CURRICULUM

(REGULATIONS 2019 V21)

FOR

B.E. COMPUTER SCIENCE AND ENGINEERING

CYBER SECURITY

CHOICE BASED CREDIT SYSTEM

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

EASWARI ENGINEERING COLLEGE

(Autonomous Institution)
BharathiSalai, Ramapuram, Chennai - 600 089

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

S.No	Course Code	Course Title	Category	L	T	P	R	CREDITS
**SEMESTER I**								

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

^   Mandatory to register for the course and earn one credit

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

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

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

^   Mandatory to register for the course and earn one credit

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

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

		SEMESTER III						
S.No	**Course Code**	**Course Title**	**Category**	**Hours / Week**				**CREDITS**
				L	**T**	**P**	**R**	
THEORY								
1.	191MAB302T	Discrete Mathematics	BS	3	2	-	-	4
2.	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
TOTAL CREDITS								**24**
EMPLOYABILITY ENHANCEMENT COURSE								
10.	191CSA311I	Internship / Industrial Training[#]	EEC	-	-	-	-	1[#]
11	191CSA301I	Industry Supported Course (Optional) [##]	EEC	-	-	-	-	1[##]
ONLINE COURSE								
12		Online Course (Optional) [$]	PE	-	-	-	-	3[$]

**   Student may opt for any one. They have to complete the respective Phase II insemester 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 ProfessionalElective – IV and Professional Elective – VI. A student earned only three credits can drop only Professional Elective – VI. Please refer Clause14.9 of B.E. Regulations 2019.

S. No	Course Code	Course Title	Category	L	T	P	R	CREDITS
SEMESTER IV								
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$

*   Students have to complete the respective phase II.

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

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

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

SEMESTER V								
S.No	**Course Code**	**Course Title**	**Category**	**Hours / Week**				**CREDITS**
				L	**T**	**P**	**R**	
THEORY								
1.	191CSC501T	Computer Networks	PC	3	2	-	-	4
2.	191CCC501T	Cyber Security Essentials	PC	3	-	-	-	3
3.	191CCC502T	Cryptography	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.	191CCC511L	Cryptography and Cyber Security 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) [$]	PE	3	-	-	-	3[$]

[**]   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 threecredits 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.	191CSE813T	Cyber Forensics	PC	3	-	-	-	3	
2.	191CCC601T	Cyber Threat 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.	191CCC611L	Cyber Forensics Laboratory	PC	-	-	3	1	2	
TOTAL CREDITS								**19**	
MANDATORY COURSE									
8.	191GEM611L	NSS / NCC / YRC – Phase - III*	MC	-	-	2	-	1*	
9.	191GEM601T	Foreign Language / Indian Constitution &	MC	3	-	-	-	3&	
EMPLOYABILITY ENHANCEMENT COURSE									
10.	191CSA611I	Internship / Industrial Training #	EEC	-	-	-	-	1#	
11.	191CSA601I	Industry Supported Course (optional) ##	EEC	-	-	-	-	1##	
ONLINE COURSE									
12.		Online Course (Optional) $	PE	3	-	-	-	3$	

*   Students have to complete the respective phase III.

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

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

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

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

S.No	Course Code	Course Title	Category	Hours / Week				CREDITS
SEMESTER VII								
				L	T	P	R	
THEORY								
1.	191MBH721T	Professional Ethics	HS	3	-	-	-	3
2.	191CCC701T	Network Security	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.	191CCC711L	Security and Penetration Testing 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##

@   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.

S.No	Course Code	Course Title	Category	Hours / Week				CREDITS
SEMESTER VIII								
				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 ElectronicsEngineering	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	Java Programming	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	191CCC501T	Cyber Security Essentials	V	3
16	191CCC502T	Cryptography	V	3
17	191CSC511L	Computer Networks Laboratory	V	2
18	191CCC511L	Cryptography and Cyber Security Laboratory	V	1
19	191CSC603T	Compiler Design	VI	4
20	191CSE813T	Cyber Forensics	VI	3
21	191CCC601T	Cyber Threat Intelligence	VI	3
22	191CCC611L	Cyber Forensics Laboratory	VI	2
23	191CCC701T	Network Security	VII	3
24	191CCC711L	Security and Penetration Testing Laboratory	VII	2
TOTAL CREDITS				**64**

PROFESSIONAL ELECTIVE COURSES (PE)

S.No	Course Code	Course Title	Semester	Credits
PROFESSIONAL ELECTIVE – I : Cyber Security				
1	191CCE701T	Cyber Law and Ethics	V	3
2	191CCE702T	Ethical Hacking	V	3
3	191CCE703T	Intrusion Prevention/Detection System	V	3
4	191CCE704T	Malware Analysis	V	3
5	191CCE705T	Security Tools and Techniques	V	3
6	191CCE706T	Cyber Crime Investigation	V	3
7	191CCE707T	Applied Number Theory	V	3
PROFESSIONAL ELECTIVE – II: Application Security				
1	191CCE711T	Cloud Security	VI	3
2	191CCE712T	Social Network Security	VI	3
3	191CCE713T	Multimedia Security	VI	3
4	191CCE714T	Web Application Security	VI	3
5	191CCE715T	Biometric Security	VI	3
6	191CCE716T	Mobile and Wireless Security	VI	3
PROFESSIONAL ELECTIVE – III : PROGRAMMING				
1	191CCE721T	Visual Programming	VII	3
2	191CCE722T	Advanced JAVA Programming	VII	3
3	191CCE723T	Game Programming	VII	3
4	191CCE724T	Web Programming	VII	3
5	191CCE725T	XML and Web Services	VII	3
6	191CCE726T	C# and .NET Framework	VII	3
PROFESSIONAL ELECTIVE – IV: EMERGING TECHOLOGIES				
1	191CCE731T	Internet of Things	VII	3
2	191CCE732T	Quantum Computing	VII	3
3	191CCE733T	Data Mining	VII	3
4	191CCE734T	Mobile Computing	VII	3
5	191CCE735T	Blockchain Technologies	VII	3
6	191CCE736T	Virtual Reality	VII	3

S.No	Course Code	Course Title	Semester	Credits
		PROFESSIONAL ELECTIVE – V: Data Privacy		
1	191CCE801T	Vulnerability Management and Remediation	VIII	3
2	191CCE802T	Secure Coding	VIII	3
3	191CCE803T	System Security	VIII	3
4	191CCE804T	Applied Cryptography	VIII	3
5	191CCE805T	Engineering Secure Software Systems	VIII	3
6	191CCE806T	Information Warfare	VIII	3
7	191CCE807T	Hardware Security	VIII	3
		PROFESSIONAL ELECTIVE – VI : ARTIFICIAL INTELLIGENCE		
1	191CCE811T	Machine Learning Techniques	VIII	3
2	191CCE812T	Natural Language Processing	VIII	3
3	191CCE813T	Deep Learning	VIII	3
4	191CCE814T	Artificial Intelligence	VIII	3
5	191CCE815T	Data Science	VIII	3
6	191CCE816T	Robotic Process Automation	VIII	3

LIST OF OPEN ELECTIVES

S.No	Course Code	Course Title	Category	Hours / Week				CREDITS
				L	T	P	R	
		Semester V						
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	Introduction to Database Systems	OE	3	-	-	-	3
3	191CSO703T	Fundamentals of Data Structure	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	191CSP711J	Project work / Startup Phase I	VII	2
4	191CSP811J	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	191GEM102T	தமிழர்மரபு / Heritage of Tamils	I	1[^]
3	191CYM201T	Environmental Science [&&]	II	3[&&]
4	191GEM202T	தமிழரும்தொழில்நுட்பமும்/ Tamils and Technology	II	1[^]
5	191GEM211L	NSS / NCC /YRC - Phase I[*]	II	1[*]
6	191GEM411L	NSS / NCC / YRC - Phase II[*]	IV	1[*]
7	191GEM611L	NSS / NCC / YRC - Phase III[*]	VI	1[*]
8	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, PushpLata. 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 RajeevanGeeta. 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, 6[th]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, 8[th]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 Chemistry‖, Sri Krishna, Hitech publishing Company Pvt. Ltd, 2014
2.	Jain P.C. and Monika Jain, ―Engineering Chemistry‖ Dhanpat Rai, Publishing Company (P) Ltd.,New Delhi, 2015.

REFERENCE BOOKS:

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

191GES101T	ENGINEERING GRAPHICS (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.	ReemaThareja ―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-I‖ Global publications, 2019.
2.	Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., ―Vogel's Textbook of practical organic chemistry, LBS Singapore (1994).
3.	Jeffery G.H, Bassett J., Mendham J. and Denny R.C., ―Vogel's Text book of quantitative analysis chemical analysis‖, ELBS 5th Edn. Longman, Singapore publishers, Singapore, 1996.
4.	Daniel R. Palleros, ―Experimental organic chemistry‖ John Wiley & Sons, Inc.,New York (2001).

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

PREREQUISITES:

NIL

COURSE OBJECTIVES:

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

		Periods per week				Credits
191GES204T	**PROGRAMMING IN C**	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.	ReemaThareja, —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.	PradipDey, 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 equipment's – 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 equipment 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 management‖ Federation Alexandria Virgiia, Third Edition, 2008.

SYLLABUS OF

SEMESTER – III

COURSES

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

PREREQUISITES:
NIL

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

UNIT	TITLE	PERIODS
I	MATHEMATICAL LOGIC	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 Designǁ, 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.

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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, JoseeLajoie and Barbara E. Moo, —C++ Primer, Pearson Education, New Delhi, 2010.
4.	YashwantKanetkar, —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.	ReemaThareja, —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, SartajSahni, 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, ZvonkoVranesic, SafwatZaky and NaraigManjikian, 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, SartajSahni and SanguthevarRajasekaran, 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 Concepts‖, Sixth Edition, Tata McGraw Hill, 2011
2.	RamezElmasri, Shamkant B. Navathe, ―Fundamentals of Database Systems‖, Sixth Edition, Pearson Education, 2011

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

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.

191CCC501T	CYBER SECURITY ESSENTIALS	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	To learn the challenges and impacts of threats.
2.	To understand information assurance and supporting networks.
3.	To understand cyber attacks and tools for mitigating them.
4.	To learn how to detect a cyber attack.
5.	To learn how to prevent a cyber attack.

UNIT		PERIODS
I	CYBER SECURITY FUNDAMENTALS	9

Introduction to Cyber Security - Security challenges - Essentials of Security - Impacts due to lack of security - Challenges of Security - Security Model Work - Confidentiality, Integrity, and Availability (CIA) Triad - Types of Security Threats - Hackers - Types of hackers

UNIT		PERIODS
II	NETWORK AND SECURITY CONCEPTS	9

Information Assurance Fundamentals - Basic Cryptography - Symmetric Encryption - Public Key Encryption - The Domain Name System (DNS) - Firewalls - Virtualization - Radio-Frequency Identification - Case Study: Microsoft Windows Security Principles.

UNIT		PERIODS
III	ATTACKER TECHNIQUES AND EXPLOITATION	9

Anti Forensics - Proxies - Tunneling Techniques - Fraud Techniques: Phishing, Smishing, Vishing, and Mobile Malicious Code, Rogue Antivirus, Click Fraud - Exploitation: Techniques to Gain a Foothold - DoS Conditions - Brute Force and Dictionary Attacks - Misdirection, Reconnaissance, and Disruption Methods.

UNIT		PERIODS
IV	DETECTION AND PREVENTION OF MALICIOUS CODES	9

Self-Replicating Malicious Code - Evading Detection and Elevating Privileges - Rootkits - Spyware - Attacks against Privileged User Accounts and Escalation of Privileges - Token Kidnapping - Virtual Machine Detection - Stealing Information and Exploitation.

UNIT		PERIODS
V	DEFENSE AND ANALYSIS TECHNIQUES	9

Memory Forensics - Capabilities of Memory Forensics - Memory Analysis Frameworks - Dumping Physical Memory - Installing and Using Volatility - Finding Hidden Processes - Volatility Analyst Pack.

	TOTAL PERIODS:	45

COURSE OUTCOMES:

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

CO1:	Understand the basics of cyber security, cyber threats.
CO2:	Apply network security solutions to prevent the users and systems connecting tounknown locations.
CO3:	Classify various types of attacks and learn the tools to launch the attacks
CO4:	Apply intrusion techniques to detect intrusion
CO5:	Apply intrusion prevention techniques to prevent intrusion

TEXT BOOKS:

1.	Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short - Cybersecurity Essentials, October 2018, Sybex publications, ISBN: 9781119362395
2.	James Graham, Ryan Olson, Rick Howard - Cyber Security Essentials Paperback, Auerbach Publications (O'reilly), 1st edition (15 December 2010), ISBN-10 : 1439851239, ISBN-13 : 978-1439851234, eBook

REFERENCE BOOKS:

1.	AnandShinde,"IntroductiontoCyberSecurityGuidetotheWorldofCyberSecurity", Notion Press, 2021
2.	NinaGodbole,SunitBelapure,"CyberSecurity:UnderstandingCyberCrimes,ComputerForensicsandLegal Perspectives",WileyPublishers,2011

191CCC502T	CRYPTOGRAPHY	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	Learn to analyze the security of in-built cryptosystems.
2.	Know the fundamental mathematical concepts related to security.
3.	Develop cryptographic algorithms for information security.
4.	Comprehend the various types of data integrity and authentication schemes
5.	Understand cyber crimes and cyber security.

UNIT		PERIODS
I	INTRODUCTION TO SECURITY	9

IComputer Security Concepts – The OSI Security Architecture – Security Attacks – Security Services and Mechanisms – A Model for Network Security – Classical encryption techniques:Substitution techniques, Transposition techniques, Steganography – Foundations of modern cryptography: Perfect security – Information Theory – Product Cryptosystem – Cryptanalysis.

UNIT		PERIODS
II	SYMMETRIC CIPHERS	9

Number theory – Algebraic Structures – Modular Arithmetic - Euclid's algorithm – Congruence andmatrices – Group, Rings, Fields, Finite Fields

SYMMETRIC KEY CIPHERS: SDES – Block Ciphers – DES, Strength of DES – Differential andlinear cryptanalysis – Block cipher design principles – Block cipher mode of operation – Evaluationcriteria for AES – Pseudorandom Number Generators – RC4 – Key distribution.

UNIT		PERIODS
III	ASYMMETRIC CRYPTOGRAPHY	9

MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes – Primality Testing –Factorization – Euler's totient function, Fermat's and Euler's Theorem – Chinese RemainderTheorem – Exponentiation and logarithm

ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – DiffieHellman key exchange -– Elliptic curve arithmetic – Elliptic curve cryptography.

UNIT		PERIODS
IV	INTEGRITY AND AUTHENTICATION ALGORITHMS	9

Authentication requirement – Authentication function – MAC – Hash function – Security of hashfunction: HMAC, CMAC – SHA – Digital signature and authentication protocols – DSS – Schnorr

Digital Signature Scheme – ElGamal cryptosystem – Entity Authentication: Biometrics, Passwords,Challenge Response protocols – Authentication applications – Kerberos

MUTUAL TRUST: Key management and distribution – Symmetric key distribution using symmetric and asymmetric encryption – Distribution of public keys – X.509 Certificates.

UNIT		PERIODS
V	**CYBER CRIMES AND CYBER SECURITY**	**9**
Cyber Crime and Information Security – classifications of Cyber Crimes – Tools and Methods –Password Cracking, Keyloggers, Spywares, SQL Injection – Network Access Control – Cloud Security – Web Security – Wireless Security		

	TOTAL PERIODS:	**45**

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Understand the fundamentals of networks security, security architecture, threats and vulnerabilities
CO2:	Apply the different cryptographic operations of symmetric cryptographic algorithms
CO3:	Apply the different cryptographic operations of public key cryptography
CO4:	Apply the various Authentication schemes to simulate different applications.
CO5:	Understand various cyber crimes and cyber security.

TEXT BOOKS:	
1.	William Stallings, "Cryptography and Network Security - Principles and Practice", Seventh Edition, Pearson Education, 2017.
2.	Nina Godbole, SunitBelapure, "Cyber Security: Understanding Cyber crimes, Computer Forensics and Legal Perspectives", First Edition, Wiley India, 2011.

REFERENCE BOOKS:	
1.	Behrouz A. Ferouzan, DebdeepMukhopadhyay, "Cryptography and Network Security", 3rd Edition, Tata Mc Graw Hill, 2015.
2.	Charles Pfleeger, Shari Pfleeger, Jonathan Margulies, "Security in Computing", Fifth Edition, Prentice Hall, New Delhi, 2015.

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

191CCC511L	**CRYPTOGRAPHY AND CYBER SECURITY LABORATORY**	Periods per week				Credits
		L	T	P	R	
		0	0	2	0	1

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	Learn different cipher techniques.
2.	Implement the algorithms DES, AES.
3.	Implement the algorithms RSA and Diffie-Hellman.
4.	Implement hashing techniques such as SHA-1, MD-5.
5.	Develop a digital signature scheme.

LIST OF EXPERIMENTS	
1.	Write a program to implement the following cipher techniques to perform encryption and decryption Caesar Cipher Playfair Cipher Hill Cipher
2.	Write a program to implement the following transposition techniques (i) Rail fence technique –Row major transformation (ii) Rail fence technique - Column major transformation
3.	Write a program to implement DES algorithm
4.	Write a program to implement RSA Encryption algorithm
5.	Write a program to implement AES algorithm
6.	Write a program to implement the Diffie-Hellman Key Exchange mechanism. Consider one of the parties as Alice and the other party as bob.
7.	Write a program to calculate the message digest of a text using the SHA-1 algorithm.
8.	Write a program to calculate the message digest of a text using the MD-5 algorithm.
9.	Write a program to implement digital signature standard.
	TOTAL PERIODS: 30

COURSE OUTCOMES:

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

CO1:	Develop a code for classical encryption techniques.
CO2:	Build the symmetric algorithms.
CO3:	Build the asymmetric algorithms.
CO4:	Construct a code for various Authentication schemes.
CO5:	Apply the principles of digital signature.

SYLLABUS OF

SEMESTER – VI

COURSES

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 Principles‖, —Algorithms and Protocols, Wiley Publications, 2003.
2.	Nelson, Phillips, Enfinger, Steuart, —Computer Forensics and Investigations‖, Cengage Learning, India Edition, 2008.

REFERENCE BOOKS:	
1.	John R.Vacca, "Computer Forensics", Cengage Learning, 2005
2.	MarjieT.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.

191CCC601T	CYBER THREAT INTELLIGENCE	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:

NIL

COURSE OBJECTIVES:

1.	Leaders can guide organizations in accurately accessing threats, Risks, and vulnerabilities
2.	To minimize the potential for incidents and, when necessary, provide more thoughtful responses
3.	To analyze Cyber Threat Intelligence
4.	To Providers of threat indicators

UNIT	TITLE	PERIODS
I	DEFINING CYBER THREAT INTELLIGENCE	9

The Need for Cyber Threat Intelligence: The menace of targeted attacks, The monitor– and–respond strategy, Why the strategy is failing, Cyber Threat Intelligence Defined, Key Characteristics: Adversary based, Risk focused, Process oriented, Tailored for diverse consumers, The Benefits of Cyber Threat Intelligence

UNIT	TITLE	PERIODS
II	DEVELOPING CYBER THREAT INTELLIGENCE REQUIREMENTS	9

Assets That Must Be Prioritized: Personal information, Intellectual property, Confidential business information, Credentials and IT systems information, Operational systems. Adversaries: Cybercriminals, Competitors and cyber espionage agents, Hack activists. Intelligence Consumers: Tactical users, Operational users, Strategic users

UNIT	TITLE	PERIODS
III	COLLECTING CYBER THREAT INFORMATION	9

Threat Indicators, File hashes and reputation data, Technical sources: honey pots and scanners, Industry sources: malware and reputation feeds. Level 2: Threat Data Feeds, Cyber threat statistics, reports, and surveys, Malware analysis. Level 3: Strategic Cyber Threat Intelligence, Monitoring the underground, Motivation and intentions, Tactics, techniques, and procedures

UNIT	TITLE	PERIODS
IV	ANALYZING AND DISSEMINATING CYBER THREAT INTELLIGENCE	9

Information versus Intelligence, Validation and Prioritization: Risk scores, Tags for context, Human assessment. Interpretation and Analysis: Reports, Analyst skills, Intelligence platform, Customization. Dissemination: Automated feeds and APIs, Searchable knowledge base, Tailored reports

UNIT	TITLE	PERIODS
V	OPEN SOURCE SOFTWARE DEVELOPMENT	9

Types of Partners: Providers of threat indicators, Providers of threat data feeds, Providers of comprehensive cyber threat intelligence. Important Selection Criteria: Global and cultural reach, Historical data and knowledge, Range of intelligence deliverables, APIs and integrations, Intelligence platform, knowledge base, and portal, Client services, Access to experts. Intelligence–driven Security

	TOTAL PERIODS:	45

COURSE OUTCOMES:

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

CO1:	Study of different Cyber Threat.
CO2:	Study the technique to Develop Cyber Threat Intelligence Requirements.

CO3:	Can Collect Cyber Threat Information.
CO4:	Help in Analyzing and Disseminating Cyber Threat Intelligence.
CO5:	Study of Open Source Software Development.

TEXT BOOKS:

1.	Jon Friedman. Mark Bouchard, CISSP. Foreword by John P. Watters, Cyber Threat Intelligence, Definitive Guide TM, 2015.
2.	Scott J. Roberts, Rebekah Brown, Intelligence– Driven Incident Response: Outwitting the Adversary, O'Reilly Media, 2017.

REFERENCE BOOKS:

1.	Henry Dalziel, How to Define and Build an Effective Cyber Threat Intelligence Capability Elsevier Science & Technology, 2014.
2.	John Robertson, Ahmad Diab, Ericsson Marin, Eric Nunes, VivinPaliath, Jana Shakarian,PauloShakarian, DarkWeb Cyber Threat Intelligence Mining Cambridge University Press, 2017
3.	Bob Gourley, The Cyber Threat, Createspace Independent Pub, 2014.

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 MamtaBhatnagar, 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.

191CCC611L	**CYBER FORENSICS LABORATORY**	Periods per week				Credits
		L	T	P	R	
		0	0	3	1	2

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To learn different HEX editors
2.	To Study Encase Forensics.
3.	To implement and install HEX Editor.
4.	To Use Encase Forensics.

LIST OF EXPERIMENTS	
1.	Introduction to HEX Editor 18.5
2.	Introduction to Encase Forensics 4.20
3.	Installation of HEX Editor and Encase Forensics.
4.	Comparison of Files using HEX Editor 18.5 and FC Command
5.	Imaging using Encase Forensics 4.20
6.	Imaging using FTK Imager 3.2.0.0
7.	Extracting Browser Artifacts
8.	File Carving using Testdisk and Photorec
9.	Microsoft Sys internalsi. Microsoft Sys internals – Networking Utilitiesii. Microsoft Sys internals – Process Utilitiesiii. Microsoft Sys internals – Security Utilitiesiv. Microsoft Sys internals – System Information Utilitiesv. Microsoft Sys internals – Miscellaneous Utilitiesvi. Microsoft Sys internals – File and Disk Utilities

	TOTAL PERIODS:	60

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Learn different HEX editors
CO2:	Study Encase Forensics.
CO3:	Implement and install HEX Editor.
CO4:	Use Encase Forensics.
CO5:	Extracting Browser Artifacts

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

191CCC701T	NETWORK SECURITY	Periods per week				Credits
		L	T	P	R	
		3	0	0	0	3

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To understand the basic concepts of security
2.	To understand the concept of authentication protocols and digital signatures.
3.	To learn various methods and protocols to understand the cryptography.
4.	To learn various network security attacks.
5.	To understand the IP and Web security.

UNIT	TITLE	PERIODS
I	FUNDAMENTALS OF NETWORKING SECURITY	9

Overview of networking security- Security Services -Confidentiality, Authentication, Integrity, Non-repudiation, access Control - Availability and Mechanisms- Security Attacks -Interruption,Interception ,Modification and Fabrication.

UNIT	TITLE	PERIODS
II	AUTHENTICATION AND SECURITY	9

Authentication overview - Authentication protocols - Authentication and key establishment – keyexchange - mediated key exchange - User Authentication –password based authentication -password security - Certificate Authority and key management - digital signatures – digitalCertificates.

UNIT	TITLE	PERIODS
III	PUBLIC-KEY CRYPTOGRAPHY AND MESSAGE AUTHENTICATION	9

Basics of cryptography -cryptographic hash functions - symmetric and public-key encryption -public key cryptography principles & algorithms - cipher block modes of operation - Secure HashFunctions – HMAC

UNIT	TITLE	PERIODS
IV	SECURITY ATTACKS	9

Buffer overflow attacks & format string vulnerabilities - Denial-of-Service Attacks -Hijacking attacks: exploits and defenses - Internet worms – viruses – spyware –phishing – botnets - TCP sessionhijacking - ARP attacks - route table modification - UDP hijacking - man-in-the-middle attacks.

UNIT	TITLE	PERIODS
V	IP SECURITY AND WEB SECURITY	9

Network defense tools: Firewalls,VPNs, Intrusion Detection, and filters –Ecybercrimecymail privacy: PrettyGood Privacy (PGP) and S/MIME - Network security protocols in practice- Introduction toWireshark – SSL - IPsec, and IKE -DNS security- Secure Socket Layer (SSL) and Transport LayerSecurity (TLS) - Secure Electronic Transaction (SET)

	TOTAL PERIODS:	45

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Describe computer and network security fundamental concepts and principles.
CO2:	Acquire the knowledge of various authentication protocols, key exchange mechanism, and digital certificates.
CO3:	To get better knowledge on fundamental concepts of cryptography, encryption and hashing techniques.
CO4:	Identify and assess different types of threats and attacks such as social engineering, rootkit, and botnets,etc.
CO5:	Acquire Demonstrate the ability to select among available network security technology and protocols such as IDS, firewalls, SSL , TLS, etc.

TEXT BOOKS:	
1.	Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.

REFERENCE BOOKS:	
1.	Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn IdoDubrawsky, Steve W.Manzuik and Ryan Permeh, Wiley Dreamtech
2.	Cryptography and network Security, Third edition, Stallings, PHI/Pearson
3.	A look back at Security Problems in the TCP/IP Protocol Suite, S. Bellovin, ACSAC 2004.

191CSC711L	**SECURITY AND PENETRATION TESTING LABORATORY**	Periods per week				Credits
		L	T	P	R	
		0	0	3	1	2

PREREQUISITES:
NIL

COURSE OBJECTIVES:	
1.	To learn about the Foot printing
2.	To learn about the Port scanning
3.	To know about the Windows and Linux Enumerations
4.	To know about the Antivirus Programming
5.	To know about the Password cracking

LIST OF EXPERIMENTS	
1.	To perform the Foot printing
2.	Demonstrate Port scanning
3.	Implement Windows and Linux Enumerations
4.	Simulate Hacking web applications
5.	Simulate Hacking web servers
6.	Simulate Network hacking
7.	Perform Database hacking
8.	Study Sniffer tools
9.	Simulate Antivirus Programming
10.	Perform Password cracking

	TOTAL PERIODS:	60

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Learn about the Foot printing
CO2:	Learn about the Port scanning
CO3:	Know about the Windows and Linux Enumerations
CO4:	Know about the Antivirus Programming
CO5:	Know about the Password cracking