in social media
10.	Recruitment system

11.	Foreign trading system
12.	Book shop automation system
13.	BPO management system
14.	Library management system
15.	Student information system

TOTAL PERIODS:	**30**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Apply the object-oriented concepts for Software analysis and design.
CO2:	Design UML diagrams based on Software Requirements Specification.
CO3:	Appraise the software quality using design patterns.
CO4:	Test the compliance of the software with the SRS.
CO5:	Create the intended software system using the specification and UML notations

SYLLABUS OF

SEMESTER – VI

COURSES

191CSC601T	MOBILE COMPUTING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand the basic concepts of mobile computing.
2.	To learn the basics of mobile telecommunication system.
3.	To be familiar with the network layer protocols and Ad-Hoc networks.
4.	To know the basis of transport and application layer protocols.
5.	To gain knowledge about different mobile platforms and application development.

UNIT	TITLE	PERIODS
I	INTRODUCTION	9
Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing – Spread spectrum -MAC Protocols – SDMA- TDMA – FDMA- CDMA.		
UNIT	TITLE	PERIODS
II	MOBILE TELECOMMUNICATION SYSTEM	9
Introduction to Cellular Systems – GSM – Services & Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS - UMTS – Architecture – Handover – Security.		
UNIT	TITLE	PERIODS
III	MOBILE NETWORK LAYER	9
Mobile IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR, AODV, Hybrid routing – ZRP, Multicast Routing - ODMRP, Vehicular Ad Hoc networks (VANET) – MANET Vs VANET – Security.		
UNIT	TITLE	PERIODS
IV	MOBILE TRANSPORT AND APPLICATION LAYER	9
Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML.		
UNIT	TITLE	PERIODS
V	MOBILE PLATFORMS AND APPLICATIONS	9
Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Analyze various multiplexing techniques for multiple data streaming
CO2:	Choose appropriate mobile communication standard for wireless applications..
CO3:	Analyze different network protocols for mobile and ad-hoc wireless communication system
CO4:	Evaluate the performance of transport and application layer protocols.
CO5:	Develop a mobile application using android/blackberry/ios/Windows SDK.

TEXT BOOKS:	
1.	Jochen Schiller, — "Mobile Communications", PHI, Second Edition, 2009.
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.	Toh C. K., — AdHoc Mobile Wireless Networks, First Edition, Pearson Education, 2002
3.	Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, — Principles of Mobile Computing, Springer, 2003.
4.	William.C.Y.Lee —Mobile Cellular Telecommunications-Analog and Digital Systems‖, Second Edition, TataMcGraw Hill Edition,2006.

WEBSITES:	
1.	Android Developers : http://developer.android.com/index.html
2.	Apple Developer : https://developer.apple.com/
3.	BlackBerry Developer : http://developer.blackberry.com
4.	Windows Phone DevCenter : http://developer.windowsphone.com

191CSC602T	ARTIFICIAL INTELLIGENCE	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand the various characteristics of Intelligent agents
2.	To learn the different search strategies in AI
3.	To learn to represent knowledge in solving AI problems
4.	To understand the different ways of planning in software agents
5.	To know about the various expert systems of AI.

UNIT	TITLE	PERIODS
I	INTRODUCTION TO AI AND PRODUCTION SYSTEMS	9
Introduction–Definition–Future of Artificial Intelligence-Characteristics of Intelligent agents-Typical intelligent agents-Problem Solving Approach to Typical AI problems-Production systems-Production systems characteristics.		
UNIT	TITLE	PERIODS
II	PROBLEM SOLVING METHODS	9
Problem solving Methods – Search Strategies- Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems -Searching with Partial Observations – Constraint Satisfaction Problems –Constraint Propagation- Backtracking Search – Game Playing –Optimal Decisions in Games- Alpha – Beta Pruning-Stochastic Games.		
UNIT	TITLE	PERIODS
III	KNOWLEDGE REPRESENTATION AND INFERENCE	9
First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering-Categories and Objects – Events – Reasoning Systems for Categories -Reasoning with Default Information- Rule value approach, Fuzzy reasoning – Rule value approach– Certainty factors, Bayesian Theory - Bayesian Network.		
UNIT	TITLE	PERIODS
IV	PLANNING AND LEARNING	9
Planning Problem –STRIPS- Planning and acting in the real world- Learning –Inductive learning -Learning Decision trees–Learning in Neural and Belief Networks- Reinforcement learning –Knowledge in learning.		
UNIT	TITLE	PERIODS
V	EXPERT SYSTEM	9
Expert systems Knowledge acquisition concepts – AI application to robotics – Current trends in Intelligent Systems-Typical expert systems - MYCIN, DART, Expert systems shells.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Develop intelligent agents for AI problems.
CO2:	Experiment heuristic search algorithms for game play.
CO3:	Apply inference theory for knowledge representation.
CO4:	Analyze learning algorithms for planning and acting in real time applications.
CO5:	Design applications using AI Expert system

TEXT BOOKS:	
1.	Bratko I, "Prolog: Programming for Artificial Intelligence", Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.
2.	Russell S. and Norvig P., "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.

REFERENCE BOOKS:	
1.	Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", Mc Graw Hill- 2008.
2.	Tim Jones M, "Artificial Intelligence: A Systems Approach(Computer Science)", Jones and Bartlett Publishers, Inc.; First Edition, 2008.
3.	William F. Clocksin and Christopher S. Mellish," Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003.

191CSC603T	COMPILER DESIGN	Periods per week				Credits
		L	T	P	R	
		3	2	0	0	4

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To learn the various phases of compiler.
2.	To learn the various parsing techniques.
3.	To understand intermediate code generation and run-time environment.
4.	To learn to implement front-end of the compiler.
5.	To learn to implement code generator.

UNIT	TITLE	PERIODS
I	INTRODUCTION TO COMPILERS	L - 9, T - 3
Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata – Minimizing DFA.		
UNIT	TITLE	PERIODS
II	SYNTAX ANALYSIS	L - 12, T - 3
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	L - 8, T - 3
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	L - 8, T - 3
Runtime Environments – source language issues – Storage organization – Storage Allocation Strategies: Static, Stack and Heap allocation Issues in the Design of a code generator – Code generation for Runtime storage Management: Static and Stack allocation - Basic Blocks and Flow graphs - Design of a simple Code Generator.		
UNIT	TITLE	PERIODS
V	CODE OPTIMIZATION	L - 8, T - 3
Principal Sources of Optimization – Peep-hole optimization - DAG- Optimization of Basic Blocks - Global Data Flow Analysis. Recent trends in Compiler Design.		

TOTAL PERIODS:	60

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Make use of regular expressions to perform lexical analysis.
CO2:	Develop parsers using parsing algorithms.
CO3:	Generate intermediate code for the source program.
CO4:	Analyze the various storage allocation strategies for generation of target code
CO5:	Apply appropriate code optimization techniques for the given intermediate code.

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

191LEH611L	INTERPERSONAL SKILLS / LISTENING AND SPEAKING	Periods per week				Credits
		L	T	P	R	
		0	0	2	0	1

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Equip students with the English language skills required for the successful undertaking
2.	Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.
3.	Improve general and academic listening skills
4.	Make effective presentations.

UNIT	TITLE	PERIODS
I		6
Listening as a key skill- its importance- speaking - give personal information - ask for personal information - express ability - enquire about ability - ask for clarification Improving pronunciation - pronunciation basics taking lecture notes - preparing to listen to a lecture - articulate a complete idea as opposed to producing fragmented utterances.		
UNIT	TITLE	PERIODS
II		6
Listen to a process information- give information, as part of a simple explanation - conversation starters: small talk - stressing syllables and speaking clearly - intonation patterns - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.		
UNIT	TITLE	PERIODS
III		6
Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minute informal talk - greet - respond to greetings - describe health and symptoms - invite and offer - accept - decline - take leave - listen for and follow the gist- listen for detail		
UNIT	TITLE	PERIODS
IV		6
Being an active listener - Giving verbal and non-verbal feedback - participating in a group discussion - summarizing academic readings and lectures - conversational speech- listening to and participating in conversations - persuade.		
UNIT	TITLE	PERIODS
V		6
Formal and informal talk - listen to follow and respond to explanations, directions and instructions in academic and business contexts - strategies for presentations and interactive communication - group/pair presentations - negotiate disagreement in group work.		

TOTAL PERIODS:	30

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Listen and respond appropriately.
CO2:	Participate in group discussions
CO3:	Make effective presentations
CO4:	Participate confidently and appropriately in conversations both formal and informal

TEXT BOOKS:	
1.	Brooks, Margret. Skills for Success. Listening and Speaking. Level 4, Oxford University Press, Oxford: 2011.
2.	Richards, C. Jack. & David Bholke. Speak Now Level 3, Oxford University Press, Oxford: 2010

REFERENCE BOOKS:	
1.	Bhatnagar, Nitin and Mamta Bhatnagar, Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010.
2.	Hughes, Glyn and Josephine Moate, Practical English Classroom. Oxford University Press: Oxford, 2014.
3.	Ladousse, Gillian Porter, Role Play. Oxford University Press: Oxford, 2014
4.	Richards C. Jack, Person to Person (Starter). Oxford University Press: Oxford, 2006
5.	Vargo, Mari, Speak Now Level 4. Oxford University Press: Oxford, 2013.

191CSC611L	APPLICATION DEVELOPMENT LABORATORY (MOBILE/WEB)	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.

LIST OF EXPERIMENTS	
1.	Develop an application that uses GUI components, Layout Managers and event listeners.
2.	Develop an application to simulate a keyboard.
3.	Create an application that uses graphical primitives.
4.	Develop an application that makes use of databases.
5.	Implement an application that uses Multi-threading.
6.	Develop a native application that uses GPS location information.
7.	Implement an application that writes data to the SD card.
8.	Implement an application that send a SMS and creates an alert upon receiving the SMS.
9.	Create an application that makes use of Menu.
10.	Develop an application to build an alarm clock.
11.	Implement a hybrid mobile application for displaying a website.
12.	Mini Project (Food delivery app, Attendance tracking app, Online ticket booking app etc.)

TOTAL PERIODS:	60

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Design mobile applications using GUI and Layouts.-K6
CO2:	Develop mobile applications using Event listener and Databases
CO3:	Create mobile applications using RSS Feed and Multithreading
CO4:	Develop mobile applications using Internal/External Storage, SMS and GPS
CO5:	Build hybrid mobile applications

REFERENCE BOOKS:	
1.	Build Your Own Security Lab, Michael Gregg, Wiley India

SYLLABUS OF

SEMESTER – VII

COURSES

191MBH721T	PROFESSIONAL ETHICS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To exposure the aspects of professional ethics and Human Values
2.	To enable the students to create an awareness on Professional ethics and Rights
3.	To become aware of Social Experimentation and Engineering Standards
4.	To enable the students to learn safety, Responsibilities and Rights
5.	To gain knowledge about Global Issues related to Engineering.

UNIT	TITLE	PERIODS
I	HUMAN VALUES	9
Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.		
UNIT	TITLE	PERIODS
II	PROFESSIONALISM	9
Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory Professional Rights – Employee Rights – Intellectual Property Rights (IPR)- Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime		
UNIT	TITLE	PERIODS
III	SOCIAL EXPERIMENTATION AND RESPONSIBILITIES	9
Engineers as responsible Experimenters: Challenger, Chernobyl, Three Mile Island - Multinational Corporations- Computer Ethics – Corporate Social Responsibility-Customs and Religion		
UNIT	TITLE	PERIODS
IV	SAFETY, RESPONSIBILITIES AND RIGHTS	9
Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination		
UNIT	TITLE	PERIODS
V	GLOBAL ISSUES	9
Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Apply Human values, skills, and attitudes to become more aware of themselves and their surroundings
CO2:	Apply moral rights and values in the Society
CO3:	Analyze the role of professional engineer as responsible social experimenter
CO4:	Apply the fundamentals of safety, Responsibilities and Rights in real life
CO5:	Analyze the global issues related to Engineers

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

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

191CSC701T	DATA SCIENCE	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Building the fundamentals of data Science
2.	Imparting design thinking capability to build big-data
3.	Developing design skills of models for big data problems
4.	Gaining practical experience in programming tools for data sciences
5.	Empowering students with tools and techniques used in data science

UNIT	TITLE	PERIODS
I	INTRODUCTION TO BIG DATA, FRAMEWORKS AND VISUALIZATION	10
Big Data and Data Science - Big Data Analytics, Business intelligence vs Big data, big data frameworks, MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed file systems, Current landscape of analytics, data visualization techniques, visualization software.		
UNIT	TITLE	PERIODS
II	EDA & BASIC STATISTICAL INFERENCE	9
Exploratory Data Analysis (EDA), statistical measures, Basic tools (plots, graphs and summary statistics) of EDA, Data Analytics Lifecycle, Discovery. Developing Initial Hypotheses, Identifying Potential Data Sources, EDA case study, testing hypotheses on means, proportions and variances.		
UNIT	TITLE	PERIODS
III	REGRESSION MODELS & LINEAR ALGEBRA BASICS	10
Regression models: Simple linear regression, least-squares principle, MLR, logistic regression, Multiple correlation, Partial correlation. Matrices to represent relations between data, Linear algebraic operations on matrices – Matrix decomposition: Singular Value Decomposition (SVD) and Principal Component Analysis (PCA).		
UNIT	TITLE	PERIODS
IV	DATA PREPROCESSING AND FEATURE SELECTION	8
Data cleaning - Data integration - Data Reduction - Data Transformation and Data Discretization, Feature Generation and Feature Selection, Feature Selection algorithms: Filters- Wrappers.		
UNIT	TITLE	PERIODS
V	BASIC MACHINE LEARNING ALGORITHMS	8
Classifiers - Decision tree – Random Forests - Naive Bayes - k-Nearest Neighbors (k-NN), k-means – SVM Association Rule mining – Ensemble methods.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Develop big data solution using Hadoop and data visualization technique
CO2:	Use Exploratory Data Analysis and statistical inference for real world applications
CO3:	Analyze the data using regression and Matrix decomposition techniques
CO4:	Choose appropriate pre-processing and feature selection techniques to lever inconsistencies
CO5:	Apply Basic Machine Learning Algorithms for complex problems

TEXT BOOKS:	
1.	Jure Leskovek, Anand Rajaraman and Jefrey Ullmam, Mining of Massive Datasets v2.1, Cambridge University Press,2019.(free online).
2.	Seema Acharya, Subhasini Chellappan, Big Data Analytics, paperback 2nd edition,Wiley 2019.

REFERENCE BOOKS:	
1.	Cathy O'Neil and Rachel Schutt," Doing Data Science, Straight Talk From The Frontline", O'Reilly 2014.
2.	Jiawei Han, Micheline Kamber and Jian Pei, "Data Mining Concepts and Techniques", Third Edition, ISBN 0123814790, 2011.
3.	Jay Liebowitz, Big Data and Business Analytics, CRC press 2013.
4.	C. Rajan, Data mining methods,2nd edition, Narosa 2016.

191CSC711L	DATA SCIENCE LABORATORY	Periods per week				Credits
		L	T	P	R	
		0	0	3	1	2

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To implement Map Reduce programs for processing big data
2.	To realize storage of big data using H base, Mongo DB
3.	To analyze big data using linear models
4.	To analyze big data using machine learning techniques such as SVM / Decision tree
5.	To understand classification and clustering

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

TOTAL PERIODS:	**60**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Build an environment for big data analytics using Hadoop/HDFS/Pig and R
CO2:	Apply Map reduce programming paradigm to process the dataset.
CO3:	Predict the data using linear and logistic regression models.
CO4:	Analyze the data using machine learning models and visualization tools.
CO5:	Develop big data solutions using Hbase / MongoDB / Pig/R.

SYLLABUS OF

PROFESSIONAL ELECTIVE - I

COURSES

191CSE501T	ADVANCED JAVA PROGRAMMING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To learn the Advanced concepts in J2SE
2.	To understand server side programming using Servlet
3.	To learn the Java server pages and implementation
4.	To understand the Model View Controller Architecture
5.	To learn to develop web based applications using struts hibernate Frameworks

UNIT	TITLE	PERIODS
I	INTRODUCING JAVAEE	9
Enterprise Java, Basic Application Structure, Using Web Containers, Creating Servlets, Configuring Servlets, Understanding HTTP methods, Using Parameters and Accepting Form Submissions, Using Init parameters, File Uploading, JDBC		
UNIT	TITLE	PERIODS
II	JAVA SERVER PAGES	9
Creating JSPs, Using Java within JSP, Combining Servlets and JSPs, Maintaining State using Sessions, JSP Custom Tag Library, Integrating Servlets and JSP: Model View Controller Architecture		
UNIT	TITLE	PERIODS
III	STRUTS FRAMEWORK	9
Introduction to Struts – Building a Simple Struts Application – Understanding Model, View and Controller Layer- Overview of Tiles		
UNIT	TITLE	PERIODS
IV	JAVA SERVER FACES(JSF)	9
Introduction to Java Server Faces (JSF)- JSF Application Architecture – Building a simple JSF Application - JSF Request Processing Lifecycle – The Facelets View Declaration Language – User Interface Component Model- JSF Event Model		
UNIT	TITLE	PERIODS
V	SPRING FRAMEWORK AND HIBERNATE	9
MVC pattern for Web Applications, Spring Framework, Understanding Application Context, Bootstrapping Spring framework, Configuring Spring framework, Data Persistence, Object/relational Mapping, Hibernate ORM, Mapping Entities to Tables		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Solve the complex problems using advanced Java concepts.
CO2:	Design server side programs using Servlets and JSP.
CO3:	Develop an applications using Java Server Faces and Struts Framework
CO4:	Apply cutting-edge frameworks in web application development.-
CO5:	Develop a web application using Hibernates and Spring framework

TEXT BOOKS:	
1.	Anil Hemrajani, Agile Java Development with Spring, Hibernate and Eclipse, 2006 Sams Publishing
2.	Herbert Schildt, The Complete Reference-Java, Tata Mcgraw- Hill Edition, Eighth Edition, 2014.

REFERENCE BOOKS:	
1.	Christian Bauer, Gavin King, Gary Gregory, Java Persistence with Hibernate, 2015.
2.	Craig Walls, Spring in Action Paperback, Manning Publications, 2014.
3.	Ed Burns, Chris Schalk, JavaServer Faces 2.0, The Complete Reference, McGraw-Hill Publishers, 2010.
4.	Nicholas S. Williams, Professional Java for Web Applications, Wrox Press, 2014

191CSE502T	SOFTWARE TESTING AND QUALITY ASSURANCE	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To determine Software testing basics and preliminaries.
2.	To understand various testing Methodologies.
3.	To understand test management and test automation techniques
4.	To be exposed to the Software Quality Assurance (SQA) architecture.
5.	To understand the Quality Standards and Procedures.

UNIT	TITLE	PERIODS
I	TESTING BASIC CONCEPTS AND PRELIMINARIES	9
Principles of Testing-Software Development Lifecycle Models-Phases of Software Project-Quality Assurance and Quality Control-Testing, Verification, Validation- Test metrics and measurements – project, progress and productivity metrics.		
UNIT	TITLE	PERIODS
II	TESTING METHODOLOGIES	9
White Box Testing - Basis Path Testing - Control Structure Testing - Black Box Testing - Equivalence Partitioning - Boundary Value Analysis - Testing for Web applications –Integration Testing- Regression Testing-System and Acceptance Testing - Navigation Testing.		
UNIT	TITLE	PERIODS
III	TEST AUTOMATION AND MANAGEMENT	9
People and Organizational Issues in Testing - Test Planning – Management - Execution – Reporting- Software test automation – skills needed for automation – scope of automation – design and architecture for automation – requirements for a test tool – challenges in automation		
UNIT	TITLE	PERIODS
IV	SOFTWARE QUALITY ARCHITECTURE & INFRASTRUCTURE	9
Software quality assurance (SQA) – Definition and objectives – Software quality factors- McCall's quality model – SQA system and architecture – Software Project life cycle Components -Procedures and work instructions - Templates - Checklists – 3S developmenting - Staff training and Certification- Corrective and preventive actions – Configuration management – Software change control – Configuration management audit -Documentation control .		
UNIT	TITLE	PERIODS
V	STANDARD and CERTIFICATIONS	9
Quality management standards – ISO 9001 :2015 and ISO 9000-3 - capability Maturity Models - CMM and CMMI assessment methodologies-SPICE Project- SQA project process standards – IEEE std 1012 & 1028 – Organization of Quality Assurance - SQA units and other actors in SQA systems.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Design Test metrics for Software Development Model.
CO2:	Apply various testing Methodologies for web applications.
CO3:	Implement test management and test automation techniques for software projects.
CO4:	Apply software Quality architecture for different domains.
CO5:	Choose the Quality Standards and Procedures for organizations.

TEXT BOOKS:	
1.	Daniel Galin, “SoftwareQuality Assurance”, Pearson Publication, 2009.
2.	Srinivasan Desikan and Gopalaswamy Ramesh, —Software Testing – Principles and Practices, Pearson Education, 2006.

REFERENCE BOOKS:	
1.	Alan C. Gillies, “Software Quality: Theory and Management”, International Thomson Computer Press, 1997.
2.	Ilene Burnstein, —Practical Software Testing‖, Springer International Edition, 2003
3.	Mordechai Ben-Menachem “Software Quality: Producing Practical Consistent Software”, International Thompson Computer Press, 1997.
4.	Ron Patton, —Software Testing‖, Second Edition, Sams Publishing, Pearson Education, 2007.

191CSE503T	MICROPROCESSOR AND MICROCONTROLLER	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand the Architecture of 8086 microprocessor.
2.	To learn the design aspects of I/O and Memory Interfacing circuits.
3.	To interface microprocessors with supporting chips.
4.	To study the Architecture of 8051 microcontroller.
5.	To design a microcontroller based system

UNIT	TITLE	PERIODS
I	THE 8086 MICROPROCESSOR	9
Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.		
UNIT	TITLE	PERIODS
II	8086 SYSTEM BUS STRUCTURE	9
8086 signals – Basic configurations – System bus timing –System design using 8086 – I/O programming – Introduction to Multiprogramming – System Bus Structure – Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.		
UNIT	TITLE	PERIODS
III	I/O INTERFACING	9
Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller.		
UNIT	TITLE	PERIODS
IV	MICROCONTROLLER	9
Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.		
UNIT	TITLE	PERIODS
V	INTERFACING MICROCONTROLLER	9
Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Evaluate the hardware architecture of the Microprocessor and Microcontroller.
CO2:	Apply the fundamental knowledge of architectural design and analyse the configurations of microprocessors.
CO3:	Analyze the interfacing of different peripherals with Microprocessor.
CO4:	Apply knowledge of programming proficiency based on the Instruction set of 8086 microprocessor and 8051 microcontroller.
CO5:	Construct systems using microprocessors and microcontrollers for real time applications.

TEXT BOOKS:	
1.	Yu-Cheng Liu, Glenn A.Gibson, ―Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design‖, Second Edition, Prentice Hall of India, 2007. (UNIT I- III)
2.	Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, ―The 8051 Microcontroller and Embedded Systems: Using Assembly and C‖, Second Edition, Pearson education, 2011. (UNIT IV-V)

REFERENCE BOOKS:	
1.	Doughlas V. Hall, ―Microprocessors and Interfacing, Programming and Hardware,TMH,2012
2.	A.K.Ray, K.M.Bhurchandi, Advanced Microprocessors and Peripherals ―3rd edition, Tata McGrawHill,2012

191CSE504T	NATURAL LANGUAGE PROCESSING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To learn the fundamentals of natural language processing
2.	To understand the use of CFG and PCFG in NLP
3.	To understand the role of semantics of sentences and pragmatics
4.	To apply the NLP techniques to IR applications

UNIT	TITLE	PERIODS
I	INTRODUCTION	9
Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance		
UNIT	TITLE	PERIODS
II	WORD LEVEL ANALYSIS	9
Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models		
UNIT	TITLE	PERIODS
III	SYNTACTIC ANALYSIS	9
Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.		
UNIT	TITLE	PERIODS
IV	SEMANTICS AND PRAGMATICS	9
Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.		
UNIT	TITLE	PERIODS
V	DISCOURSE ANALYSIS AND LEXICAL RESOURCES	9
Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Recommend appropriate tokens using language model
CO2:	Evaluate grammatically correct sentences through word level analysis
CO3:	Construct a rule-based system to deal with morphology of a language.
CO4:	Analyze semantics and pragmatics of English language for text processing.
CO5:	Build NLP applications using statistical approaches.

TEXT BOOKS:	
1.	Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2.	Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python‖, First Edition, O_Reilly Media, 2009.

REFERENCE BOOKS:	
1.	Breck Baldwin, —Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2.	Richard M Reese, —Natural Language Processing with Java‖, O_Reilly Media, 2015.
3.	Nitin Indurkhya and Fred J. Damerau, —Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
4.	Tanveer Siddiqui, U.S. Tiwary, —Natural Language Processing and Information Retrieval‖, Oxford University Press, 2008.

191CSE505T	XML AND WEB SERVICES	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand XML basics
2.	To learn concepts for XML Processing using parsers
3.	To learns the basics of web services and standards
4.	To implement the java based web service applications
5.	To understand the need of XML security and SOA basics

UNIT	TITLE	PERIODS
I	XML BASICS	9
XML structure – Elements – Creating Well-formed XML -Basic XML- Document Type Definition Name Spaces – Schema Elements, Types, Attributes –X Files-XPath		
UNIT	TITLE	PERIODS
II	XML PROCESSING	9
XML Parsers and Validation-DOM Parser-SAX parser- XSL and XSL Transformations- XLINK – XPATH –XSL Formatting-Modelling databases in XML- XFORMS – XHTML		
UNIT	TITLE	PERIODS
III	WEBSERVICE OVERVIEW	9
Web Services Overview – Architecture- WSDL - Overview Of SOAP – HTTP –RPC – SOAP: Protocol – Message Structure – Intermediaries – Actors – Design Patterns And Faults – SOAP With Attachments – UDDI		
UNIT	TITLE	PERIODS
IV	JAVA WEB SERVICE	9
Java web service Basics – Creating, Publishing, Testing and Describing a Web services (WSDL)- Consuming a web service, Database Driven web service from an application – SOAP- Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC)		
UNIT	TITLE	PERIODS
V	XML SECURITY AND SOA BASICS	9
Security Overview - Canonicalization - XML Security Framework - XML Encryption - XML Digital Signature - XKMS Structure - Guidelines For Signing XML Documents - XML In Practice. Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures - Principles of service orientation – Service Layers		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Design the structure of XML to store and transport the data.
CO2:	Apply Parsers, XSLT to process the data XML.
CO3:	Apply SOAP, HTTP and UDDI in web services applications.
CO4:	Build the real time web services using J2EE.
CO5:	Analyze SOA architectural paradigms and techniques with XML security framework

TEXT BOOKS:	
1.	Ron Schmeltzer et al, "XML and Web Services", Pearson Education, 2002.
2.	Sandeep Chatterjee and James Webber, "Developing Enterprise Web Services: An Architect's Guide", Prentice Hall, 2004.

REFERENCE BOOKS:	
1.	Frank. P. Coyle, "XML, Web Services And The Data Revolution", Pearson Education, 2002.
2.	Heather Williamson, "XML, The Complete Reference", McGraw Hill Education, 2012.
3.	Newcomer, Lomow, "Understanding SOA with Web Services", Pearson Education, 2009.
4.	Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill Education, 2013.

191CSE506T	BIO INSPIRED COMPUTING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

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 Mataheuristics -Analysis of Algorithms -Nature Inspires Algorithms -Parameter tuning and parameter control		
UNIT	TITLE	PERIODS
II	RANDOM WALK AND ANEALING	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 ALOGORITHMS 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	APPLICATION 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 - Improved Weighted Thresholded Histogram Equalization Algorithm for Digital Image Contrast Enhancement Using Bat Algorithm - 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:	Apply heuristics to Optimize bio-inspired algorithms
CO2:	Apply search strategy for randomization and simulated annealing
CO3:	Implement genetic algorithms for bio inspired problems
CO4:	Analyze swarm intelligence algorithm for optimal feature extraction
CO5:	Create optimized solutions using 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 Ispired Optimization Algorithm,Elsevier First Edition 2014
3.	Yang, Cui, XIao, Gandomi, Karamanoglu, "Swarm Intelligence and Bio-Inspired Computing", Elsevier First Edition 2013

191CSE507T	FORMAL LANGUAGES AND AUTOMATA THEORY	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To present the core concepts in automata theory and formal languages.
2.	Classify machines by their power to recognize languages.
3.	Employ finite state machines to solve problems in computing.
4.	Understand Turing Machine and their capability.
5.	Determine the decidability and intractability of computational problems.

UNIT	TITLE	PERIODS
I	**FORMAL PROOFS AND FINITE AUTOMATA**	9
	Formal proofs- Introduction - Inductive Proofs , Finite Automata – Introduction - Deterministic Finite Automata, Non-deterministic Finite Automata, Finite Automata with ϵ-transition, Equivalence of DFA and NFA - with and without ϵ-transition, Equivalence of Finite Automata, Minimization of Finite Automata.	
UNIT	**TITLE**	**PERIODS**
II	**REGULAR EXPRESSIONS AND GRAMMARS**	9
	Regular expressions, Equivalence of finite automata and regular expressions, pumping lemma for regular languages, Grammars- Context-Free Grammar (CFG), Derivations and Parse tree - Relationship between derivation and derivation trees – Ambiguity.	
UNIT	**TITLE**	**PERIODS**
III	**NORMAL FORMS AND PUSHDOWN AUTOMATA**	9
	Normal forms- Chomsky Normal Form (CNF), Greibach Normal Form (GNF), Pushdown Automata – Languages of a Pushdown Automata – Equivalence of Pushdown Automata and CFG– Deterministic Pushdown Automata, Pumping Lemma for CFL.	
UNIT	**TITLE**	**PERIODS**
IV	**TURING MACHINE**	9
	Turing machines – Models, Computable languages and functions, Techniques for Turing machine construction, Multi head and Multi tape Turing Machines, Non-deterministic Turing machine, The Halting problem, Chomsky hierarchy of languages.	
UNIT	**TITLE**	**PERIODS**
V	**UNDECIDABILITY AND INTRACTABLE PROBLEMS 9**	9
	Undecidability- Non Recursive Enumerable (RE) Language – Undecidable Problem with RE – Undecidable Problems about TM – Post‘s Correspondence Problem, Intractable Problems - The Class P and NP, An NP-Complete Problem.	

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Apply the fundamentals concepts of automata theory and formal languages.
CO2:	Illustrate the knowledge of language classes & grammars in regular expression
CO3:	Design the grammar and automata for different language classes.
CO4:	Construct turing machine for given language
CO5:	Analyze the complexity of the computational functions

TEXT BOOKS:	
1.	Hopcroft J.E, Motwani R and Ullman J. D, — Introduction to Automata Theory, Languages and Computations, Third Edition, Pearson Education, 2007.

REFERENCE BOOKS:	
1.	H.R.Lewis H.R. and C.H.Papadimitriou C. H. — Elements of the theory of Computation, Second Edition, PHI,2003.
2.	John C Martin, “Introduction to Languages and the Theory of Computation”, Third Edition, Tata McGraw Hill Publishing Company, New Delhi, 2007.
3.	Kamala Krithivasan and Rama. R, “Introduction to Formal Languages, Automata Theory and Computation”, Pearson Education 2009.
4.	Mishra K L P and Chandrasekaran N, “Theory of Computer Science – Automata, Languages and Computation”, Third Edition, Prentice Hall of India, 2004

SYLLABUS OF

PROFESSIONAL ELECTIVE - II

COURSES

191CSE601T	VISUAL PROGRAMMING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Understand the concepts of GUI and development.
2.	Learn the processes, mechanics and issues in Programming fundamentals
3.	Be exposed to the Core architectures of Microsoft Foundation classes
4.	Know about Dialog Based applications, controls and sliders.
5.	Learn to develop User friendly GUI

UNIT	TITLE	PERIODS
I	WINDOWS PROGRAMMING	9

The windows programming Model – Event driven programming – GUI concepts – Overview of Windows programming – Creating and displaying the window – Message Loop – windows procedure WM_PAINT message – WM_DESTROY message – Data types – Resources – An Introduction to GDI – Device context – Text output – Scroll Bars – Keyboard – Mouse Menus.

UNIT	TITLE	PERIODS
II	VISUAL BASIC PROGRAMMING	9

Visual Basic Applications – Form and properties – Variables and Constants – Variant type – Procedure scope – Main – Control statements – control arrays – Creating and using Controls – Menus and Dialogs – Programming fundamentals – Objects and instances – Debugging – Responding to mouse events – Drag and Drag drop events Responding to keyboard events – keypress, keyup, keydown events – Using grid control – Graphics controls – shape and line control – File system controls – Common dialog controls – Processing files – Accessing databases with the data controls.

UNIT	TITLE	PERIODS
III	VISUAL C++ PROGRAMMING	9

Visual C++ components – Introduction to Microsoft Foundation Classes Library – Getting started with AppWizard – Class Wizard – Event handling – Keyboard and Mouse events - WM_SIZE, WM_CHAR messages - Graphics Device Interface - Pen, Brush, Colors, Fonts - Single and Multiple document interface - Reading and Writing documents - Resources – Bitmaps creation, usage of BMP and displaying a file existing as a BMP.

UNIT	TITLE	PERIODS
IV	CONTROLS	9

Dialog Based Applications, controls – Animate control, image list, CRect tracker – Tree control – CtabControl – Dynamic controls – slider control – progress control – Inheriting CTreeView – CRicheditView – Modal Dialog, – Modeless Dialog – CColorDialog – CfileDialog.

UNIT	TITLE	PERIODS
V	**ADVANCED CONCEPTS**	9
Domain Name System – Email – World Wide Web (HTTP) – Simple Status bars – Splitter windows and multiple views – Dynamic Link Library – Data base Management with ODBC – TCP/IP – Winsock and WinInet, – ActiveX control – creation and usage – Container class.		

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Develop GUI using Windows components.
CO2:	Create an application using Visual Basic Programming.
CO3:	Build an application using Visual C++ Programming.
CO4:	Implement dialog based applications using controls.
CO5:	Integrate cutting-edge technologies in web application development.

TEXT BOOKS:	
1.	Charles Petzold, “Windows Programming”, Microsoft press, 1996.
2.	David Kruglirski J, “Programming Microsoft Visual C++”, Fifth Edition, Microsoft press, 1998.

REFERENCE BOOKS:	
1.	Deitel, “Visual Basic 6.0 How To Program”, Pearson Education, 1999.
2.	Kate Gregory, “Using Visual C++”, Prentice Hall of India Pvt., Ltd., 1999
3.	Steve Holzner, “Visual C++ 6 programming”, Wiley Dreamtech India Private Ltd., 2003.

191CSE602T	AGILE METHODOLOGIES	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
2.	To provide a good understanding of software design and a set of software technologies and APIs.
3.	To do a detailed examination and demonstration of Agile development and testing techniques.
4.	To understand the benefits and pitfalls of working in an Agile team.
5.	To understand Agile development and testing.

UNIT	TITLE	PERIODS
I	AGILE METHODOLOGY	9
Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values		
UNIT	TITLE	PERIODS
II	AGILE PROCESSES	9
Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.		
UNIT	TITLE	PERIODS
III	AGILITY AND KNOWLEDGE MANAGEMENT	9
Agile Information Systems – Agile Decision Making - Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment , Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).		
UNIT	TITLE	PERIODS
IV	AGILITY AND REQUIREMENTS ENGINEERING	9
Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.		
UNIT	TITLE	PERIODS
V	AGILITY AND QUALITY ASSURANCE	9
Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.		

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Analyze the software system requirements by agile classification methods
CO2:	Apply suitable agile processes for project development.
CO3:	Use Agility and Knowledge management to articulate real time problems.
CO4:	Develop solutions for complex problems using requirements engineering paradigm.
CO5:	Utilize techniques and tools for improving software quality.

TEXT BOOKS:	
1.	David J. Anderson and Eli Schragenheim, —Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results‖, Prentice Hall, 2003.
2.	Hazza and Dubinsky, —Agile Software Engineering, Series: Undergraduate Topics in Computer Science‖, Springer, 2009.

REFERENCE BOOKS:	
1.	Craig Larman, —Agile and Iterative Development: A Manager's Guide, Addison-Wesley, 2004.
2.	Kevin C. Desouza, — Agile Information Systems: Conceptualization, Construction, and Management, Butterworth- Heinemann, 2007.

191CSE603T	CRYPTOGRAPHY AND NETWORK SECURITY	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Understand OSI security architecture and classical encryption techniques.
2.	Acquire fundamental knowledge on the concepts of number theory.
3.	Understand various Symmetric and Public Key Cryptosystems.
4.	Describe the principles of Hash functions and Digital Signature.
5.	Learn security aspects related to E-mail and fire wall designs.

UNIT	TITLE	PERIODS
I	INTRODUCTION & NUMBER THEORY	9
Security Concepts: The OSI Security Architecture - Security Attacks - Security Services - Security Mechanisms - A Model for Network Security. Classical Encryption techniques: Symmetric cipher model, Substitution techniques, Transposition techniques.Number Theory: Modular arithmetic-Euclid's algorithm-Prime numbers-Fermat's and Euler's theorem-The Chinese remainder theorem- Discrete logarithms.		
UNIT	TITLE	PERIODS
II	SYMMETRIC CIPHERS & PUBLIC KEY CRYPTOGRAPHY	9
Block Ciphers and Stream Ciphers - Data Encryption Standard- Triple DES - Block cipher principles- Block cipher modes of Operation- Advanced Encryption Standard (AES). Public Key Cryptography: Principles of Public Key Cryptosystems-The RSA algorithm- Diffie Hellman Key exchange-Elliptic curve arithmetic-Elliptic curve cryptography.		
UNIT	TITLE	PERIODS
III	CRYPTOGRAPHIC DATA INTEGRITY ALGORITHMS	9
Cryptographic Hash functions: Applications, SHA. Message Authentication Codes: Authentication requirement – Authentication function – HMAC – CMAC. Digital Signature: Elgamal – Schnorr - DSA.		
UNIT	TITLE	PERIODS
IV	MUTUAL TRUST	9
Key Management and Distribution: Symmetric Key Distribution using Symmetric Encryption - Asymmetric Encryption - Distribution of Public Keys - X.509 Certificates - Public Key Infrastructure. User Authentication: Remote User Authentication Principles – Kerberos.		
UNIT	TITLE	PERIODS
V	NETWORK AND INTERNET SECURITY PROTOCOLS	9
Transport Layer Security - Email Security: S/MIME - Pretty Good Privacy (PGP) – IP Security – Firewalls - Characteristics and Types.		

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Apply cryptographic concepts and principles of number theory for secure services.
CO2:	Implement symmetric and asymmetric cryptographic Techniques
CO3:	Apply cryptographic integrity algorithms to provide authentication
CO4:	Apply key management scheme in distributed environment to ensure mutual trust
CO5:	Recommend security protocols and firewalls for internet services

TEXT BOOKS:	
1.	William Stallings, Cryptography and Network Security, 7th Edition, Pearson Education.

REFERENCE BOOKS:	
1.	Behrouz A Forouzan, Cryptography and Network Security, Tata McGraw Hill Ltd, New Delhi, 2010.
2.	Bernard Menezes, Cryptography and Network Security, Cengage Learning India, First Edition, New Delhi, 2010.

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

191CSE604T	INFORMATION RETRIEVAL	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
Database Management Systems

COURSE OBJECTIVES:	
1.	To understand the basics of Information Retrieval.
2.	Expose them to various retrieval models with emphasis on pros and cons of these models.
3.	To understand machine learning techniques for text classification and clustering.
4.	To understand various search engine system operations.
5.	To learn different techniques of recommender system.

UNIT	TITLE	PERIODS
I	INTRODUCTION	9
Information Retrieval – Early Developments – The IR Problem – The User's Task – Information versus Data Retrieval - The IR System – The Software Architecture of the IR System – The Retrieval and Ranking Processes - The Web – The e-Publishing Era – How the web changed Search – Practical Issues on the Web – How People Search – Search Interfaces Today – Visualization in Search Interfaces.		
UNIT	TITLE	PERIODS
II	MODELING AND RETRIEVAL EVALUATION	9
Basic IR Models - Boolean Model - TF-IDF (Term Frequency/Inverse Document Frequency) Weighting - Vector Model – Probabilistic Model – Latent Semantic Indexing Model – Neural Network Model – Retrieval Evaluation – Retrieval Metrics – Precision and Recall – Relevance Feedback and Query Expansion.		
UNIT	TITLE	PERIODS
III	TEXT CLASSIFICATION AND CLUSTERING	9
A Characterization of Text Classification – Unsupervised Algorithms: Clustering – Naïve Text Classification – Supervised Algorithms – Decision Tree – k-NN Classifier – SVM Classifier – Feature Selection or Dimensionality Reduction – Evaluation metrics – Accuracy and Error – Organizing the classes – Indexing and Searching – Inverted Indexes – Sequential Searching – Multi-dimensional Indexing.		
UNIT	TITLE	PERIODS
IV	WEB RETRIEVAL AND WEB CRAWLING	9
The Web – Search Engine Architectures – Cluster based Architecture – Distributed Architectures – Search Engine Ranking – Link based Ranking – Simple Ranking Functions – Learning to Rank – Evaluations– Search Engine User Interaction – Browsing – Applications of a Web Crawler – Taxonomy – Architecture and Implementation – Scheduling Algorithms – Evaluation.		
UNIT	TITLE	PERIODS
V	RECOMMENDER SYSTEM	9
Recommender Systems Functions – Data and Knowledge Sources – Recommendation Techniques – Basics of Content-based Recommender Systems – High Level Architecture – Advantages and Drawbacks of Content-based		

Filtering – Collaborative Filtering – Matrix factorization models – Neighborhood models.

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Use an open source search engine framework and explore its capabilities.
CO2:	Evaluate the performance of information retrieval models
CO3:	Apply text classification, clustering and indexing techniques for Information Retrieval.
CO4:	Design a search engine with innovative features.
CO5:	Design a recommender system for real time applications

TEXT BOOKS:	
1.	Ricardo Baeza –Yates, Berthier Ribeiro –Neto, —Modern Information Retrieval: The concepts and Technology behind Search‖ (ACM Press Books), Second Edition, 2011.
2.	Ricci, F, Rokach, L. Shapira, B. Kantor, — ”Recommender Systems Handbook”, First Edition, 2011.

REFERENCE BOOKS:	
1.	Bruce Croft, Donald Metzler, and Trevor Strohman,” Search Engines: Information Retrieval in Practice”, Pearson Education, 2009.
2.	Christopher D. Manning, Prabhakar Raghavan, Hinrich Schutze, - Introduction to Information Retrieval, Cambridge University Press, First South Asian Edition, 2008.
3.	Stefan Buttcher, Charlie Clarke, Gordon Cormack, “Information Retrieval: Implementing and Evaluating Search Engines”, The MIT Press, Cambridge, Massachusetts London, England, 2010
4.	Tanveer Siddiqui and U. S. Tiwary,” Natural Language Processing And Information Retrieval”, Oxford University Press,2008.

191CSE605T	SERVICE ORIENTED ARCHITECTURE	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To learn fundamentals of XML
2.	To provide an overview of Service Oriented Architecture and Web services and their importance
3.	To learn web services standards and technologies
4.	To learn service oriented analysis
5.	To design for developing SOA based applications

UNIT	TITLE	PERIODS
I	XML	9
XML document structure – Well-formed and valid documents – DTD – XML Schema – Parsing XML using DOM, SAX – XPath - XML Transformation and XSL – Xquery		
UNIT	TITLE	PERIODS
II	SERVICE ORIENTED ARCHITECTURE (SOA) BASICS	9
Characteristics of SOA, Benefits of SOA, Comparing SOA with Client- Server and Distributed architectures –--- Principles of Service Orientation – Service layers		
UNIT	TITLE	PERIODS
III	WEB SERVICES (WS) AND STANDARDS	9
Web Services Platform – Service descriptions – WSDL – Messaging with SOAP – Service discovery – UDDI – Service-Level Interaction Patterns – Orchestration and Choreography		
UNIT	TITLE	PERIODS
IV	WEB SERVICES EXTENSIONS	9
WS-Addressing - WS-Reliable Messaging - WS-Policy – WS- Coordination – WS -Transactions - WS- Security - Examples		
UNIT	TITLE	PERIODS
V	SERVICE ORIENTED ANALYSIS AND DESIGN	9
SOA delivery strategies – Service oriented analysis – Service Modelling – Service oriented design – Standards and composition guidelines -- Service design – Business process design – Case Study		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Design the structure of XML to store and transport the data.
CO2:	Apply the SOA architectural paradigms and techniques for real time applications.
CO3:	Build web services and standards in web application.
CO4:	Develop solutions using web services extensions.
CO5:	Design Service Oriented Architecture for enterprise application.

TEXT BOOKS:	
1.	Sandeep Chatterjee and James Webber,—Developing Enterprise Web Services: An Architect's Guide, Prentice Hall, 2004
2.	Thomas Erl, — Service Oriented Architecture: Concepts, Technology, and Design, Pearson Education, 2005

REFERENCE BOOKS:	
1.	Eric Newcomer, Lomow, “Understanding SOA with Web Services”, Pearson Education, 2005
2.	Frank P.Coyle, —XML, Web Services and the Data Revolution, Pearson Education, 2002
3.	James McGovern, Sameer Tyagi, Michael E Stevens, Sunil Mathew, —Java Web Services Architecture‖, Elsevier, 2003.
4.	Ron Schmelzer et al. — XML and Web Services‖, Pearson Education, 2002.

191CSE606T	BLOCKCHAIN TECHNOLOGIES	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To Understand the basics of Blockchain technologies
2.	To enable the students to learn mathematical techniques for block chain construction
3.	Understand the concepts of Bitcoin
4.	Know about smart contracts and Ethereum
5.	Learn to develop Blockchain applications

UNIT	TITLE	PERIODS
I	FOUNDATIONS OF BLOCKCHAIN TECHNOLOGY	9
The consensus problem - Asynchronous Byzantine Agreement - AAP protocol and its analysis - Nakamoto Consensus on permission-less, nameless, peer-to-peer network - Proof of Work (PoW) as random oracle - formal treatment of consistency, liveness and fairness - Proof of Stake (PoS) based Chains- Different types of blockchain		
UNIT	TITLE	PERIODS
II	MATHEMATICAL TECHNIQUES FOR BLOCK CONSTRUCTION	9
Cryptographic basics for cryptocurrency - a short overview of Hashing, signature schemes, encryption schemes and elliptic curve cryptography, Blocks - Merkle Tree		
UNIT	TITLE	PERIODS
III	BITCOIN	9
Bitcoin - Wallet - hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bitcoin.		
UNIT	TITLE	PERIODS
IV	ETHEREUM AND SMART CONTRACTS	9
Ethereum - Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity - Smart Contracts - some attacks on smart contracts		
UNIT	TITLE	PERIODS
V	CASE STUDY	9
Zero Knowledge proofs and protocols in Blockchain - Applications: Internet of Things, Medical Record Management System and distributed supply chain management-IBM Blockchain Platform Hyperledger		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Analyze the abstract models of Block chain technologies for consensus problem.
CO2:	Apply mathematical models for block chain construction
CO3:	Infer the properties of bit coin for digital transaction
CO4:	Develop a smart contract in Ethereum Virtual Machine to run DApps.
CO5:	Design real time applications using Block chain protocols.

TEXT BOOKS:	
1.	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).
2.	Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies, 1st Edition, 2015

REFERENCE BOOKS:	
1.	Garay J. A. et al, The bitcoin backbone protocol - analysis and applications EUROCRYPT 2015
2.	LNCS VOl 9057, (VOLII), pp 281-310. (Also available at rint.iacr.org/2016/1048). (Serious beginning of discussions related to formal models for bitcoin protocols).
3.	Gavin Wood DR, ``ETHEREUM: A Secure Decentralized Transaction Ledger,'' Yellow paper.2014.
4.	Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015 (article available for free download) { curtain raiser kind of generic article, written by seasoned experts and pioneers}
5.	Pass R. et al, Analysis of Blockchain protocol in Asynchronous networks, EUROCRYPT 2017, (eprint.iacr.org/2016/454) . A significant progress and consolidation of several principles).

191CSE607T	WIRELESS SENSOR NETWORKS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand basic sensor network concepts
2.	To know physical layer issues, medium Access control Protocols
3.	To comprehend network layer characteristics and protocols
4.	To understand transport layer issues and protocols.
5.	To understand the network management and Middleware services.

UNIT	TITLE	PERIODS
I	INTRODUCTION	9
Introduction to wireless sensor networks - Challenges and Constraints - Application of sensor networks - Node architecture - Operating System - Fundamental aspects.		
UNIT	TITLE	PERIODS
II	PHYSICAL LAYER AND MEDIUM ACCESS LAYER	9
Basic architectural framework – Physical layer – source encoding – channel encoding – modulation – medium access control- Wireless MAC protocols – Characteristics of MAC protocols in sensor networks – Contention free MAC protocols - traffic adaptive medium access - Low-Energy Adaptive Clustering Hierarchy –Contention based protocols - Power Aware Multi-Access with signaling - Data- Gathering MAC - Receiver-Initiated MAC.		
UNIT	TITLE	PERIODS
III	NETWORK LAYER AND TRANSPORT LAYER	9
Routing metrics – Data centric Routing - Proactive routing – OLSR – Reactive Routing – AODV – Location Based Routing - Traditional Transport Control Protocols - TCP (RFC 793) - UDP (RFC 768) - Mobile IP - Feasibility of Using TCP or UDP for WSNs - Transport Protocol Design Issues – Examples of Existing Transport Control Protocols- CODA (Congestion Detection and Avoidance).		
UNIT	TITLE	PERIODS
IV	NETWORK MANAGEMENT	9
Power Management - Local Power Management Aspects - Processor Subsystem - Communication Subsystem - Active Memory - Power Subsystem- Dynamic Power Management - Dynamic Operation Modes - Time Synchronization – Clocks and the Synchronization Problem - Time Synchronization in Wireless Sensor Networks - Basics of Time Synchronization - Synchronization Messages -Time Synchronization Protocols - Ad Hoc Positioning System (APS) .		
UNIT	TITLE	PERIODS
V	MIDDLEWARE FOR WIRELESS SENSOR NETWORKS	9
Introduction -WSN Middleware Principles - Middleware Architecture – Data Related Functions, Architectures – Case study - MiLAN (Middleware Linking Applications and Networks) - IrisNet (Internet- Scale Resource-Intensive		

Sensor Networks Services).

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Analyze the challenges and constraints in wireless sensor network architecture.
CO2:	Analyze the protocol design issues of sensor networks at Physical and MAC Layer.
CO3:	Apply transmission protocols in network and transport layer.
CO4:	Apply power optimization and time synchronization techniques for network management.
CO5:	Design an application using Middleware architecture.

TEXT BOOKS:	
1.	Dr.Xerenium, Shen, Dr. Yi Pan , “Fundamentals of Wireless Sensor Networks, Theory and Practice”, Wiley Series on wireless Communication and Mobile Computing, 1st Edition, 2010.
2.	Siva Ram Murthy C., and Manoj B. S., "Ad Hoc Wireless Networks: Architectures and Protocols", Prentice Hall Professional Technical Reference, 2008.

REFERENCE BOOKS:	
1.	Bhaskar Krishnamachari , “Networking Wireless Sensors”, Cambridge university press, 2005.
2.	Carlos De Morais Cordeiro, Dharma Prakash Agrawal “Ad Hoc & Sensor Networks: Theory and Applications”, World Scientific Publishing Company, 2006.
3.	Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publication - 2002.
4.	Holger Karl and Andreas Willig “Protocols and Architectures for Wireless Sensor Networks”, Wiley, 2005
5.	Kazem Sohraby, Daniel Manoli, “Wireless Sensor networks- Technology, Protocols and Applications”, Wiley Inter Science Publications, 2007.
6	Raghavendra C.S, Krishna Sivalingam M., Taieb znati, “Wireless Sensor Networks”, Springer Science, 2004.

SYLLABUS OF

PROFESSIONAL ELECTIVE - III

COURSES

191CSE701T	PROGRAMMING IN PHP	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To acquaint themselves with the fundamental concepts and programming environment of PHP.
2.	To design classes and efficiently use PHP functions
3.	To implement object oriented concepts like inheritance, reusability, and encapsulation
4.	To apply custom exceptions and employ concurrency.
5.	To understand and design the Database using MySQL.

UNIT	TITLE	PERIODS
I	PHP FUNDAMENTALS	9
PHP – Exploring the PHP Environment – HTML Embedding, Comments - Variables, Data types – Operators – PHP String functions, Controls Structures, Arrays – Types – Multi dimension array – Array functions, Functions in PHP.		
UNIT	TITLE	PERIODS
II	PHP OO LANGUAGE	9
Introduction – Object, Class, new Keyword, Constructor, Destructor, Accessing Methods and Properties Using the $this Variable, Class Constants, Cloning Objects, polymorphism, parent :: and self :: , instance of Operator, Abstract method and Classes Interfaces and Inheritance of Interfaces. Final methods, Overloading, Exception handling.		
UNIT	TITLE	PERIODS
III	WEB PAGES WITH PHP	9
Embedding into HTML, User Input, Safe Handling user Input, PHP Form, form processing, Working with Form Data, GET, POST, REQUEST, Reading Data in web Pages, Performing Data validation, required data, number , text, Cookies and Session in PHP.		
UNIT	TITLE	PERIODS
IV	WORKING WITH DATABASE	9
MySQL, Creating Database and Table, CURD,JOIN, Aggregate Queries, Connecting to MySQL with PHP, Accessing and Updating Database with PHP,SQL injections, Prepared Statements.		
UNIT	TITLE	PERIODS
V	ADVANCED CONCEPTS	9
File Handling -Create, Open, read, write to files, Working with FTP in PHP,PHP mail functions, Advanced mail functions, Building and Formatting dates and times, PHP filters.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Develop simple PHP paradigms for real world Applications.
CO2:	Write PHP functions and classes using OOP Concepts.
CO3:	Interpret mark up languages for client server communication.
CO4:	Implement CRUD operations in MYSQL DB for PHP applications.
CO5:	Build PHP programs to handle files with advanced functions.

TEXT BOOKS:	
1.	Steven Holzner, “PHP: The Complete Reference”, Tata McGraw Hill Education,1st Edition,2007.

REFERENCE BOOKS:	
1.	George Schlossnagle,“Advanced PHP Programming”, First Edition, Sams Publishing, 2004.
2.	Larry Ullman, “PHP and MySQL for Dynamic Web Sites”, Prentice Hall, 4th Edition, 2016.
3.	Luke Welling, Laura Thomson, “PHP and MySQL Web Development”, Pearson, 4th Edition, 2009.

191CSE702T	SOFTWARE REQUIREMENTS ENGINEERING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Understand the basics of requirements engineering
2.	Learn different techniques used for requirements elicitation
3.	Know the role played by requirements analysis in requirement integration
4.	Appreciate the use of various methodologies for requirements development
5.	Study the current trends in requirements prioritization and validation.

UNIT		PERIODS
I	REQUIREMENTS ENGINEERING OVERVIEW	9
Software Requirement Overview – Software Development Roles – Software Development Process Kernels – Commercial Life Cycle Model – Vision Development – Stakeholders Needs & Analysis – Stakeholder needs – Stakeholder activities.		
UNIT		PERIODS
II	REQUIREMENTS ELICITATION	9
The Process of Requirements Elicitation – Requirements Elicitation Problems – Problems of Scope – Problems of Understanding – Problems of Volatility – Current Elicitation Techniques – Information Gathering – Requirements Expression and Analysis – Validation – An Elicitation Methodology Framework – A Requirements Elicitation Process Model – Methodology over Method – Integration of Techniques – Fact-Finding – Requirements Gathering – Evaluation and Rationalization – Prioritization – Integration and Validation.		
UNIT		PERIODS
III	REQUIREMENTS ANALYSIS	9
Identification of Functional and Non Functional Requirements – Identification of Performance Requirements – Identification of safety Requirements – Analysis – Feasibility and Internal Compatibility of System Requirements – Definition of Human Requirements Baseline.		
UNIT		PERIODS
IV	REQUIREMENTS DEVELOPMENT	9
Requirements analysis – Requirements Documentation – Requirements Development Workflow – Fundamentals of Requirements Development – Requirements Attributes Guidelines Document – Supplementary Specification Document – Use Case Specification Document – Methods for Software Prototyping – Evolutionary prototyping – Throwaway prototyping.		
UNIT		PERIODS
V	REQUIREMENTS VALIDATION	9
Validation objectives – Analysis of requirements validation – Activities Properties – Requirement reviews Requirements testing – Case tools for requirements engineering.		

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Identify the software requirements for stakeholder needs.
CO2:	Illustrate the stages of requirements elicitation
CO3:	Classify the requirements as functional and non-functional
CO4:	Develop requirements through various prototyping technique
CO5:	Analyze requirements through CASE tools for validation

REFERENCE BOOKS:	
1.	Dean Leffingwe, Don Widrig, —Managing Software Requirements A Use Case Approach, Second Edition, Addison Wesley, 2003
2.	Karl Eugene Wiegers, —Software Requirements, Word Power Publishers, 2000
3.	Ian Graham, —Requirements Engineering and Rapid Development, Addison Wesley, 1998
4.	Ian Sommerville, Pete Sawyer, —Requirements Engineering: A Good Practice Guide, Sixth Edition, Pearson Education, 2004
5.	Wiegers, Karl, Joy Beatty, Software requirements, Pearson Education, 2013

191CSE703T	INTERNET OF THINGS	Periods per week				Credits
		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 OF IoT	9
Overview - Definition and Characteristics - Physical Design - Logical Design - Enabling Devices - Levels and Deployment Templates. IoT and M2M - IoT and M2M Differences - Software Defined Networking - Network Function Virtualization.		
UNIT	TITLE	PERIODS
II	IOT PROTOCOL AND PLATFORM DESIGN	9
Need for IoT System Management – SNMP - Network operator requirements – NETCONF – YANG - IoT System management with NETCONF and YANG. IoT Platforms Design Methodology - Embedded devices: Sensors – Actuators - Embedded computing basics.		
UNIT	TITLE	PERIODS
III	PHYSICAL DEVICES AND ENDPOINTS	9
IoT Device – Basic Building Blocks - Raspberry Pi - Interfaces - Arduino –PcDuino – BeagleBone Black - Electric Imp – Cubie Board.		
UNIT	TITLE	PERIODS
IV	IOT NETWORK ARCHITECTURE AND DESIGN	9
Drivers Behind New Network Architectures - Comparing IoT Architectures - A Simplified IoT Architecture - The Core IoT Functional Stack - IoT Data Management and Compute Stack. Data and Analytics for IoT – Introduction - Machine Learning - Big Data Analytics Tools and Technology.		
UNIT	TITLE	PERIODS
V	CASE STUDIES/ APPLICATIONS	9
Introduction - Home automation - Smart and Connected Cities – Environment - Agriculture – Manufacturing – Transportation: Smart Parking Architecture and Smart Traffic Control.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Identify the characteristics and components of IoT.
CO2:	Design IoT platform for system management
CO3:	Build IoT applications using Rasperry Pi/Arduino.
CO4:	Appraise data analytics and cloud offerings related to IoT.
CO5:	Develop IoT enabled applications.

TEXT BOOKS:	
1.	Adrian McEwen and Hakim Cassimally , —Designing the Internet of Things‖, John Wiley and Sons Ltd., UK, 2014.
2.	Arshdeep Bahga, Vijay Madisetti, —Internet of Things – A hands-on approach‖, Universities Press, 2015.
3.	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.	Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds),—Architecting the Internet of Things, Springer, 2011
2.	Jan Holler, 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
3.	Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011.
4.	Olivier Hersent, David Boswarthick, Omar Elloumi , —The Internet of Things – Key applications and Protocols‖, Wiley, 2012.

WEBSITES:	
1.	https://www.arduino.cc/

191CSE704T	BUSINESS INTELLIGENCE AND ANALYTICS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Be exposed with the basic rudiments of business intelligence system
2.	understand the modeling aspects behind Business Intelligence
3.	understand of the business intelligence life cycle and the techniques used in it
4.	Be exposed with different data analysis tools and techniques
5.	Be familiar with the visualization.

UNIT	TITLE	PERIODS
I	BUSINESS INTELLIGENCE	9
Effective and timely decisions – Data, information and knowledge – Role of mathematical models – Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligence system – Ethics and business intelligence.		
UNIT	TITLE	PERIODS
II	KNOWLEDGE DELIVERY	9
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
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
Marketing models – Logistic and Production models – Case studies		
UNIT	TITLE	PERIODS
V	FUTURE OF BUSINESS INTELLIGENCE	9
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 be able to:	
CO1:	Modeling the aspects of business intelligence.
CO2:	Applying visualization techniques for business intelligence.
CO3:	Analyze the efficiency of the CCR model.
CO4:	Interpret the models for business intelligence applications.
CO5:	Apply various emerging technologies for predicting the future of business intelligence.

TEXT BOOKS:	
1.	Efraim Turban, Ramesh Sharda, Dursun Delen, “Decision Support and Business Intelligence Systems”, 9th Edition, Pearson 2013.

REFERENCE BOOKS:	
1.	Carlo Vercellis, “Business Intelligence: Data Mining and Optimization for Decision Making”, Wiley Publications, 2009.
2.	Cindi Howson, “Successful Business Intelligence: Secrets to Making BI a Killer App”, McGraw-Hill, 2007.
3.	David Loshin Morgan, Kaufman, “Business Intelligence: The Savvy Manager‟s Guide”, Second Edition, 2012.
4.	Larissa T. Moss, S. Atre, “Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making”, Addison Wesley, 2003.
5.	Ralph Kimball , Margy Ross , Warren Thornthwaite, Joy Mundy, Bob Becker, “The Data Warehouse Lifecycle Toolkit”, Wiley Publication Inc.,2007.

191CSE705T	SEMANTIC WEB TECHNOLOGY	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Understand the basics of semantic web technologies
2.	Analyze various ontology rules and querying with Resource Description Framework (RDF)
3.	Understand the OWL
4.	Develop semantic web application using swoogle
5.	Develop semantic web services

UNIT		PERIODS
I	INTRODUCTION	9
The world of the semantic web-WWW-meta data-Search engine- Search engine for traditional web- Semantic web-Search engine for semantic web-Traditional web to semantic web.		
UNIT		PERIODS
II	SEMANTIC WEB TECHNOLOGY	9
RDF-Rules of RDF-Aggregation-Distributed information-RDFS-core elements of RDFS Ontology- Taxonomy-Inferencing based on RDF schema		
UNIT		PERIODS
III	OWL	9
OWL-Using OWL to define classes-Set operators-Enumerations- Define properties ontology matching-Three faces of OWL-Validate OWL		
UNIT		PERIODS
IV	SWOOGLE	9
Swoogle-FOAF-Semantic markup-Issues-prototype system-Design of Semantic web search engine- Discovery and indexation-prototype system-case study		
UNIT		PERIODS
V	SEMANTIC WEB SERVICES	9
Semantic web services-OWL-S-Upper ontology-WSDL-S,OWL-S to UDDI mapping ,Design of the search engine, implementations		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Apply the basics of semantic web and search engine
CO2:	Analyze various ontology rules and querying with Resource Description Framework
CO3:	Evaluate the operations of Ontology Web Language.
CO4:	Appraise discovery and indexation methods of Swoogle search engine.
CO5:	Estimate the capabilities and limitations of semantic web service for different applications

TEXT BOOKS:	
1.	Liyang Yu , “Introduction to the Semantic Web and Semantic web services” Chapman & Hall/CRC, Taylor & Francis group, 2007.

REFERENCE BOOKS:	
1.	Grigoris Antoniou and Frank van Harmelen, “A Semantic Web Primer”, MIT Press, 2012.
2.	Johan Hjelm, “Creating the Semantic Web with RDF“, Wiley,2001

191CSE706T	QUANTUM COMPUTING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
Calculus and linear algebra, and know some 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 be able to:	
CO1:	Solve the computational problems using mathematical framework of quantum computing.
CO2:	Summarize quantum mechanics for designing quantum circuits.
CO3:	Analyze the behavior of various quantum algorithms.
CO4:	Choose the basic requirements for classification and implementation of quantum computers
CO5:	Simulate a simple quantum error-correcting code

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

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

SYLLABUS OF

PROFESSIONAL ELECTIVE - IV

COURSES

191CSE711T	COMPUTATIONAL LOGICS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand basics Propositional logic
2.	To learn the different rules in propositional logic
3.	To know about the first order logic concepts
4.	To apply the first order logic to derive conclusions.
5.	To gain knowledge about the refinement and abstraction after the computation.

UNIT	TITLE	PERIODS
I	PROPOSITIONAL LOGIC	9
Introduction, declarative sentences-Syntax, Well formed formula, Induction and recursion, Satisfiability and Tautology- Propositional connectives and boolean function, Semantics - Computability and Decidability, CNF, Examples for conversion of CNF-Boolean Satisfiability		
UNIT	TITLE	PERIODS
II	PROPOSITIONAL LOGIC RULES	9
Natural Deduction, Examples, Problems -Derived rules, Example-.Soundness theorem, Completeness theorem		
UNIT	TITLE	PERIODS
III	FIRST ORDER LOGIC	9
Relations and predicates, Formulas, Interpretations-. Logical Equivalence, Semantic tableaux, Algorithm for semantic table- Soundness Theorem, Completeness Theorem.		
UNIT	TITLE	PERIODS
IV	FIRST ORDER LOGIC RESOLUTION	9
Ground resolution-Substitution-Unification Algorithm- Correctness of unification Algorithm,-Robinson's unification Algorithm - General Resolution-Soundness of General Resolution-Completeness of General resolution.		
UNIT	TITLE	PERIODS
V	REFINEMENT & ABSTRACTION	9
Syntax and Semantics, Modal of time- LTL, Semantic Tableaux- Binary Temporal Operators-Branching Time Temporal Logic- BDD, OBDD.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Infer knowledge using Propositional logic
CO2:	Derive new statements using propositional logic rules
CO3:	Apply first order logic to generate semantic sentences.
CO4:	Build proofs by resolution and unification theorems.
CO5:	Articulate the knowledge about the refinement and abstraction of logical models.

TEXT BOOKS:	
1.	Huth M and Ryan M ," Logic in Computer Science : Modeling and Reasoning about systems", Cambridge University Press, 2005, and J Strother Moore. Kluwer Academic Publishers, June, 2000. (ISBN: 0-7923-7744-3)
2.	Mordechai Ben-Ari, "Mathematical Logic for Computer Science", III Edition, Springer ,2012

REFERENCE BOOKS:	
1.	Jean H. Gallier"Logic for Computer Science: Foundations of Automatic Theorem Proving", Second Edition, Dover Publications,2014
2.	ICopi I.M, Cohen D., P.Jetli, M.Prabakar, "Introduction to Logic", Pearson Education,2006 .
3.	Matt Kaufmann, Panagiotis Manolios, and J Strother Moore. Kluwer,"Computer-Aided Reasoning: An Approach.", Academic Publishers, June, 2000

191CSE712T	DESIGN PATTERN	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To solve design problems using design patterns and observer patterns
2.	To analyze various creational pattern methods for solving design problems
3.	To choose various structural pattern methods for solving design problems
4.	To select appropriate behavioural pattern method for design problems
5.	To apply pattern approach over a software application for solving design issues

UNIT	TITLE	PERIODS
I	INTRODUCTION TO DESIGN PATTERNS AND OBSERVER PATTERN	9
Basics of Design patterns, Description of design patterns, Catalog and organization of catalog, design patterns to solve design problems, selection of design pattern, Use of design patterns.		
UNIT	TITLE	PERIODS
II	CREATIONAL PATTERNS	9
Abstract Factory, Builder, Factory Method, Prototype, Singleton, Creational Patterns		
UNIT	TITLE	PERIODS
III	STRUCTURAL PATTERNS	9
Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy, Discussion		
UNIT	TITLE	PERIODS
IV	BEHAVIORAL PATTERNS	9
Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns		
UNIT	TITLE	PERIODS
V	A CASE STUDY	9
Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look- and-Feel Standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Provide solutions for commonly occurring problems in software design
CO2:	Analyze types of creational patterns for creating objects in design problems
CO3:	Design objects structure by identifying relationship between the software objects.
CO4:	Formulate the responsibilities among the objects in design problems
CO5:	Develop a pattern approach over the software application for handling design issues

TEXT BOOKS:	
1.	Erich Gamma, Design Patterns, Addison-Wesley, 1994.

REFERENCE BOOKS:	
1.	Design Patterns Explained: A New Perspective on Object- Oriented Design, 2nd Edition, Alan Shalloway James R. Trott, Addison-Wesley Professional, 2005
2.	Head First Design Patterns by Kathy Sierra, Bert Bates, Elisabeth Robson, Eric Freeman Publisher: O'Reilly Media, Inc. 2004
3.	Design Patterns Explained: A New Perspective on Object- Oriented Design, 2nd Edition, Alan Shalloway James R. Trott, Addison-Wesley Professional, 2005

191CSE713T	ADVANCED COMPUTER ARCHITECTURE	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
Computer Architecture

COURSE OBJECTIVES:	
1.	To introduce the students to the recent trends in the field of Computer Architecture and identify performance related parameters.
2.	To learn the different multiprocessor issues.
3.	To expose the different types of multicore architectures.
4.	To understand the design of the memory hierarchy.
5.	To introduce the students to the recent trends in the field of Computer Architecture and identify performance related parameters.

UNIT	TITLE	PERIODS
I	FUNDAMENTALS OF COMPUTER DESIGN AND ILP	9
Fundamentals of Computer Design – Measuring and Reporting Performance – Instruction Level Parallelism and its Exploitation – Concepts and Challenges –Exposing ILP - Advanced Branch Prediction - Dynamic Scheduling - Hardware-Based Speculation - Exploiting ILP - Instruction Delivery and Speculation - Limitations of ILP - Multithreading		
UNIT	TITLE	PERIODS
II	MEMORY HIERARCHY DESIGN	9
Introduction–Optimizations of Cache Performance–Memory Technology and Optimizations– Protection: Virtual Memory and Virtual Machines–Design of Memory Hierarchies–Case Studies.		
UNIT	TITLE	PERIODS
III	MULTIPROCESSOR ISSUES	9
Introduction- Centralized, Symmetric and Distributed Shared Memory Architectures –Cache Coherence Issues – Performance Issues – Synchronization – Models of Memory Consistency – Case Study-Interconnection Networks – Buses, Crossbar and Multi-stage Interconnection Networks		
UNIT	TITLE	PERIODS
IV	MULTICORE ARCHITECTURES	9
Homogeneous and Heterogeneous Multi-core Architectures – Intel Multicore Architectures – SUN CMP architecture – IBM Cell Architecture. Introduction to Warehouse-scale computers- Architectures- Physical Infrastructure and Costs- Cloud Computing –Case Study- Google Warehouse-Scale Computer.		
UNIT	TITLE	PERIODS
V	VECTOR, SIMD AND GPU ARCHITECTURES	9
Introduction-Vector Architecture – SIMD Extensions for Multimedia – Graphics Processing Units – Case Studies – GPGPU Computing – Detecting and Enhancing Loop Level Parallelism-Case Studies		

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Evaluate the performance of computer design by exploiting ILP.
CO2:	Apply optimization techniques in memory hierarchy design.
CO3:	Analyze the issues related to multiprocessor environment
CO4:	Apply the salient features of multicore architectures to achieve parallelism.
CO5:	Demonstrate Vector, SIMD AND GPU Architectures in data level parallelism.

REFERENCE BOOKS:	
1.	Darryl Gove, —Multicore Application Programming: For Windows, Linux, and Oracle Solaris‖, Pearson, 2011
2.	David B. Kirk, Wen-mei W. Hwu, —Programming Massively Parallel Processors‖, Morgan Kauffman, 2010
3.	David E. Culler, Jaswinder Pal Singh, —Parallel computing architecture : A hardware/software approach‖ , Morgan Kaufmann / Elsevier Publishers, 1999
4.	John L. Hennessey and David A. Patterson, —Computer Architecture – A Quantitative Approach‖, Morgan Kaufmann / Elsevier, 5th edition, 2012.
5.	Kai Hwang and Zhi.Wei Xu, —Scalable Parallel Computing‖, Tata McGraw Hill, NewDelhi, 2003

191CSE714T	CLOUD COMPUTING TECHNOLOGIES	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand the basic concepts of cloud computing.
2.	To gain knowledge in the concept of virtualization.
3.	To gain knowledge about different cloud platform architecture.
4.	To understand the concept of programming models.
5.	To understand the security issues in the grid and the cloud environment

UNIT	TITLE	PERIODS
I	CLOUD COMPUTING FUNDAMENTALS	9
Cloud Computing definition-Evolution of Cloud Computing-Cloud characteristics cloud Types, Cloud services: Benefits and challenges of cloud computing, Major Players in Cloud Computing-Issues in Cloud.		
UNIT	TITLE	PERIODS
II	VIRTUALIZATION	9
Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software - Pros and Cons of cloud computing – 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
III	CLOUD PLATFORM ARCHITECTURE	9
A Generic Cloud Architecture Design – Layered cloud Architectural Development – Virtualization Support and Disaster Recovery – Architectural Design Challenges - Public Cloud Platforms : GAE, AWS – Inter-cloud Resource Management		
UNIT	TITLE	PERIODS
IV	PROGRAMMING MODEL	9
Parallel and Distributed Programming Paradigms – Map Reduce, Twister and Iterative Map Reduce – Hadoop Library from Apache – Mapping Applications - Programming Support -Google App Engine, Amazon AWS - Cloud Software Environments –Concepts of Eucalyptus, Open Nebula, OpenStack, Aneka, Cloud Sim.		
UNIT	TITLE	PERIODS
V	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.		

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Articulate the basic concepts, key technologies, strengths and limitations of cloud computing.
CO2:	Analyze the impact of recent technologies in virtual environment
CO3:	Interpret the architectural design challenges of cloud computing.
CO4:	Develop cloud Services by integrating the programming models
CO5:	Apply the security models in the cloud environment

TEXT BOOKS:	
1.	John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010
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

REFERENCE BOOKS:	
1.	Danielle Ruest, Nelson Ruest, —Virtualization: A Beginner"s Guidell, McGraw-Hill Osborne Media, 2009.
2.	Jim Smith, Ravi Nair , "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
3.	Tim Mather, Subra Kumaraswamy, and Shahed Latif ,"Cloud Security and Privacy", O'Reilly Media, Inc.,2009.
4.	Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", McGraw-Hill Osborne Media, 2009.
5.	Tom White, "Hadoop: The Definitive Guide", Yahoo Press, 2012.

191CSE715T	MACHINE LEARNING TECHNIQUES	Periods per week				Credits
		L	T	P	R	
		3	**0**	**0**	**0**	**3**

PREREQUISITES:
NIL

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

UNIT	**TITLE**	**PERIODS**
I	**INTRODUCTION**	**9**
Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.		
UNIT	**TITLE**	**PERIODS**
II	**NEURAL NETWORKS AND GENETIC ALGORITHMS**	**9**
Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.		
UNIT	**TITLE**	**PERIODS**
III	**BAYESIAN AND COMPUTATIONAL LEARNING**	**9**
Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – Em Algorithm – Probability Learning – Sample Complexity – Finite And Infinite Hypothesis Spaces – Mistake Bound Model.		
UNIT	**TITLE**	**PERIODS**
IV	**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 – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning		

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Analyze the supervised, unsupervised, and semi-supervised machine learning techniques.
CO2:	Apply back propagation and genetic algorithms to solve real time problems.
CO3:	Solve uncertainty problems using Bayesian theorem
CO4:	Produce class labels by instance based learning techniques.
CO5:	Solve complex problems by appropriate machine learning approaches

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.

191CSE716T	C# and .NET Framework	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To learn basic programming in C# and the object oriented programming concepts.
2.	To update and enhance skills in writing Windows applications, ADO.NET and ASP .NET.
3.	To study the advanced concepts in data connectivity, WPF, WCF and WWF with C# and .NET 4.5.
4.	To implement mobile applications using .Net compact framework
5.	To understand the working of base class libraries, their operations and manipulation of data using XML.

UNIT	TITLE	PERIODS
I	C# LANGUAGE BASICS	9
.Net Architecture - Core C# - Variables - Data Types - Flow control - Objects and Types- Classes and Structs - Inheritance- Generics – Arrays and Tuples - Operators and Casts – Indexers		
UNIT	TITLE	PERIODS
II	C# ADVANCED FEATURES	9
Delegates - Lambdas - Lambda Expressions - Events - Event Publisher - Event Listener - Strings and Regular Expressions - Generics - Collections - Memory Management and Pointers - Errors and Exceptions - Reflection		
UNIT	TITLE	PERIODS
III	BASE CLASS LIBRARIES AND DATA MANIPULATION	9
Diagnostics -Tasks, Threads and Synchronization - .Net Security - Localization - Manipulating XML- SA and DOM - Manipulating files and the Registry- Transactions - ADO.NET- Peer-to-Peer Networking PNRP - Building P2P Applications - Windows Presentation Foundation (WPF).		
UNIT	TITLE	PERIODS
IV	WINDOW BASED APPLICATIONS, WCF AND WWF	9
Window based applications - Core ASP.NET- ASP.NET Web forms - Windows Communication Foundation (WCF)- Introduction to Web Services - .Net Remoting - Windows Service - Windows Workflow Foundation (WWF) - Activities – Workflows		
UNIT	TITLE	PERIODS
V	NET FRAMEWORK AND COMPACT FRAMEWORK	9
Assemblies - Shared assemblies - Custom Hosting with CLR Objects - Appdomains - Core XAML - Bubbling and Tunneling Events- Reading and Writing XAML - .Net Compact Framework - Compact Edition Data Stores – Errors, Testing and Debugging – Optimizing performance – Packaging and Deployment – Networking and Mobile Devices		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Build applications using C# Language in the .NET Framework.
CO2:	Implement Memory and Event Management schemes in C#.
CO3:	Create applications using ADO.NET and ASP .NET.
CO4:	Prepare Windows based Applications using .NET Framework.
CO5:	Apply .NET compact Framework in Assemblies

TEXT BOOKS:	
1.	Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner —Professional C# 2012 and .NET 4.5, Wiley, 2012
2.	Harsh Bhasin, —Programming in C#, Oxford University Press, 2014.

REFERENCE BOOKS:	
1.	Andrew Troelsen, Pro C# 5.0 and the .NET 4.5 Framework, Apress publication, 2012.
2.	Andy Wigley, Daniel Moth, Peter Foot, —Mobile Development Handbookǁ, Microsoft Press, 2011.
3.	Ian Gariffiths, Mathew Adams, Jesse Liberty, Programming C# 4.0ǁ, O_Reilly, Fourth Edition, 2010.

191CSE717T	3D PRINTING AND DESIGN	Periods per week				Credits
		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 – Continuous jet, 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; Opensource; Future trends;		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Apply the basic concepts of 3D printing technologies.
CO2:	Analyze the 3D Printing process, materials and their limitations
CO3:	Choose appropriate method for designing and modeling using inkjet printing
CO4:	Select appropriate method for designing and modeling using laser technology
CO5:	Design 3D printing models for industrial applications.

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

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

SYLLABUS OF

PROFESSIONAL ELECTIVE - V

COURSES

191CSE801T	GAME PROGRAMMING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Understand the concepts of Game design and development.
2.	Learn the processes, mechanics and issues in Game Design.
3.	Be exposed to the Core architectures of Game Programming.
4.	Know about Game programming platforms, frame works and engines.
5.	Learn to develop games.

UNIT	TITLE	PERIODS
I	GAME PROGRAMMING	9
Introduction to Game Programming Architecture, Application layer, Game logic, Game views, managing memory, controlling the main loop, Loading and Caching game data- Game Resources, Resource Files, Game event management.		
UNIT	TITLE	PERIODS
II	3D GRAPHICS FOR GAME PROGRAMMING	9
3D Transformations, Quaternions, 3D Modeling and Rendering, Ray Tracing, Shader Models, Lighting, Color, Texturing, Camera and Projections, Culling and Clipping, Character Animation, Physics-based Simulation, Scene Graphs.		
UNIT	TITLE	PERIODS
III	GAME ENGINE DESIGN	9
Game engine architecture, Engine support systems, Resources and File systems, Game loop and real-time simulation, Human Interface devices, Collision and rigid body dynamics, Game profiling.		
UNIT	TITLE	PERIODS
IV	GAMING PLATFORM AND FRAMEWORKS	9
Overview of windows programming, Windows messaging and Event Handling, Real time Game Loop, Overview of DirectX, Surfaces and Drawing Animated, Transparent and Tiled Sprite, Game Sound system Architecture, Keyboard, Mouse.		
UNIT	TITLE	PERIODS
V	GAME DEVELOPMENT	9
Developing 2D and 3D interactive games using DirectX or Python – Isometric and Tile Based Games, Paddle Game, Puzzle games, Single-Player games, Multi-Player games.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Analyze the resources for game programming environment.
CO2:	Apply 3D graphical and animation methods for game programming.
CO3:	Design game engine for real time simulation.
CO4:	Analyze the game programming platforms, frameworks and engines.
CO5:	Create interactive games using DirectX or Python.

TEXT BOOKS:	
1.	Jason Gregory, “Game Engine Architecture”, CRC Press / A K Peters, 2009.
2.	Mike Mc Shaffrfy and David Graham, “Game CodingComplete”, Fourth Edition, Cengage Learning, PTR, 2012.

REFERENCE BOOKS:	
1.	1. David H. Eberly, “3D Game Engine Design, Second Edition: A Practical Approach to Real- Time Computer Graphics” 2nd Editions, Morgan Kaufmann, 2006.
2.	Ernest Adams and Andrew Rollings, “Fundamentals of Game Design”, 2nd Edition Prentice Hall/ New Riders, 2009.
3.	Jung Hyun Han, “3D Graphics for Game Programming”, 1st Edition, Chapman andHall/CRC, 2011, ISBN:1439827370 9781439827376.
4.	Mike McShaffrfy, “Game Coding Complete”, 3rd Edition, Charles RiverMedia, 2009, ISBN:978-1584506805

191CSE802T	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	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:	Apply the concepts of SDN in API and overlays
CO3:	Design SDN solutions for multitenant data centers.
CO4:	Apply SDN programming interfaces for network function virtualization
CO5:	Design applications using SDN framework

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.	Fei Hu, Editor, —Network Innovation through Open Flow and SDN: Principles and Design, CRC Press, 2014.
2.	Siamak Azodolmolky, —Software Defined Networking with Open Flow, Packet Publishing, 2013
3.	Vivek Tiwari, —SDN and Open Flow for Beginnersǁ, Amazon Digital Services, Inc., 2013

191CSE803T	TCP/IP TECHNOLOGIES	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Understand the IP addressing schemes.
2.	Understand the fundamentals of network design and implementation
3.	Understand the design and implementation of TCP/IP networks
4.	Understand on network management issues
5.	Learn to design and implement network applications.

UNIT	TITLE	PERIODS
I	INTRODUCTION TO INTERNETWORKING CONCEPTS	9
Internetworking concepts and architecture model - classful Internet address - CIDR – Subnetting and Supernetting – AARP – RARP – IP- IP Routing – ICMP – IPV6		
UNIT	TITLE	PERIODS
II	TRANSMISSION CONTROL PROTOCOL	9
Services – header – connection establishment and termination – interactive data flow – bulk data flow – timeout and retransmission – persist timer – keep alive timer – futures and performance		
UNIT	TITLE	PERIODS
III	IP IMPLEMENTATION	9
IP global software organization –routing table–routing algorithms – fragmentation and reassembly – error processing (ICMP) – Multicast Processing (IGMP).		
UNIT	TITLE	PERIODS
IV	TCP IMPLEMENTATION I	9
Data structure and input processing – transmission control blocks – segment format – comparison– finite state machine implementation – Output processing – mutual exclusion –computing the computing the TCP Data length.		
UNIT	TITLE	PERIODS
V	TCP IMPLEMENTATION II	9
Timers – events and messages – timer process – deleting and inserting timer event – flow control and adaptive retransmission– congestion avoidance and control – urgent data processing and push function		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Apply internetworking concepts with addressing protocols.
CO2:	Analyse the services and functionalities of TCP.
CO3:	Implement Internet Protocol for routing, multicast and error processing
CO4:	Implement TCP using Finite state machine.
CO5:	Design solutions for network management issues.

TEXT BOOKS:	
1.	Douglas E Comer, "Internetworking with TCP/IP Principles, Protocols and Architecture", Vol 1, V th Edition 2006 and Vol 2, III rd Edition, 1999.
2.	Richard Stevens W "TCP/IP Illustrated" Vol 1. Pearson Education, 2003.

REFERENCE BOOKS:	
1.	Forouzan, " TCP/IP Protocol Suite" Second Edition, Tata MC Graw Hill, 2003.
2.	Forouzan B. A., "Data communication & Networking", Tata MC Graw Hill, 4th Edition.
3.	Larry L. Perterson and Bruce S. Davie , "Computer Networks- A Systems Approach", 2011, Morgan Kaufmann
4.	Mahbub Hasan & Raj Jain, " High performance TCP/IP Networking", PHI -2005

191CSE804T	DEEP LEARNING	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

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

UNIT	TITLE	PERIODS
I	INTRODUCTION	9
Introduction to machine learning- Linear models (SVMs and Perceptrons, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates		
UNIT	TITLE	PERIODS
II	DEEP NETWORKS	9
History of Deep Learning- A Probabilistic Theory of Deep Learning- Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks- Convolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning		
UNIT	TITLE	PERIODS
III	DIMENSIONALITY REDUCTION	9
Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyper parameter optimization		
UNIT	TITLE	PERIODS
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 WaveNet-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:	Analyze the data using machine learning and Neural Nets.
CO2:	Implement various deep learning methods for handling complex data.
CO3:	Apply deep architectures for dimensionality reduction.
CO4:	Examine optimization and generalization in deep learning.
CO5:	Apply Deep Learning Algorithms in Real Time applications.

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

191CSE805T	OPEN SOURCE SYSTEMS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Be exposed to the context and operation of free and open source software (FOSS) communities and associated software projects.
2.	Be familiar with participating in a FOSS project
3.	Learn scripting language like Python or Perl
4.	Learn programming language like Ruby
5.	Learn some important FOSS techniques like page filtering etc.

UNIT	TITLE	PERIODS
I	PHILOSOPHY	9
Notion of Community--Guidelines for effectively working with FOSS community--, Benefits of Community based Software Development --Requirements for being open, free software, open source software –Four degrees of freedom - FOSS Licensing Models - FOSS Licenses – GPL- AGPLLGPL - FDL - Implications – FOSS examples.		
UNIT	TITLE	PERIODS
II	LINUX	9
Linux Installation and Hardware Configuration – Boot Process-The Linux Loader (LILO) - The Grand Unified Boot loader (GRUB) - Dual-Booting Linux and other Operating System - Boot-Time Kernel Options- X Windows System Configuration-System Administration – Backup and Restore Procedures Strategies for keeping a Secure Server.		
UNIT	TITLE	PERIODS
III	PERL LANGUAGE	9
Perl- Introduction, Scalar Data, Arrays, Functions, Control Structures, File I/O, Basic text processing, Hashes, sorting, Loop Control, Standard perl modules, Regular expressions, CGI Programming, References and Data structures		
UNIT	TITLE	PERIODS
IV	PROGRAMMING TOOLS AND TECHNIQUES	9
Usage of design Tools like Argo UML or equivalent, Version Control Systems like Git or equivalent, – Bug Tracking Systems- Package Management Systems		
UNIT	TITLE	PERIODS
V	FOSS CASE STUDIES	9
Open Source Software Development - Case Study – Libreoffice –Word, excel, powerpoint, outlook, publisher-Samba-Introduction, CIFS, SMB, How to use SWAT with SSL Security.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Categorize and install various open-source operating systems.
CO2:	Interpret information about Free and Open Source Software projects.
CO3:	Modify Free and Open Source Software packages using PERL language.
CO4:	Apply programming tools and techniques for project management.
CO5:	Develop projects using Free and Open Source Software.

TEXT BOOKS:	
1.	Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, “Linux in a Nutshell”, Sixth Edition, OReilly Media, 2009
2.	Richard Peterson, “Linux the complete reference”, Sixth edition,2007

REFERENCE BOOKS:	
1.	http://www.gnu.org/philosophy/
2.	http://www.tldp.org/LDP/lame/LAME/linux-admin-made-easy/
3.	https://docs.python.org/2/tutorial/
4.	http://www.perl.org/books/beginning-perl/

191CSE806T	ROBOTICS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

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:	Discover the problems that are amenable to solution by AI methods.
CO2:	Apply appropriate search techniques to solve a given problem in AI.
CO3:	Formalise a given problem in the language/framework of different AI methods.
CO4:	Interpret various learning algorithms for knowledge representation.
CO5:	Apply AI concepts in robotics.

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

REFERENCE BOOKS:	
1.	David Jefferis, “Artificial Intelligence: Robotics and Machine Evolution”, Crabtree Publishing Company, 1992.

SYLLABUS OF

PROFESSIONAL ELECTIVE - VI

COURSES

191CSE811T	PARALLEL PROGRAMMING USING OPEN CL	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To know the fundamental concepts of CPU & GPU Concepts and tools.
2.	To learn kernel, thread models and programs
3.	To know the concept on memory and performance metrics
4.	To acquaint themselves with the concept of synchronization and functions
5.	To understand and design the algorithms with various tools

UNIT	TITLE	PERIODS
I	INTRODUCTION	9
History, graphics processors, graphics processing units, GPGPUs, Clock speeds, CPU / GPU comparisons, heterogeneity. Accelerators, parallel programming, CUDA/ OpenCL / OpenACC		
UNIT	TITLE	PERIODS
II	COMPUTATION	9
Kernels, launch parameters, thread hierarchy, warps / wavefronts, thread blocks / workgroups, streaming multiprocessors, 1D / 2D / 3D thread mapping, device properties, simple programs		
UNIT	TITLE	PERIODS
III	MEMORY	9
Memory hierarchy, DRAM / global, local / shared, private / local, textures, constant memory. Pointers, parameter passing, arrays and dynamic memory, multi-dimensional arrays. Memory allocation, memory copying across devices. Programs with matrices, performance evaluation with different memories.		
UNIT	TITLE	PERIODS
IV	SYNCHRONIZATION AND FUNCTIONS	9
Memory consistency. Barriers (local versus global), atomics, memory fence. Prefix sum, reduction. Programs for concurrent data structures such as worklists, linked-lists. Synchronization across CPU and GPU. Device functions, host functions, kernels, functions, Using libraries (such as Thrust), developing libraries.		
UNIT	TITLE	PERIODS
V	SUPPORTING TOOLS AND STREAMS	9
Debugging GPU programs. Profiling, profile tools, performance aspects. Asynchronous processing, tasks, task-dependence. Overlapped data transfers, default stream, synchronization with streams. Events, event-based-synchronization - overlapping data transfer and kernel execution, pitfalls..Case Studies: Image processing. Graph algorithms.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Interpret the basic concepts on CPU & GPU in parallel programming.
CO2:	Develop Open CL programs using threads, workgroups and thread mappings.
CO3:	Evaluate the performance of different memories.
CO4:	Apply different data structures for synchronization between CPU & GPU.
CO5:	Develop parallel programming using Open CL with supporting tools and streams.

TEXT BOOKS:	
1.	Programming Massively Parallel Processors: A Hands-on Approach; David Kirk, Wen-mei Hwu; Morgan Kaufman; 2010 (ISBN: 978-0123814722)

REFERENCE BOOKS:	
1.	CUDA Programming: A Developer's Guide to Parallel Computing with GPUs; Shane Cook; Morgan Kaufman; 2012 (ISBN: 978-0124159334)

191CSE812T	HUMAN COMPUTER INTERFACE	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To learn the foundations of Human Computer Interaction.
2.	To become familiar with the design technologies for individuals and persons with disabilities.
3.	To be aware of mobile HCI.
4.	To learn the guidelines for user interface.

UNIT	TITLE	PERIODS
I	FOUNDATIONS OF HCI	9
The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies.		
UNIT	TITLE	PERIODS
II	DESIGN & SOFTWARE PROCESS	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 – Universal Design.		
UNIT	TITLE	PERIODS
III	MODELS AND THEORIES	9
HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW.		
UNIT	TITLE	PERIODS
IV	MOBILE HCI	9
Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools - Case Studies.		
UNIT	TITLE	PERIODS
V	WEB INTERFACE DESIGN	9
Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies.		

TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Apply foundations of HCI for effective interaction
CO2:	Design HCI in software process with design rules.
CO3:	Formulate HCI models for web application.
CO4:	Design HCI for Mobile application development.
CO5:	Build web interfaces for real time applications.

TEXT BOOKS:	
1.	Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale — "Human Computer Interaction", 3rd Edition, Pearson Education, 2004
2.	Brian Fling, — "Mobile Design and Development", First Edition, O'Reilly Media Inc., 2009

REFERENCE BOOKS:	
1.	Bill Scott and Theresa Neil, —Designing Web Interfaces‖, First Edition, O'Reilly, 2009.
2.	Jhon.M.carrol," Human Computer Interaction in the new millennium", Pearson Education 2002

191CSE813T	CYBER FORENSICS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

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	INTRODUCTION TO COMPUTER 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 be able to:	
CO1:	Apply IP sec protocols in network layer and transport layer.
CO2:	Design firewalls for trusted system.
CO3:	Investigate cyber crimes using computer forensics techniques.
CO4:	Use forensics tools for evidence collection.
CO5:	Analyze forensics data for data validation.

TEXT BOOKS:	
1.	Man Young Rhee, —Internet Security: Cryptographic Principlesǁ, —Algorithms and Protocols, Wiley Publications, 2003.
2.	Nelson, Phillips, Enfinger, Steuart, —Computer Forensics and Investigationsǁ, Cengage Learning, India Edition, 2008.

REFERENCE BOOKS:	
1.	John R.Vacca, “Computer Forensics”, Cengage Learning, 2005
2.	Marjie T.Britz, “Computer Forensics and Cyber Crime”: An Introduction”, 3 rd Edition, Prentice Hall, 2013.
3.	Richard E.Smith, “Internet Cryptography”, 3 rd Edition Pearson Education, 2008.

191CSE814T	KNOWLEDGE BASED DECISION SUPPORT SYSTEM	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To know the decision making algorithms and evaluation.
2.	Acquire knowledge on decision support system and lifecycle.
3.	To know knowledge acquisition, validation and verification.
4.	Adequate knowledge in intelligent system development.
5.	To implement management support system.

UNIT	TITLE	PERIODS
I	INTRODUCTION	9

Decision making, Systems, Modelling, and support – Introduction and Definition – Systems – Models – Modelling process – Decision making: The intelligence phase –The design phase - The choice phase – Evaluation: The implementation phase –Alternative Decision – Making models – Decision support systems – Decision makers - Case applications.

UNIT	TITLE	PERIODS
II	DECISION SUPPORT SYSTEM DEVELOPMENT	9

Decision Support System Development: Introduction - Life cycle – Methodologies – prototype – Technology Levels and Tools – Development platforms – Tool selection – Developing DSS Enterprise systems: Concepts and Definition – Evolution of information systems – Information needs – Characteristics and capabilities – Comparing and Integrating EIS and DSS – EIS data access, Data Warehouse, OLAP, Multidimensional analysis, Presentation and the web – Including soft information enterprise on systems - Organizational DSS – supply and value chains and decision support – supply chain problems and solutions – computerized systems MRP, ERP, SCM – frontline decision support systems.

UNIT	TITLE	PERIODS
III	KNOWLEDGE MANAGEMENT	9

Introduction, Knowledge management –Development –methods, Technologies, and Tools. Knowledge acquisition and validation: Knowledge engineering – Scope – Acquisition methods - Interviews – Tracking methods – Observation and other methods – Grid analysis – Machine Learning: Rule induction, case-based reasoning – Neural computing – Intelligent agents – Selection of an appropriate knowledge acquisition methods – Multiple experts – Validation and verification of the knowledge base - Analysis, coding, documenting, and diagramming – Numeric and documented knowledge acquisition - Knowledge acquisition and the Internet/Intranets. Case Study - Knowledge representation

UNIT	TITLE	PERIODS
IV	**INTELLIGENT SYSTEM DEVELOPMENT**	9

Inference Techniques: Reasoning in artificial intelligence – Inference with rules: The Inference tree – Inference with frames – Model-based and case-based reasoning - Explanation and Meta knowledge – Inference with uncertainty – Representing uncertainty – Probabilities and related approaches – Theory of certainty – Approximate reasoning using fuzzy logic.

UNIT	TITLE	PERIODS
V	**MANAGEMENT SUPPORT SYSTEMS**	9

Implementing and integrating management support systems – Implementation: The major issues - Strategies – System integration – Generic models MSS, DSS, ES – Integrating EIS, DSS and ES, and global integration – Intelligent DSS – Intelligent modeling and model management – Examples of integrated systems – Problems and issues in integration.

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Analyze the significance of evaluation and decision-making systems
CO2:	Develop decision support system for Enterprise application.
CO3:	Make use of knowledge acquisition, validation, and verification in an expert systems
CO4:	Develop intelligent systems by inference techniques
CO5:	Create a management support system and management information systems

TEXT BOOKS:	
1.	Efrain Turban, Jay E.Aronson, “Decision Support Systems and Intelligent Systems” 6th Edition, Pearson Education, 2001

REFERENCE BOOKS:	
1.	Efrem A.Mallach, “Decision Support and Data Warehouse Systems”, Tata McGraw-Hill, 2002.
2.	Ganesh Natarajan, Sandhya Shekhar, “Knowledge management – Enabling Business Growth”, Tata McGraw Hill, 2002.
3.	George M.Marakas, “Decision Support System”, Prentice Hall, India, 2003

191CSE815T	SOCIAL NETWORK ANALYSIS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Understand the concept of semantic web and related applications.
2.	Learn knowledge representation using ontology.
3.	Understand human behaviour in social web and related communities.
4.	Understand the importance of Privacy in Social Media.
5.	Learn visualization of social networks.

UNIT	TITLE	PERIODS
I	INTRODUCTION	9
Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web -Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis -Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis.		
UNIT	TITLE	PERIODS
II	ONTOLOGY, MODELLING AND AGGREGATING SOCIAL MEDIA DATA	9
Ontology and their role in the Semantic Web: Ontology-based knowledge Representation – Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language -Modelling and aggregating social network data: State-of-the-art in network data representation -Ontological representation of social individuals - Ontological representation of social relationships -Aggregating and reasoning with social network data.		
UNIT	TITLE	PERIODS
III	MINING COMMUNITY IN SOCIAL NETWORK	9
Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks – Accessibility testing of Social Websites.		
UNIT	TITLE	PERIODS
IV	PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES	9
Understanding and predicting human behaviour for social communities - User data management -Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness- Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation .		

]

UNIT	TITLE	PERIODS
V	**APPLICATIONS**	9
Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks. Case Study: Evaluation of web based social network extraction.		

TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Analyze social network data by network analytic tools.
CO2:	Apply ontology and modeling methods in social media data to represent knowledge
CO3:	Apply community mining algorithms in social network.
CO4:	Predict human behavior and Privacy issues in social networks.
CO5:	Evaluate the web based social networks with Visualization techniques.

TEXT BOOKS:	
1.	Borko Furht, “Handbook of Social Network Technologies and Applications”, 1st Edition, Springer,2010.
2.	Peter Mika, “Social Networks and the Semantic Web”, First Edition, Springer 2007.

REFERENCE BOOKS:	
1.	Dion Goh and Schubert Foo, “Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively”, IGI Global Snippet, 2008.
2.	Guandong Xu ,Yanchun Zhang and Lin Li, “Web Mining and Social Networking –
3.	John G. Breslin, Alexander Passant and Stefan Decker, “The Social Semantic Web”, Springer,2009.
4.	Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, “Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling”, IGI Global Snippet, 2009

191CSE816T	VIRTUAL REALITY	Periods per week				Credits
		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:	Apply the concepts of Virtual Reality systems for real world problems
CO2:	Apply geometric modeling and transformations for Virtual environment
CO3:	Simulate virtual environment for moving objects
CO4:	Integrate Hardware and Software Components for Virtual Reality systems
CO5:	Analyze various virtual reality applications

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

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.	Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, “3D User
3.	William R.Sherman, Alan B.Craig :Understanding Virtual Reality – Interface, Application, Design”, The Morgan Kaufmann Series, 2003.

WEBSITES:	
1.	URL:https://www.mooc-list.com/course/making-your-first-virtual-reality-game-coursera
2.	URL https://www.mdpi.com/2414-4088/1/2/11/pdf