Sri Krishna College of Engineering and Technology

An Autonomous Institution, Affiliated to Anna University

Coimbatore – 641 008

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CURRICULUM AND SYLLABI

B.E. COMPUTER SCIENCE AND ENGINEERING

REGULATION 2017

SRI KRISHNA COLLEGE OF ENGINEERING AND TECHNOLOGY

An Autonomous Institution Affiliated to Anna University
Kuniamuthur, Coimbatore - 641 008

VISION, MISSION AND QUALITY POLICY OF THE INSTITUTE

VISION

To produce globally competitive engineers with high ethical values and social responsibilities

MISSION

Our mission is to impart the highest quality of technical education, provide impetus to research and development, foster innovation in the technological growth, encourage entrepreneurship and strive to solve problems of mankind. We also endeavour to embed the greatest values of human life and inculcate the will to attain progress and prosperity in life in socially accepted norms, to remain an asset to our nation and be a part of its pride and heritage

QUALITY

We, at Sri Krishna College of Engineering and Technology are dedicated to provide quality technical education to the satisfaction of all our Customers through

- ✓ Motivating our students towards success.
- ✓ Involvement at all levels.
- ✓ Continual update of all facilities.
- ✓ Creating opportunities for placement.
- ✓ Providing education in a discipline atmosphere.
- ✓ Quality improvement of faculty.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VISION AND MISSION OF THE DEPARTMENT

VISION

To prepare professionals with high academic and ethical values who will contribute to the computational world.

MISSION

- To develop human resources who can impart knowledge in computing.
- To impart necessary professional skills through student enrichment programme.
- To inculcate strong ethical values among students.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

PROGRAMME EDUCATIONAL OBJECTIVES&

PROGRAMME OUTCOMESOF THE DEPARTMENT

PROGRAMME EDUCATIONALOBJECTIVES

PEO1 Successful careers in industry that meet the needs of Indian and multinational companies.
PEO2 Problem solving skills in computer science and engineering by applying mathematical, scientific and engineering fundamentals and also to pursue higher studies.
PEO3 Good scientific and engineering breadth so as to comprehend, analysis, design, and create novel products and solutions for the real life problems.
PEO4 Possess professional and ethical attitude, effective communication skills, team working skills, multi-disciplinary approach, and an ability to relate engineering issues to broader social context. PEO5 Exhibit leadership qualities and progress through life-long learning.

PROGRAMME OUTCOMES

PO – a Graduates would be able to apply knowledge of mathematics, science, engineering fundamentals to solve problems in computer science and engineering.
PO – b Graduates would be able to identify, formulate, and analyze problems in computer science and engineering.
PO – c Graduates would be able to demonstrate an ability to analyze and design software systems.
PO – d Graduates would be able to demonstrate an ability to analyze and design hardware systems.
PO – e Graduates would be able to demonstrate an ability to visualize and work on multi- disciplinary tasks.
PO – f Graduates would be able to create, select and apply appropriate techniques, resources and modern engineering and IT tools.
PO – g Graduates would be able to apply reasoning informed by contextual knowledge to assess societal and environmental issues and the consequent responsibilities relevant to the ethical engineering practice.
PO – h Graduates would be able to comprehend and write effective reports, design documentations and make effective presentations and give and receive clear instructions.
PO – i Graduates would be able to understand the impact of professional engineering solutions in societal and environmental context and also will be aware of contemporary issues.
PO – j Graduates would be able to recognize the need for engaging in lifelong learning.
PO – k Graduates who can participate and succeed in competitive examinations like GATE, GRE, CAT.

R2017

SEMESTER I							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credits**	**Ext/Int**	**Category**
1	17EN001	Technical Communication skills I	3/0/2	5	4	40/60	HS
2	17MA101	Linear Algebra And Differential Calculus	3/2/0	5	4	60/40	BS
3	17CS201	Problem Solving Techniques and C Programming	3/0/3	6	5	40/60	ES
4	17CS301	Computer Science Essentials I	3/0/0	4	3	60/40	PC
5	17CH103	Engineering Chemistry	3/0/2	5	4	40/60	BS
6	17ME204	Engineering Practices Laboratory	0/0/3	3	2	40/60	ES
Total				**28**	**22**		

SEMESTER II							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credit**	**Ext/Int**	**Category**
1	17EN002	Technical Communication Skills II	3/0/2	5	4	40/60	HS
2	17MA104	Integral Calculus and Laplace Transform	3/2/0	5	4	60/40	BS
3	17PH102	Engineering Physics	3/0/2	5	4	40/60	BS
4	17CS203	Linux and Advanced C Programming	3/0/3	6	5	40/60	ES
5	17CS302	Computer Science Essentials II	3/0/0	4	3	60/40	PC
6	17ME205	Engineering Graphics Laboratory	0/0/3	3	2	40/60	ES
		Total		**28**	**22**		

SEMESTER III							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credit**	**Ext/Int**	**Category**
1	17MA107	Discrete Structures	3/2/0	5	4	60/40	BS
2	17CS303	Operating Systems	3/0/0	3	3	60/40	PC
3	17CS304	Data Structures	3/0/3	6	5	40/60	PC
4	17CS205	Digital Principles and System Design	3/0/2	5	4	40/60	ES
5	17CS206	Object Oriented Programming using Java	3/0/0	3	3	60/40	ES
6	17CS305	Operating Systems Laboratory	0/0/3	3	2	40/60	PC
7	17CS207	Java Programming Laboratory	0/0/3	3	2	40/60	ES
8	17CS7XX	Mandatory Course-I	2/0/0	2	1	0/100	MC
		Total		**30**	**24**		

SEMESTER IV							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credit**	**Ext/Int**	**Category**
1	17MA110	Probability and Statistics	3/2/0	5	4	60/40	BS
2	17CS306	Fundamentals of Open Source Software	3/0/2	5	4	40/60	PC
3	17CS307	Database Management Systems	3/0/0	3	3	60/40	PC
4	17CS308	Computer Architecture	3/0/0	4	3	60/40	PC
5	17CS309	Design and Analysis of algorithms	3/0/0	4	3	60/40	PC
6	17CS310	DBMS Laboratory	0/0/3	3	2	40/60	PC
7	17CS311	Algorithms Laboratory	0/0/3	3	2	40/60	PC
8	17CS601	Mini Project-I	-	-	2	40/60	PW
9	17CS7XX	Mandatory Course-II	2/0/0	2	1	0/100	MC
			Total	**29**	**24**		

SEMESTER V							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credit**	**Ext/Int**	**Category**
1	17MA114	Fourier Series and Computational Methods	3/2/0	5	4	60/40	BS
2	17CS312	Theory of Computation	3/0/0	4	3	60/40	PC
3	17CS208	Microprocessors and Microcontrollers	3/0/0	3	3	60/40	ES
4	17CS313	Computer Networks	3/0/0	3	3	60/40	PC
5	17CS314	Artificial Intelligence	3/0/2	5	4	40/60	PC
6	17CS4XX	Professional Elective-I	3/0/0	3	3	60/40	PE
7	17CS209	Microprocessor Laboratory	0/0/3	3	2	40/60	ES
8	17CS315	Computer Networks Laboratory	0/0/3	3	2	40/60	PC
9	17CS7XX	Mandatory Course-III	2/0/0	2	1	0/100	MC
			Total	**31**	**25**		

SEMESTER VI							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credit**	**Ext/Int**	**Category**
1	17CS316	Compiler Design	3/0/0	4	3	60/40	PC
2	17CS317	Software Development	3/0/0	3	3	60/40	PC
3	17CS318	Data Analytics	3/0/0	4	3	60/40	PC
4	17CS319	Virtualization and Cloud	3/0/0	4	3	60/40	PC
5	17CS4XX	Professional Elective-II	3/0/0	3	3	60/40	PE
6	17XX50X	Open Elective	3/0/0	3	3	60/40	OE
7	17CS320	Compiler Design Laboratory	0/0/3	3	2	40/60	PC
8	17CS321	CASE tools Laboratory	0/0/3	3	2	40/60	PC
9	17CS322	Cloud and Data Analytics Laboratory	0/0/3	3	2	40/60	PC
10	17CS602	Mini Project-II	-	-	2	40/60	PW
11	17CS7XX	Mandatory Course-IV	2/0/0	2	1	0/100	MC
			Total	**32**	**27**		

SEMESTER VII							
S No.	Course Code	Course	L/T/P	Contact hrs/week	Credit	Ext/Int	Category
1	17CS323	Internet of Things	3/0/0	3	3	60/40	PC
2	17CS324	Web Technology	3/0/0	3	3	60/40	PC
3	17CS4XX	Professional Elective-III	3/0/0	3	3	60/40	PE
4	17CS4XX	Professional Elective-IV	3/0/0	3	3	60/40	PE
5	17CS4XX	Professional Elective-V	3/0/0	3	3	60/40	PE
6	17CS4XX	Professional Elective-VI	3/0/0	3	3	60/40	PE
7	17CS325	Internet of Things (IoT) Laboratory	0/0/3	3	2	40/60	PC
8	17CS326	Web Technology Laboratory	0/0/3	3	2	40/60	PC
			Total	24	22		

SEMESTER VIII							
S No.	Course Code	Course	L/T/P	Contact hrs/week	Credit	Ext/Int	Category
1	17CS603	Project	0/0/24	24	12	40/60	PW
			Total	24	12		

HUMANITIES (8 credits)

S. No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	Credits	Category
1.	17EN001	Technical Communication skills - I	3/0/2	5	4	HS
2.	17EN002	Technical Communication Skills – II	3/0/2	5	4	HS

BASIC SCIENCES (28 Credits)

S. No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	Credits	Category
1.	17MA101	Linear Algebra And Differential Calculus	3/2/0	5	4	BS
2.	17CH103	Engineering Chemistry	3/0/2	5	4	BS
4.	17MA104	Integral Calculus and Laplace Transform	3/2/0	5	4	BS
5.	17PH102	Engineering Physics	3/0/2	5	4	BS
6.	17MA107	Discrete Structures	3/2/0	5	4	BS
7.	17MA110	Probability and Statistics	3/2/0	5	4	BS
8.	17MA114	Fourier Series and Computational Methods	3/2/0	5	4	BS

ENGINEERING SCIENCES (28 Credits)

S. No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	Credits	Category
1.	17CS201	Problem Solving Techniques and C Programming	3/0/3	6	5	ES
2.	17ME204	Engineering Practices Laboratory	0/0/3	3	2	ES
3.	17CS203	Linux and Advanced C Programming	3/0/3	6	5	ES
4.	17ME205	Engineering Graphics Laboratory	0/0/3	3	2	ES
5	17CS205	Digital Principles and System Design	3/0/2	5	4	ES
6.	17CS206	Object Oriented Programming Using Java	3/0/0	3	3	ES
7.	17CS207	Java Programming Laboratory	0/0/3	3	2	ES
8.	17CS208	Microprocessors and Microcontrollers	3/0/0	3	3	ES
9.	17CS209	Microprocessor Laboratory	0/0/3	3	2	ES

PROFESSIONAL CORE (73 Credits)

S. No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	Credits	Category
1.	17CS301	Computer Science Essentials I	3/0/0	4	3	PC
2.	17CS302	Computer Science Essentials II	3/0/0	4	3	PC
3.	17CS303	Operating Systems	3/0/0	3	3	PC
4.	17CS304	Data Structures	3/0/3	6	5	PC
5.	17CS305	Operating Systems Laboratory	0/0/3	3	2	PC
6.	17CS306	Fundamentals of Open Source Software	3/0/2	5	4	PC
7.	17CS307	Database Management Systems	3/0/0	3	3	PC
8.	17CS308	Computer Architecture	3/0/0	4	3	PC
9.	17CS309	Design and Analysis of algorithms	3/0/0	4	3	PC
10.	17CS310	DBMS Laboratory	0/0/3	3	2	PC
11.	17CS311	Algorithms Laboratory	0/0/3	3	2	PC
12.	17CS312	Theory of Computation	3/0/0	4	3	PC
13.	17CS313	Computer Networks	3/0/0	3	3	PC
14.	17CS314	Artificial Intelligence	3/0/2	5	4	PC
15.	17CS315	Computer Networks Laboratory	0/0/3	3	2	PC
16.	17CS316	Compiler Design	3/0/0	4	3	PC
17.	17CS317	Software Development	3/0/0	3	3	PC
18.	17CS318	Data Analytics	3/0/0	4	3	PC
19.	17CS319	Virtualization and Cloud	3/0/0	4	3	PC
20.	17CS320	Compiler Design Laboratory	0/0/3	3	2	PC
21.	17CS321	CASE tools Laboratory	0/0/3	3	2	PC
22.	17CS322	Cloud and Data Analytics Laboratory	0/0/3	3	2	PC
23.	17CS323	Internet of Things	3/0/0	3	3	PC
24.	17CS324	Web Technology	3/0/0	3	3	PC
25.	17CS325	Internet of Things (IoT) Laboratory	0/0/3	3	2	PC
26.	17CS326	Web Technology Laboratory	0/0/3	3	2	PC

ELECTIVE/AUDIT COURSES (18 + 3 Credits)

S. No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	Credits	Category
PROFESSIONAL ELECTIVES						
Networking and Computing						
1.	17CS401	Wireless Networks	3/0/0	3	3	PE
2.	17CS402	Cryptography and Network Security	3/0/0	3	3	PE
3.	17CS403	Distributed Systems	3/0/0	3	3	PE
4.	17CS404	Mobile Application Development	3/0/0	3	3	PE
5.	17CS405	Mobile Computing	3/0/0	3	3	PE
6.	17CS406	Quantum Computing	3/0/0	3	3	PE
Programming Languages , Multimedia and Software Engineering						
1.	17CS407	Advanced Java Programming	3/0/0	3	3	PE
2.	17CS408	Python programming	3/0/0	3	3	PE
3.	17CS409	Computer Graphics and Multimedia	3/0/0	3	3	PE
4.	17CS410	Image Processing	3/0/0	3	3	PE
5.	17CS411	Open source web services	3/0/0	3	3	PE
6.	17CS412	Software Testing and Quality Assurance	3/0/0	3	3	PE
7.	17CS413	Building Enterprise Applications	3/0/0	3	3	PE

Intelligent Systems and latest trends						
1.	17CS414	Data Warehousing and Mining	3/0/0	3	3	PE
2.	17CS415	Design patterns and design thinking	3/0/0	3	3	PE
3.	17CS416	Data Science	3/0/0	3	3	PE
4.	17CS417	User Experience Design	3/0/0	3	3	PE
5.	17CS418	Machine Learning	3/0/0	3	3	PE
6.	17CS419	Game Theory and its Applications	3/0/0	3	3	PE
7.	17CS420	Business Intelligence	3/0/0	3	3	PE
8.	17CS421	Deep Learning				
OPEN ELECTIVES						
1.	17CS501	Internet Marketing and E-Commerce	3/0/0	3	3	OE
2.	17CS502	Green Computing	3/0/0	3	3	OE
3.	17CS503	Introduction to Python	3/0/0	3	3	OE
4.	17CS504	Software Product Development and Management	3/0/0	3	3	OE
5.	17CS505	Java Fundamentals	3/0/0	3	3	OE

MANDATORY COURSES (4 credits)

S.No	Course Code	Course Title	Credits	Category
1.	17CH701	Environmental Science	1	MC
2.	17CS702	Life Skills and Ethics	1	MC
3.	17CS703	Quantitative aptitude and soft skills	1	MC
4.	17CS704	Foreign Language/Spoken Hindi	1	MC
5.	17CS705	MOOC Certification	1	MC

ONE CREDIT COURSES

S.No	Course	Course Title	Credits
1.	17CS801	SPSS	1
2.	17CS802	SQLite	1
3.	17CS803	Ruby on rails	1
4.	17CS804	CCNA	1
5.	17CS805	Angular JS	1
6.	17CS806	MATLAB Programming	1
7.	17CS807	Practical TCP/IP and Ethernet Networking for industry	1
8.	17CS808	Ethics in Cyber Security	1
9.	17CS809	Open source Testing	1
10.	17CS810	Hadoop	1

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

S. No	Stream	Credits/Semester								Credits	%	AICTE Norms % (Min- Max)
		I	II	III	IV	V	VI	VII	VIII			
1.	Humanities (HS)	4	4							8	4.44	**5-10**
2.	Basic Sciences(BS)	8	8	4	4	4				28	15.56	**15-20**
3.	Engineering Sciences(ES)	7	7	9		5				28	15.56	**15-20**
4.	Professional Core(PC)	3	3	10	17	12	18	10		73	40.56	**30-40**
5.	Professional Electives(PE)					3	3	12		18	10	**10-15**
6.	Open Electives(OE)						3			3	1.66	**5-10**
7.	Project Work(PW)				2		2		12	16	8.89	**10-15**
8.	Industrial Practice (IP)									2	1.11	
9.	Mandatory Course (MC)			1	1	1	1			4	2.22	**-**
	Total	**22**	**22**	**24**	**24**	**25**	**27**	**22**	**12**	**180**	**100**	**176 Credits**

17EN001 **TECHNICAL COMMUNICATION SKILLS I** **3/0/2/4**

Nature of Course : E (Theory Skill Based)

Course Objectives:

1 To equip the students with the LSRW skills.
2 To develop communication skills and soft skills.
3 To facilitate the students to use the Language in practical mode.
4 To prepare the students for all competitive program like BEC/ IELTS/ TOEFL.

Course Outcomes:

Upon completion of the course, students shall have ability to

CO01.1	Remember language skills for business related situations.	[R]
CO01.2	Understand and intensely focus on improving and increasing LSRW skills	[U]
CO01.3	Apply a good command over basic writing and reading skills.	[AP]
CO01.4	Analyze and use vocabulary in corporate work environment.	[U]

Course Contents:

INTRODUCTION Basics of English language- History of English language- Etymology of scientific terms - Importance of LSRW skills – Getting to know people- How to talk about personality types- Self introduction-Introducing others.

LISTENING Importance of listening skills -Listening to short conversations or monologues-Seeking and supplying information -Listening for specific information- Active listening-Telephonic Conversation and Etiquette -Talking and conveying messages (over the phone)-Listening to speeches / talks- Giving directions / instruction.

SPEAKING Importance of Speaking skills-Grammar and Vocabulary- Pronunciation - Business topics- Talk about preferences-Agree and disagree- Giving opinions- Listening and responding-Sense of persuasion- Situational approaches- Reasons and Consequences -Making Predictions-Short presentation -Interactive communication-Discourse markers and management.

READING Importance of reading skills - Reading short texts such as notices, advertisements, memos, emails- Skimming and scanning -Identifying relationship between characters, facts and ideas-Comparing facts and figures-Reading and understanding specific meaning in a text - Cloze reading- Identifying relevant information- Identifying reasons and consequences through reading practices -Vocabulary practice.

WRITING Importance of writing skills - Brevity of communication -Notes- Memo- Email - Formal and informal – Letter writing- Job application Letter - Resume Writing - Itinerary-Paragraph Writing - Essay Writing- Check list- -Requests and Obligation- Letter Phrases – Instructions- Recommendations- Jumbled sentences.

PARTS OF SPEECH Present simple- Simple past- Connectors of addition and contrast- Present Continuous- Gerunds and Infinitives- Vocabulary development through prefixes-suffixes and word roots- Synonyms-Antonyms **-** Auxiliary Verbs - Countable and Uncountable Nouns - Present perfect -Future possibility/ Probability - Question formation-Sequencing words-Prepositions- If- Conditionals.

Lab Component

1	Listening Comprehension	[E]
2	Writing Emails and Letters	[E]
3	Mini Presentation	[E]
4	Telephonic Conversation	[E]
5	Reading Comprehension	[E]
	Total Hours:	**60**

Text Books:

1. Whitby, Norman. Cambridge University Press- Students Book. 2013
2. Rizvi Ashraf M , "Effective Technical Communication", McGraw Hill Education (India) Private Limited , 2016
3. Dr Sumanth S, "English for Engineers", Vijay Nicole Imprints Private Limited 2015.

Reference Books:

1. Wood, Ian,Paul Sanderson, Anne Williams with Marjorie Rosenberg, Pass Cambridge BEC Preliminary, Cengage learning. Second Edition. 2014.
2. Sharma R.C ,Mohan Krishna, Business Correspondence and Report Writing, McGraw Hill Education (India) Private Limited, 2016.
3. Lewis, Norman, Word Power Made Easy, Pocket Books, New York,1979.

Web References:

1. http://www.cambridgeindia.org
2. http://www.cambridgeenglish.org/exams/business-certificates/business
3. https://**steptest**.in

Online Resources:

1. https://www.coursera.org/specializations/business-english
2. http://www.academiccourses.com/Courses/English/Business-English

Assessment Methods & Levels (based on Blooms' Taxonomy)					
Summative assessment based on Continuous and End Semester Examination					
Bloom's Level	**Continuous Assessment**				**End Semester Examination (Theory) [40 marks]**
	Theory			**Practical**	
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	**Rubric based CIA [40 Marks]**	
Remember	20	20	20	20	20
Understand	40	40	40	40	40
Apply	40	40	40	40	40
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

17MA101 **LINEAR ALGEBRA AND DIFFERENTIAL CALCULUS** **3/2/0/4**
(COMMON TO ALL BRANCHES)

Nature of Course J (Problem analytical)
Pre requisites Basics of differentiation
Course Objectives:

1. To develop the skill to use matrix algebra techniques that are needed by engineers for practical applications.
2. To familiarize with functions of several variables applicable in many branches of engineering
3. To find the solution of ordinary differential equations as most of the engineering problems are characterized in this form.
4. To acquire sound knowledge of techniques in solving ordinary differential equations using numerical methods

Course Outcomes:
Upon completion of the course, students shall have ability to

CO101.1	Recall the concepts of matrices, ordinary and partial derivatives	[R]
CO101.2	Express a square matrix in the diagonal form	[U]
CO101.3	Evaluate the extreme values of the given function	[AP]
CO101.4	Apply the knowledge of differential equation to solve the engineering problems	[AP]
CO101.5	Apply numerical method techniques to find the solution of ordinary differential equations	[AP]

Course Contents:

Matrices- Characteristic equation – Eigen values and eigen vectors of a real matrix – Properties and Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a real symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation- **Functions of several variables**- Total derivatives – Differentiation of implicit functions – Jacobians – Taylor series expansion – Maxima and Minima – Method of Lagrangian multipliers-**Ordinary differential equations**- Second and Higher order linear differential equations with constant coefficients –Cauchy's and Legendre's linear differential equations- Method of variation of parameters - **Applications of second order differential equations**- Free and forced oscillations – Undamped and Damped system - Solution of specified differential equations connected with electric circuits and bending of beams (Differential equations and associated conditions need to be given)-**Numerical solution to first order ordinary differential equations**- Single step methods: Taylor series method - Euler's Method -Modified Euler's Method – Runge - Kutta Method of fourth order - Multistep method - Milne's Predictor- Corrector Method-Adam-Bashforth Predictor- Corrector Method.

Total Hours: 60

Text Books:

1. Kreyszig. E, "Advanced Engineering Mathematics" Tenth Edition, John Wiley and Sons (Asia) Limited, Singapore 2014.
2. Grewal. B.S, "Higher Engineering Mathematics", 43rd edition, Khanna Publications, Delhi, 2014.
3. N.P.Bali and Dr.Manish Goyal,"A Text book of Engineering Mathematics" 8th edition, Laxmi publications ltd, 2011.

Reference Books:

1. Veerarajan. T, "Engineering Mathematics for first year", 3rdedition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2011.

2 Glyn James, —Advanced Modern Engineering Mathematics, Pearson Education, 4th edition, 2012.
3 Jain M.K. Iyengar, K & Jain R.K., Numerical Methods for Scientific and Engineering Computation, New Age International (P) Ltd, Publishers 2013.

Web References:

1 http://www.nptel.ac.in/courses/111105035
2 http://www.nptel.ac.in/courses/122104017
3 http://nptel.ac.in/courses/122102009
4 http://nptel.ac.in/courses/111107063

Online Resources:

1 https://www.coursera.org/learn/linearalgebra2
2 https://www.coursera.org/learn/differentiation-calculus
3 https://www.coursera.org/learn/single-variable-calculus
4 https://alison.com/courses/Algebra-Functions-Expressions-and-Equations

Assessment Methods & Levels (based on Blooms'Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
CO101.1	Remember	Classroom or Online Quiz	2
CO101.2	Understand	Class Presentation/Power point presentation	4
CO101.3	Apply	Group Assignment	6
CO101.4 & CO101.5	Apply	Group activities	8

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	**Continuous Assessment**			**End Semester Examination**
	CIA1	**CIA2**	**Term End Assessment**	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	50	50	50	50
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CS201 **PROBLEM SOLVING TECHNIQUES AND C PROGRAMMING** **3/0/3/5**

Nature of Course: F (Theory Programming)

Course Objectives:

1. To understand problem solving concepts .
2. To gain knowledge about the control structures in C
3. To use arrays and pointers in C Programs
4. To write functions in C .

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Apply problems solving techniques to real world problems.	[AP]
CO2	Design programs using fundamental C constructs.	[U]
CO3	Use the concepts of pointers , arrays and structures in programs	[AP]
CO4	Do modular programming with functions	[U]

Course Contents:

Computational Thinking: Introduction to Computational Thinking –From abacus to machine – The first Software –First Modern Computer-Information and data - Converting information into data -Data Capacity **Problem Solving Techniques:** General problem Solving concepts-: Algorithm, Pseudo-code and Flowchart Problem Solving with Sequential Logic Structure - Problem Solving with Decisions - Problem Solving with Loops **Case Study:** Raptor and Scratch Tools. C Character Set – Identifiers and Keywords– Data Types- Constants Variables and Arrays-Declarations-Operators and Expressions Data input and output-Preparing and running a Complete C Program. **Branching:** if-else Looping: while-do while-for nested control structures - switch-break-continue-comma-goto. **Arrays:** Defining an array- Processing an array- Multi dimensional arrays Strings: Defining a string-Null character-initialization of strings – reading and writing a string- processing the string **Pointers:** fundamentals – Pointer Declaration& Usage. **Functions and Structures:** Defining a Function – Accessing a function – Function Prototypes Passing arguments to a function – Recursion Structures: Defining a structure – processing a structure. **SELF STUDY:**Unions

Total Hours: **75**

Lab Component

1. Office Automation – Resume preparation , Spreadsheet processing
2. Draw Flowchart using Raptor Tool
   a. Simple Flow Chart
   b. Decision Making
   c. Looping[Pre test & Post test]
3. Create Animation / Gaming /Application using Scratch Tool
4. Program to process data types, format input and output.
   Program to evaluate an expression
5. Program using decision making statements
6. Program using looping statements
7. Program using single and two dimensional arrays
8. Program for string manipulation
9. Program using call by value and call by reference.
   Program using recursion
10. Program using structures

Text Books:

1. David Riley and Kenny Hunt, "Computational Thinking for the Modern Problem Solver", Chapman & Hall/CRC, 2014.
2. M. Sprankle, "Problem Solving and Programming Concepts", 9th Edition, Pearson Education, New Delhi, 2011.
3. Byron, S. Gottfreid, "Programming with C", Tata McGraw Hill, Schaum's outlines, 3rd Edition, 2014.

Reference Books:

1. Herbert Schildt, "The Complete Reference C", 4th edition ,TMH,2015.
2. S.ThamaraiSelvi and R.Murugesan, "Programming in ANSI C", 6E, TMH, 2012.
3. K.R.Venugopal and SudeepR.Prasad , "Mastering C", TMH ,Second edition , 2015

Web References:

1. http://nptel.ac.in/courses/106105085/
2. http://nptel.ac.in/courses/106106127/
3. http://raptor.martincarlisle.com/
4. https://scratch.mit.edu/

Online Resources:

1. www.leetcode.com
2. www.thenewboston.com
3. www.codesdope.com

Assessment Methods & Levels (based on Blooms' Taxonomy)					
Summative assessment based on Continuous and End Semester Examination					
Bloom's Level	**Continuous Assessment**				**End Semester Examination (Theory) [40 marks]**
	Theory			**Practical**	
	CIA1 [6 marks]	**CIA2 [6 marks]**	**Term End Assessment [8 marks]**	**Rubric based CIA [40 Marks]**	
Remember	30	30	20	-	20
Understand	40	30	30	30	30
Apply	30	40	50	70	50
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

17CS301 **COMPUTER SCIENCE ESSENTIALS I** **3/0/0/3**

Nature of Course : C (Theory Concept)

Course Objectives:

1 To study and understand the basics of computing
2 To get an overall understanding of the different facets of computer science
3 To know about the different domains in Computer Science
4 To gain insight on computer hardware and software

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Know the role of algorithms and history of computing	[R]
CO2	Realize abstraction and organization of data	[U]
CO3	Understand the fundamentals of networking and internet	[U]
CO4	Know about basics of Computer Graphics and Artificial intelligence	[U]

Course Contents:

Computer and Data: Role of Algorithms, History of Computing, Science of Algorithms, Abstractions, Basics of data encoding and storage: Bits and their storage, Main memory, Mass Storage, Representing Information as Bit Patterns. **Machine Architecture:** CPU Basics, Stored Program concepts, Machine Language Introduction with example, Program Execution with illustrative example. **Operating Systems:** History of OS, OS Architecture, Coordinating Machine Activities. **Networking and the Internet:** Network Fundamentals, The Internet, The World Wide Web, **Software Engineering:** Introduction, Software Life Cycle. **Data Abstractions:** Basic data Structures, Related Concepts Database Systems: Database Fundamentals, Relational Model, Data Mining. **Computer Graphics:** Scope of Computer Graphics, Overview of 3D Graphics. Artificial Intelligence: Intelligence and Machines, Perception, Reasoning.

Total Hours: 45

Text Books:

1 J. Glenn Brookshear- "Computer Science: An Overview"- Addison-Wesley- Eleventh Edition- 2012.

Reference Books:

1 Nell B. Dale, John Lewis, "Computer Science illuminated ",Jones and Bartlett Learning , 2013
2 Anita Goel , "Computer Fundamentals",Pearson Education , 2010
3 RobertSedgewick,Kevin Wayne ,"An introduction to Computer Science", Princeton University, 2012

Web References:

1 http://web.stanford.edu/class/cs101/
2 http://www.bbc.co.uk/learning/subjects/information_technology.shtml
3 http://www.cambridgegcsecomputing.org

Online Resources:

1 http://web.stanford.edu/class/cs101/
2 http://www.bbc.co.uk/learning/subjects/information_technology.shtml

3 http://www.cambridgegcsecomputing.org
4 http://study.com/academy/lesson/what-is-a-computer-algorithm-design-examples-

Assessment Methods & Levels (based on Blooms'Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
CO1	Remember	Online Quiz	**5**
CO2	Understand	Assignment	**5**
CO3	Understand	Class Presentation	**5**
CO4	Understand	Technical Writing	**5**

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 marks]**
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	
Remember	20	20	30	30
Understand	80	80	70	70
Apply	-	-	-	-
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CH103 **ENGINEERING CHEMISTRY** **3/0 /2 /4**

Nature of Course : E (Theory skill based)

Course Objectives:

1. To make the students conversant with boiler feed water requirements, water treatment techniques, the principles and applications of electrochemistry.
2. To understand the working principles of electrodes and the significances of various component analyzer.
3. To learn the effect of corrosion in materials and the methods for prevention of corrosion.
4. To acquire knowledge in applications of plastics and rubber in engineering field.
5. To understand the concepts of photophysical and photochemical processes in spectroscopy
6. To gain knowledge about non conventional the energy sources, fuel cells and storage Devices.

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Recall the requirements of boiler feed water, water treatment procedures for industries.	[R]
CO2	Understand the working principle of Ion Selective Electrodes, pH electrodes and conductivity meters as an analyzer.	[U]
CO3	Apply the various corrosion control techniques in real time industrial environments.	[A]
CO4	Use the knowledge of polymers, various energy sources and storage devices in engineering field.	[U]
CO5	Understand the principle and working of certain analytical techniques	[U]
CO6	Solve theoretical problems based on the concepts acquired from the module in various engineering field.	[A]

Course Contents:

Water Treatment-Boiler feed water–Requirements-disadvantages of hard water - demineralization process– desalination-reverse osmosis. Applied electrochemistry: Electrochemical cells – electrolytic cell-reversible and irreversible cells -electrode potential - single, standard - oxidation and reduction potentials - emf of a cell - emf series–significances-pH measurement, glass electrodes, hydrogen electrodes, reference electrodes. Corrosion and its control: Mechanism - types–galvanic corrosion–differential aeration–pitting corrosion – factors-Corrosion control–cathodic protection–corrosion inhibitors-protective coatings– electroplating -electroless plating. Engineering polymers: Polymerisation -free radical mechanism-Plastics-types-preparation, properties and uses of PTFE- Polyurethane - Poly Carbonate -Nylon 6,6 and Nylon 6 - Rubber-Vulcanization of rubber-synthetic rubber -Butyl rubber and SBR Spectrophotometry: Beer-Lambert law – UV Visible – IR Spectrophotometers – Flame emission photometers - Atomic absorption spectrophotometers. Energy Sources: Nuclear energy-reactor-breeder reactor- Photovoltaic cells-Wind energy -Fuel cells. Storage Devices: Batteries-alkaline -Lead acid, nickel cadmium and lithium-TiS_2 batteries.

Lab Component

1	Water hardness	[E]
2	Alkalinity	[E]
3	Chloride content	[E]
4	Dissolved oxygen in water	[E]
5	pH meter	[E]
6	Conductivity meter	[E]
7	Potentiometer	[E]
8	Spectrophotometer	[E]
9	Electroplating of Nickel	[E]
10	Corrosion rate of a metal	[E]
	Total Hours:	**75**

Text Books:

1. Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2013.
2. N.Krishna murthy,Vallinayagam D.,"Engineering Chemistry" PHI Learning Pvt Ltd.,2014
3. R.V.Gadag, A.Nithyananda Shetty "Engineering Chemistry" 3rd edition PHI Learning Pvt Ltd.,2014

Reference Books:

1. Shikha Agarwal., "Engineering Chemistry and Applications", Cambridge University press, 2016.
2. Liliya.,Bazylak.I.,Gennady.E.,Zaikov.,Haghvi.A.K.,"PolymersandPolymeric Composites" CRC Press,2014.
3. Lefrou.,Christine.,Fabry.,Pierre.,Poignet.,Jean-claude.,"Electrochemistry - The Basics, with examples" 2012 ., Springer.
4. Zaki Ahmad, Digby Macdonald, "Principles of Corrosion Engineering and Corrosion Control", Elsevier Science, 2nd Edition 2012.
5. Perez, Nestor,"Electrochemistry and Corrosion Science", Springer, 2016.
6. Ghazi A.Karim. "Fuels, Energy and the Environment", CRC Press, Taylor and Francis group, 2012.

Web References:

1. http://www.analyticalinstruments.in/home/index.html
2. www.springer.com › Home › Chemistry › Electrochemistry
3. https://www.kth.se/...electrochem/welcome-to-the-division-of-applied-electrochemistry
4. www.edx.org/
5. https://www.ntnu.edu/studies/courses
6. www.corrosionsource.com/

Online Resources:

1. nptel.ac.in/courses/105104102/hardness.htm
2. https://ocw.mit.edu/courses/chemistry
3. nptel.ac.in/courses/105106112/1_introduction/5_corrosion.pdf
4. https://alison.com - Spectroscopic technique, Colorimetry
5. https://ocw.mit.edu/courses/chemistry
6. nptel.ac.in/courses/113108051

Assessment Methods & Levels (based on Blooms' Taxonomy)					
Summative assessment based on Continuous and End Semester Examination					
Bloom's Level	**Continuous Assessment**				**End Semester Examination (Theory) [40 marks]**
	Theory			**Practical**	
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	**Rubric based CIA [40 Marks]**	
Remember	30	30	30	10	20
Understand	60	50	40	20	50
Apply	10	20	30	40	30
Analyse	-	-	-	30	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

17ME204 **ENGINEERING PRACTICES LABORATORY** **0/0/3/2**

Nature of Course :M (Practical application)
Co requisites : Engineering Drawing/Graphics

Course Objectives:

1. To learn the use of basic hand tools and to know the need for safety in work place and to gain hands on experience on Carpentry, Fitting, Sheet metal, Plumbing, welding and Foundry.
2. To learn about basic electrical devices, meters and Electronics devices and meters and to gain knowledge about the fundamentals of various electrical and electronic gadgets, basic electronic instruments, their working and trouble shooting.
3. To gain knowledge about the basics of computer hardware and various operating systems

Course Outcomes:

Upon completion of the course, students shall have ability to

C204.1	Identify, formulate and solve the basic engineering problems at home and in workplace	[Ap]
C204.2	Develop the surfaces and make simple components like tray, cylinder, funnel etc.	[C]
C204.3	Make simple metal joints using welding equipment and wooden joints using carpentry tools.	[Ap]
C204.4	Prepare pipe connections and sand moulds	[Ap]
C204.5	Examine and troubleshoot electrical and electronics circuits	[A]
C204.6	Identify various computer parts and learn to operate the various operating systems in computers.	[E]

Course Contents:

1. Fabrication of rectangular tray, cylindrical container and cone
2. Preparation of butt, lap and T joint using welding (Arc, MIG,TIG)
3. Preparation of Cross lap joint and T joint using carpentry tools
4. Preparation of connection of basic pipe lines
5. Preparation of Sand mould (Solid and Split Pattern)
6. Troubleshooting of electrical and electronics components
7. Preparation of Residential wiring.
8. Soldering of electronic circuits
9. Operation of Cathode Ray Oscilloscope
10. PC Repair Fundamentals
11. Hard disk Partitioning, Installing Windows OS, Linux & Maintaining Windows OS, Linux and Disk De fragmentation.
12. Upgrading Memory and Hard Drives, Securing the PC and LAN.

Total Hours: 45

REFERENCE BOOKS:

1. Suyambazhahan "Engineering Practices Laboratory Manual" PHI Learning, Second Edition, 2011.
2. Sekhar Dash & K.Vijayakumar, "Electrical Engineering Practice Lab Manual". Vijay Nicole Imprints Private Ltd., First Edition, 2013.
3. Scott Mueller "Upgrading and Repairing PCs", 22nd Edition, QUE, Pearson Education, New Delhi, 2015.

Web References:

1. http://www.allaboutcircuits.com/education/
2. http://www.nptel.ac.in/courses/112107090/
3. nptel.ac.in/courses/112101005/14

Online Resources:

1 http://www.electrical4u.com/
2 http://vlab.co.in/

Assessment Methods & Levels (based on Bloom'sTaxonomy)		
Summative assessment based on Continuous and End Semester Examination		
Bloom's Level	**Rubric based Continuous Assessment [60 marks] (in %)**	**End Semester Examination [40 marks] (in %)**
Remember	0	0
Understand	0	0
Apply	30	30
Analyse	30	20
Evaluate	20	10
Create	20	30

17EN002 **TECHNICAL COMMUNICATION SKILLS II** **3/0/2/4**

Nature of Course: E (Theory Skill Based)

Course Objectives

1. To develop the prominence of listening and reading practices using authentic business vocabulary.
2. To instil analytical thinking and logical reasoning to enhance LSRW skills in Business related situations.
3. To urge the need of effective communication in corporate sector with Business English.
4. To prepare students for competitive program like BEC, IELTS, TOEFL.

Course Outcomes

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

CO1	Remember LSRW skills and employ cross-cultural communication in business related situations.	[R]
CO2	Understand and gain proficiency with business vocabulary.	[U]
CO3	Apply Task- Based activity to enhance an effective communication.	[AP]
CO4	Analyse and apply Business English in working environment.	[AP]

Course Contents with Course Outcomes/Blooms Taxonomy/Assessment Methods

LISTENING -Taking and Leaving Voice mail messages –Identifying the information before listening-Inferring ideas- Listening to short monologues -Longer listening tasks -Recognise functions. **SPEAKING -**Expressing hypothetical Situations – Expressing obligation -Aspects of business – Giving examples- Giving reasons- Giving extra information- Presentation at a business meeting- Connecting ideas- Collaborative task – Short talk on a business topics- Film Reviews. **READING** - Science texts - Terms related about science and scientists - Scanning for specific information- Understanding cohesive features - Skimming the reading comprehensions - Interpret opinions and ideas expressed – Collocations - Identifying dependent preposition - Identifying the extra words. **WRITING -** Definitions, Extended Definitions -Letter writing (accepting and declining invitations)- Internal communication (notes/memo/E-mail writing to the head of the department, colleague, assistant , staff in the department etc) Report writing- Business proposal- circular- agenda and minutes- Appropriate linking words- Report Phrases - Asking for Information and Making Suggestions- Transcoding (Bar Chart, Flow Chart)- Letter for calling quotations, Replying for quotations- Placing an order and complaint letter. **PARTS OF SPEECH-** Tenses - Adjectives - Adverbs - Articles- Modal verbs, Active and Passive, Impersonal Passive voice, Homophones- Homonyms- Acronyms- Abbreviations- British and American words- Comparatives and Superlatives- Gerunds- infinitives – Participles - Modal Verbs - Relative Pronouns- Reported Speech - Indirect Questions- Spotting errors.

LABORATORY COMPONENTS				
EXP NO.	**NAME OF THE EXPERIMENT**	**TEXT BOOK**	**PAGES**	**LAB HOURS**
1	MINI PRESENTATION	T2	117-130	3
2	LOGICAL REASONING AND ETHICS IN A GIVEN SITUATION	T2	91-100	3
3	TECHNICAL PRESENTATION	T2	195-213	3
4	GROUP DISCUSSION	T2	165-187	3
5	EXTEMPORE	T2	117-130	3
			Total Hours	45+15

Text Books

1. Whitby, Norman. Cambridge University Press- Students Book. 2013.

2. Rizvi Ashraf M , "Effective Technical Communication", McGraw Hill Education (India) Private Limited , 2016
3. Dr. Sumanth S, English for Engineers, Vijay Nicole Imprints Private Limited, 2015.

Reference Books:

1. Wood, Ian, Paul Sanderson, Anne Williams with Marjorie Rosenberg, Pass Cambridge BEC Vantage, Cengage learning. Second Edition. 2014.
2. Gunasekaran S,"'A Text and Workbook of Technical English II", United Global Publishers, June 2010.
3. Lewis, Norman, Word Power Made Easy, Pocket Books, New York, 1979.

Web References:

1. http://www.cambridgeindia.org
2. http://www.cambridgeenglish.org/exams/business-certificates/business-vantage
3. https://**steptest**.in

Online Resources:

1.https://www.coursera.org/specializations/business-english
2. http://www.academiccourses.com/Courses/English/Business-English

Assessment Methods & Levels (based on Blooms'Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
CO1	Remember	Extempore	**5**
CO2	Understand	Mini presentation	**5**
CO3	Apply	Technical presentation	**5**
CO4	Apply	Group Discussion	**5**

Blooms Taxonomy based Assessment Pattern:

Bloom's Category	**Continuous Assessment Tests**			**End Semester Examination**
	CIA1	**CIA2**	**Term Examination**	
Remember	30	20	20	20
Understand	30	30	30	30
Apply	40	50	50	50
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

17MA104 **INTEGRAL CALCULUS AND LAPLACE TRANSFORMS (COMMON TO ALL BRANCHES)** **3/2/0/4**

Nature of Course J (Problem analytical)

Course Objectives:

1. To gain knowledge in improper integrals, Gamma and Beta functions which are needed in engineering applications
2. To develop logical thinking and analytical skills in evaluating multiple integrals
3. To acquaint with the concepts of vector calculus needed for problems in all engineering disciplines
4. To apply numerical methods to evaluate integrals when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information
5. Solve the differential equations using Laplace transform technique

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Recall basic integration formulae, scalar and vector point function concepts	[R]
CO2	Differentiate and integrate vector point functions	[U]
CO3	Evaluate integrals using Beta and Gamma functions	[AP]
CO4	Evaluate double integral and triple integral to compute area, volume for two dimensional and three dimensional solid structure	[AP]
CO5	Find the gradient, divergence and curl of vector point functions and related theorems useful for evaluation of engineering problems	[AP]
CO6	Apply the Laplace transform technique to solve ordinary differential equations	[AP]

Course Contents:

Definite integrals-Evaluation of definite integrals using Bernoulli's formula-Beta and Gamma Integrals- Relation between Beta and Gamma Functions-Evaluation of Integrals using Beta and Gamma Functions-**Multiple integrals** - Double integration in Cartesian coordinates –Area as double integral –Change the order of integration-Triple integration in Cartesian co-ordinates – Volume as triple integral-**Vector calculus** - Vector differential operator- Gradient of a scalar point function - Directional derivatives –Divergence and Curl of a vector point function – Irrotational and solenoidal vector fields –Simple problems– Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem(statements)– Simple applications involving cubes and rectangular parallelopipeds-**Numerical integration -** Trapezoidal rule – Simpson's 1/3 and 3/8 rules – Two and three point Gaussian Quadrature formulae –Trapezoidal rule and Simpson's rule to evaluate double integrals-**Laplace transform** –Conditions for existence – Transform of elementary functions – Basic properties (without proof) – Derivatives and integrals of Laplace transform -Transforms of derivatives and integrals - Periodic functions - **Inverse Laplace transform**-Partial fraction method - convolution theorem , Initial and Final value theorems (statements)– Problems - Solution of second order differential equations with constant coefficients.

Total Hours: 75

Text Books:

1. Kreyszig. E, "Advanced Engineering Mathematics" 10th Edition, John Wiley and Sons (Asia) Limited, Singapore 2014

2 Grewal. B.S, "Higher Engineering Mathematics", 43rd edition, Khanna Publications, Delhi, 2014
3 N.P.Bali and Dr.Manish Goyal,"A Text book of Engineering Mathematics", 8th edition Laxmi publications ltd, 2011

Reference Books:

1 Veerarajan. T, "Engineering Mathematics for first year", 3rdedition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2011
2 Glyn James, ,"Advanced Modern Engineering Mathematics", Pearson Education, 4th edition, 2012
3 Jain M.K. Iyengar, K & Jain R.K., "Numerical Methods for Scientific and Engineering Computation", New Age International (P) Ltd, Publishers 2013

Web References:

1 http://nptel.ac.in/video.php?subjectId=122107037
2 http://nptel.ac.in/courses/122107036/
3 http://nptel.ac.in/video.php?subjectId=117102060

Online Resources:

1 https://www.coursera.org/learn/pre-calculus
2 https://www.coursera.org/learn/linearalgebra1
3 https://alison.com/courses/Advanced-Mathematics-1
4 https://www.edx.org/course/algebra-lineal-mexicox-acf-0903-1x.
5 https://www.edx.org/course?search_query=laplace+transform

Assessment Methods & Levels (based on Blooms'Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
CO1	Remember	Classroom or Online Quiz	2
CO2	Understand	Class Presentation/Power point presentation	4
CO3, CO4	Apply	Group Assignment	7
C05,CO6	Apply	Group activities	7

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	**Continuous Assessment**			**End Semester Examination**
	CIA1	**CIA2**	**Term End Assessment**	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	50	50	50	50
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17PH102 **ENGINEERING PHYSICS** **3/0/2/4**

Nature of Course : E (Theory skill based)

Course Objectives:

1 To learn the basic concepts of physics needed for all branches of engineering
2 To understand the concepts and working principles of laser, fibre optics, quantum physics and crystal physics.
3 To identify suitable materials to be used in the engineering field.
4 To implement and visualize theoretical aspects in the laboratory
5 To familiarize the students to handle various instruments and equipment

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Recall the basic concepts of laser, fibre optics and quantum physics used in various engineering applications	[R]
CO2	Understand the crystal structure of the various materials	[U]
CO3	Understand the fundamental concepts of electrical and magnetic properties of materials.	[U]
CO4	Interpret the behaviour of nanomaterials and shape memory alloys	[U]
CO5	Apply the gained knowledge to solve the problems related to their field of study	[AP]

Course Contents:

Laser: Principle of absorption and emission - Types of laser: CO_2, Nd-YAG, semiconductor laser - Industrial applications - Holography. Fiber optics: Principle and propagation–numerical aperture and acceptance angle – classification of optical fibers - splicing - fiber optic communication system - light source - PIN detector. Fiber optic sensors: temperature and displacement. Quantum mechanics: Matter waves, de-Broglie wavelength, uncertainty principle – Schrödinger's wave equation – time independent and time dependent - physical significance - particle in a one dimensional potential box. Conducting materials: Classical free electron theory of metals - Electrical and thermal conductivity- Wiedemann-Franz law - Band theory of solids- Fermi distribution function –Effect of temperature on Fermi function. Semiconducting materials: Intrinsic and extrinsic semiconductors – carrier concentration derivation – Fermi level – variation of Fermi level with temperature in intrinsic – electrical conductivity for intrinsic semiconductor – Band gap determination – Hall effect. Magnetic materials: Origin of magnetic moment –ferro magnetic material – domain theory – hysteresis – soft and hard magnetic materials – Ferrites. Dielectric materials: properties- Electronic and ionic polarisation – frequency and temperature dependence – internal field-Claussius-Mosotti relation-dielectric loss –dielectric breakdown mechanisms - ferro electric materials – piezo electric materials - insulating materials - applications. Crystallography: Atomic packing factor for SC, BCC, FCC and HCP structures – miller indices. Advanced materials: Shape memory alloys-characteristics -

properties of Ni-Ti alloy. Characterisation techniques: SEM, TEM and X-ray diffraction. Nanomaterials: Properties – synthesis techniques: ball milling, chemical vapour deposition and sol-gel method. Carbon nanotubes: structure - properties and applications.

Lab Component

1	Laser and optical fiber parameters	[E]
2	Lattice constant using x-ray diffraction pattern	[E]
3	Specific resistance-Carey Foster's Bridge	[E]
4	Band gap of a semiconductor	[E]
5	Characteristics of a solar cell /Photo diode	[E]
6	Thermal conductivity of a bad conductor	[E]
7	Young's modulus	[E]
8	Rigidity modulus	[E]
9	Thickness of a thin material using air wedge	[E]
10	Coefficient of viscosity for a liquid	[E]
	Total Hours:	**75**

Text Books:

1. R. K. Gaur and S.C. Gupta, "Engineering Physics",Dhanpat Rai Publications (P) Ltd, New Delhi, 2014.
2. Rajendran, V 'Engineering Physics' Mc Graw Hill Publications ltd, New Delhi, 2014.

Reference Books:

1. Serway and Jewett, "Physics for Scientists and Engineers with Modern Physics", 6th Edition, Thomson Brooks/Cole, Indian reprint (9 th Edition) 2013.
2. M.N. Avadhanulu, P.G. Kshirshagar – "A Text Book of Engineering Physics"- S.Chand & Co Ltd, 2016.
3. P.K. Mittal ," Applied Physics ", I.K. International Publishing House pvt.Ltd.

Web References:

1. http://www.nanotech-now.com/Nanomat-Preso2.pdf
2. http://nptel.ac.in/courses/108106073
3. https://www.corning.com/in/en/products/communication-networks/…/fiber.html
4. https://physics.stanford.edu/node/201
5. https://www.amazon.com/Semiconductor-Materials-Physical...References/…/0849389...
6. https://books.google.co.in/books?isbn=1482238888
7. https://www.generalplastics.com/polyurethane-foam-**dielectric**-**materials**-f...
8. https://www.asme.org/…/**nano**technology/**carbon**-**nanotube**-super-fabric
9. https://**web**.iit.edu/…/**web**/…/Academic%20**Resource**%20Center/…/**Miller**...
10. https://www.boundless.com/physics/…/the-**hall**-**effect**-559-10926/

Online Resources:

1. https://www.coursera.org/learn/ap-physics-1
2. www.cleanroom.byu.edu › Semiconductor Properties
3. https://www.urmc.rochester.edu › ... › Our Resource Laboratories
4. https://www.jic.ac.uk/**microscopy**/links.html
5. https://www.merlot.org/merlot/**materials**.htm
6. www.**fiberopticsonline**.com/
7. https://ocw.mit.edu/courses/physics/8-04-**quantum-physics**-i-spring-2013/

17CS203 **LINUX AND ADVANCED C PROGRAMMING** **3/0/3/5**

Nature of Course : F (Theory Programming)
Pre requisites : 17CS201 Problem Solving Techniques & C Programming
Course Objectives:

1. To understand the essential Linux command line operations and to manage user services with file access
2. To learn the fundamentals of shell scripting/programming
3. To apply pointers to arrays, strings and pass pointers to functions in C.
4. To gain knowledge about structures and pointer to structures.
5. To develop the ability to apply file I/O operations.
6. To acquire knowledge in pre-processor commands and bitwise operations in C.

Course Outcomes:
Upon completion of the course, students shall have ability to

CO1	Recall the programming structures	[R]
CO2	Understand and work in Linux command line interface	[U]
CO3	Write shell programs	[AP]
CO4	Apply pointer for effective memory access in C	[AP]
CO5	Employ structure and pointers to structures	[AP]
CO6	Illustrate file access.	[AP]
CO7	Demonstrate and apply the pre-processor commands and bitwise operations in C	[AP]

Course Contents:
Introduction to Linux- Linux kernel and architecture-Accessing shell based commands File System permission-Configuring and securing open ssh services- Installation of software in Linux-Shell -Types of shell-Shell scripting Pointers - pointers to array - Pointer and functions-Pointer to strings – Array of pointers –pointers to pointers-Dynamic memory allocation Structure - Type Definition -Structures and functions - return-Pointer to structures - Self -referential Structure-Bit Fields – union Files –Text versus Binary Streams – State of a File- File I/O operations – Error Handling During I/O Operations –Binary files- Random Access to Files -Bitwise Operators-Pre-processor Commands- Command Line Arguments

List of Experiments

1. Linux Bash commands- system, file, help, search- process, network and Miscellaneous commands
2. Shell Scripting
3. Pointers- Pointer to array – pointer arithmetic
4. Pointer and function
5. Pointer and string
6. Dynamic Memory Allocation- array of pointers
7. Structures-array of structures
8. Structure and functions
9. Pointers to structure - self-referential structures
10. Text and Binary File operations
11. MACROS

12 Bitwise operations

Total Hours: 75

Text Books:

1 Mark B Sobel, "Practical Guide to Linux Commands Editor and Shell Programming", Pearson education,2013
2 Kenneth A. Reek,"Pointers on C,First Edition" ,Pearson education,2007.
3 YashavantKanetkar, "Understanding Pointer in C", 3E, BPB Publication, 2011.

Reference Books:

1 YashwantKanetkar, "Let us C", 12th Edition, BPB Publications, 2014
2 B Stephen G. Kochan "Programming in C",Fourthedition,Addison Wesley publishing,2014.
3 Behrouz A. Forouzan& Richard F. Gilberg, "A Structured Programming Approach Using C", 3E, Cengage Learning, 2008
4 E Balagurusamy, "Programming in ANSI C", 6E, TMH, 2012.,"Computer System Architecture", 3rdEdition, Pearson Education, 2007

Web References:

1 http://vic.gedris.org/Manual-ShellIntro/1.2/ShellIntro.pdf
2 https://knowstuffs.wordpress.com/2012/06/11/linux-kernel-and-architecture/
3 http://redhat.lsu.edu/manuls.php
4 https://www.tutorialspoint.com/cprogramming/cprogramming_tutorial.pdf
5 http://students.iitk.ac.in/programmingclub/course/#notes

Online Resources:

1 htps://alison.com/courses/Diploma-in- Programming-in- C
2 https://www.edx.org/course/programming-basics- iitbombayx-cs101- 1x-0?gclid=CIXj9JKQh9ACFdeGaAodIX4MMw
3 https://www.coursera.org/learn/intro-programming
4 https://onlinecourses.nptel.ac.in/iitk_cs_101/previewhttps://www.edx.org/course/signals-systems-part-2-iitbombayx-ee210-2x-2

Assessment Methods & Levels (based on Blooms' Taxonomy)					
Summative assessment based on Continuous and End Semester Examination					
Bloom's Level	**Continuous Assessment**				**End Semester Examination (Theory) [40 marks]**
	Theory			**Practical**	
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	**Rubric based CIA [40 Marks]**	
Remember	20	20	20	20	10
Understand	30	30	30	20	30
Apply	50	50	50	60	60
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

17CS302 **COMPUTER SCIENCE ESSENTIALS-II** **3/0/0/3**

Nature of Course : E (Theory Skill Based)

Course Objectives:

1 To understand the basic concepts of structure of computer hardware & networking. To identify the existing configuration of the computers and peripherals.
2 To allow students to configure internetworking components.
3 To understand the storage area network management principles and protocols.
4 To enable the knowledge of Data protection in Storage area environment.
5

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Describe the relationship between hardware and Software.	[R]
CO2	Classify and explain the functions of different computer hardware components.	[U]
CO3	Understand the various methods to implement Storage Area Network.	[U]
CO4	Apply configuration procedure to implement Local Area Network and internetworking components.	[AP]
CO5	Analyze the various storage management principles and protocols.	[AN]

Course Contents:

PC components - Processor Specifications- Processor features - Processor manufacturing - BIOS Basics - UEFI Technology- RAM types and Performance- Memory modules- Memory Banks- Solid State Drive (SSD), Comparison of SSD and HDD.(Technical quiz) Motherboard Connectors System Bus types, Functions and Features- Resolving resource conflicts - input/output devices- **Network architecture overview**- Hardware elements of network- Putting network together- Internet connectivity: Trends- Broadband Internet access types- Internetworking components – IP addressing – subnet mask- server configuration-Router configuration –**Introduction to storage system management**-Storage system environment– Direct attached storage: Types of DAS-Benefits and limitations-Disk drive interfaces-Storage area Network: Evolution-Components-types-Network attached storage :General purpose servers Vs NAS Device-NAS File I/O-components of NAS - Data protection: software RAID –Hardware RAID- components-RAID levels.

Total Hours: 45

Text Books:

1 Scott Mueller "Upgrading and Repairing PCs", 22 nd Edition, QUE, Pearson Education, New Delhi, 2015.
2 G Somasundaram, Alok Shrivastava,"Information Storage and Management", EMC Education services,Wiley India, 2009 .
3 Mike Meyers, Scott Jernigan, "A+ Guide to Managing and Troubleshooting PCs", Tata McGraw Hill, 2010.

Reference Books:

1 Gary B.Shelly, Misty E.Vermaat, "Discovering Computers", Cengage Learning, 2012
2 Ron Gilster, "PC Hardware – a beginner's guide" – Tata McGraw Hill, 2002

3 Govindaraju B. "IBM PC and Clones: Hardware, Trouble Shooting and Maintenance", 2nd Edition, Tata McGraw Hill Pub. Co., New Delhi, 2002

Web References:

1 http://www.brainbell.com/tutors/A+/Hardware/Preventive_Maintenance.htm
2 http://www.technologystudent.com/elec1/dig1.htm

Online Resources:

1 http://www.worldwidelearn.com/online-training/pc-hardware-courses.htm
2 https://www.edx.org/course/clep-information-systems-computer-upvalenciax-sc101-2x

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
CO1	Remember	Quiz	**2**
CO2	Understand	Quiz	**3**
CO3	Understand	Group Assignment	**5**
CO4	Apply	Problem solving	**5**
CO5	Analyse	Technical Presentation	**5**

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 marks]**
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	
Remember	40	30	30	30
Understand	60	50	40	40
Apply	-	20	20	20
Analyse	-	-	10	10
Evaluate	-	-	-	-
Create	-	-	-	-

17ME205 **ENGINEERING GRAPHICS LABORATORY** **0/0/3/2**

Nature of Course :M (Practical application)
Co requisites :Basic drawing and Computer Knowledge

Course Objectives:

1. To know the method of constructing the conic curves used in Engineering Applications.
2. To develop an understanding of Isometric to Orthographic Views and vice versa.
3. To learn the basic projection of straight lines and plane surfaces.
4. To develop the imagination of solids inclined to one reference planes.
5. To know the sectioning of solids and development of surfaces used in various fields.

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Recall the basic concepts of engineering drawing.	[R]
CO2	Recall the basic syntax and commands of CAD software.	[R]
CO3	Interpret the parameters of engineering drawing.	[U]
CO4	Sketch the 2D geometries in the drafting software.	[AP]
CO5	Examine the isometric projection and convert it into orthographic projection (Vice versa).	[A]

Course Contents:

1.	Construction of Conic Curves (Ellipse, Parabola and Hyperbola)	R
2.	Construction of Special Curves (Cycloid and Involutes)	R
3.	Isometric to Orthographic projections – Manual sketches	U
4.	Isometric to Orthographic projections – Software sketches	U
5.	Projection of lines - Inclined to HP	Ap
6.	Projection of lines - Inclined to VP	Ap
7.	Projection of Plane surfaces (Hexagon, Pentagon and circle) – Inclined to both HP and VP	Ap
8.	Projection of Solids (Prism and Pyramid) – Inclined to HP	Ap
9.	Projection of Solids (Cone and Cylinder) – Inclined to VP	Ap
10.	Sectioning of Solids (Prism and Pyramid) with Section plane Inclined to HP	Ap
11.	Sectioning of Solids (Cone and Cylinder) with Section plane Inclined to VP	A
12.	Development of Surfaces (Prism,Pyramid,Cone and Cylinder)	A
13.	Introduction to Perspective projection	A

Total Hours: 45

Reference Books:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2014.
2. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2011.
3. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2013.

Web References:

1. http://nptel.ac.in/courses/112102101/

2. www.solidworks.com

Assessment Methods & Levels (based on Bloom'sTaxonomy)		
Summative assessment based on Continuous and End Semester Examination		
Bloom's Level	**Rubric based Continuous Assessment [60 marks] (in %)**	**End Semester Examination [40 marks] (in %)**
Remember	30	30
Understand	30	30
Apply	20	20
Analyse	20	20
Evaluate	0	0
Create	0	0

17MA107 **DISCRETE STRUCTURES** **3/2/0/4**
(CSE & IT)

Nature of Course J(Problem analytical)
Course Objectives:

1 To study the concepts needed to test the logic of a program

2 To understand and identify different types of patterns on many levels in engineering fields

3 To learn the working of class of functions which transform a finite set into another finite set which relates to input and output functions in computer science

4 To know the fundamental concepts of Group theory

Course Outcomes :
Upon completion of the course, students shall have ability to

CO1	To recall the basic concepts of sets, groups and truth table	[R]
CO2	To find the validity of arguments	[U]
CO3	Use the concepts of Discrete Mathematics in software development and hardware design	[AP]
CO4	Demonstrate and understand the fundamental concepts of a mathematical function and all of its properties.	[AP]
CO5	Apply operator-algebraic techniques to reformulate and solve group theoretic problems.	[AP]

Propositional calculus- Propositions – Logical connectives – Compound propositions – Conditional and bi-conditional propositions – Truth tables – Tautologies and contradictions –Contrapositive – Logical equivalences and implications – Normal forms – Principal conjunctive and disjunctive normal forms– Rules of inference – Arguments - Validity of arguments -**Predicate calculus**- Predicates – Statement function – Variables – Free and bound variables – Quantifiers– Universe of discourse – Logical equivalences and implications for quantified statements – Theory of inference – The rules of universal specification and generalization – Validity of arguments -**Set theory**- Basic concepts – Subset – Algebra of sets – The power set – Ordered pairs and Cartesian product – Relations on sets–Types of relations and their properties– Relational matrix and the graph of a relation – Equivalence relations – Partial ordering – Poset – Hasse diagram- **Functions**- Definitions of functions – Classification of functions –Types of functions - Examples –Composition of functions–Inverse function–Binary and n-ary operations– Characteristic function of a set – Hashing functions – Recursive functions –Permutation functions- **Group theory**-Binary operation-Semi group-Monoid-Group-Subgroup-Abelian group-Group homomorphism and isomorphism-Normal subgroup-Quotient group-Lagrangian theorem-Hamming distance-Group coding and decoding

Total Hours 60

Text Books:

1. 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
2. Kenneth H.Rosen,"Discrete Mathematics and its Applications", Seventh Edition, Tata McGraw – Hill Pub. Co. Ltd., New Delhi, 2011
3. Veerarajan T, " Discrete Mathematics with Graph theory and Combinatorics", Tata McGraw – Hill Pub. Co. Ltd., New Delhi, 2010

Reference Books:

1. Ralph. P. Grimaldi,"Discrete and Combinatorial Mathematics: An Applied Introduction", Fifth Edition, Pearson Education Asia, New Delhi, 2007

2. Bernard Kolman, Robert C. Busby, Sharan Cutler Ross, "Discrete Mathematical Structures", sixth edition , Pearson Education Pvt Ltd., New Delhi, 2010

3. Thomas Koshy, "Discrete Mathematics with Applications", Elsevier Publications, 2008.

Web References:

1 http://www.nptel.ac.in/courses/111105035
2 http://www.nptel.ac.in/courses/122104017
3 http://nptel.ac.in/courses/122102009
4 http://freevideolectures.com/Course/2267/Mathematics-I/22

Online Resources:

1 www.edx.org/Probability
2 https://ocw.mit.edu/courses/…/18-440-probability-and-random-variables-spring-2014/
3 https://onlinecourses.nptel.ac.in/noc15_ec07/

Assessment Methods & Levels (based on Blooms' Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1	Remember	Class room or online Quiz	2
CO2& CO3	Understand Apply	Class presentation/Powerpoint Presentation	6
CO4	Apply	Group Activities	6
CO5	Apply	Group Assignment	6

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination
	CIA1	CIA2	Term End Assessment	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	50	50	50	50
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CS303 **OPERATING SYSTEMS** **3/0/0/3**

Nature of Course : G (Theory analytical)

Course Objectives:

1. To understand the structure and functions of OS
2. To learn about Processes, Threads and Scheduling algorithms
3. To understand the principles of concurrency and Deadlocks
4. To learn various memory management schemes
5. To study I/O management and File systems

Course Outcomes

Upon successful completion of this course, the student will be able to

CO1	Identify and reproduce the basic concepts of Modern operating systems	[R]
CO2	Understand the various operating system mechanisms and operations.	[U]
CO3	Understand Process management concepts including scheduling, synchronization deadlocksand multithreading in real world problems	[U]
CO4	Apply concepts of memory management including virtualMemory and Page Replacement to the issues that occur in Real time applications	[AP]
CO5	Solve issues relatedto file system interface, implementation, disk management, protection and security mechanisms	[AP]

Course Contents

Introduction of basics of Modern Operating Systems: Multitasking, Multiuser, parallel, distributed & Real–time O.S, POST, GUI, Types of servers **Concurrency:** Managing multiple tasks and sharing resources: Processes and threads, context switching, synchronization, Scheduling and Deadlock. Memory Management; linking, dynamic memory allocation, dynamic address translation, virtual memory, Quantum base memory and demand paging. **File systems**: disk management and scheduling, directories, protection, and crash recovery Virtual machines and security in OS. Server OS, Network OS and Mobile OS.

Total Hours **45**

Text Books:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts" 9th Edition, John Wiley, 2013
2. D.M.Dhamdhere, "Operating systems- A Concept based Approach" 2nd Edition, Tata Mc – Graw Hill, 2010.

Reference Books:

1. Andrew S. Tanenbaum, "Modern Operating Systems", Fourth Edition, Pearson Education/PHI 2014.
2. Gary Nutt, "Operating Systems", Third Edition, Pearson Education, 2004.
3. Harvey M. Deital, "Operating Systems", Third Edition, Pearson Education, 2004.
4. Tanenbaum,"Modern Operating Systems," 3/e, Pearson Edition, 2007.

Web References:

1. nptel.ac.in/courses/Webcourse…/Operating%20Systems
2. http://geeksforgeeks.org/Operating Systems/

Online Resources

1. https://www.coursera.org/learn/embedded-operating-system

Assessment Methods & Levels (based on Blooms'Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
CO1	Remember	Quiz	**5**
CO2	Understand	Writing Skills	**5**
CO3	Understand	Class Presentation	**4**
CO4	Apply	Group Assignment	**3**
CO5	Apply	Surprise Test	**3**
Summative assessment based on Continuous and End Semester Examination			

Bloom's Category	**Continuous Assessment Tests**			**Semester End Examination [60 Marks]**
	CIA1 [6 Marks]	**CIA2 [6 Marks]**	**Term Examination [8 Marks]**	
Remember	20	20	20	20
Understand	40	20	20	20
Apply	40	60	60	60
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

17CS304 **DATA STRUCTURES** **3/0/3/5**

Nature of Course :K (Problem Programming)

Pre requisites :17CS203 - Advanced C programming

Course Objectives:

1. To stress the importance of Algorithms and Data structures in becoming a more productive programmer.
2. To understand the Algorithms and Data structures used for solving a problem are much more important than knowing the exact code for it in some programming language.
3. To provide an insight into the intrinsic nature of the problem as well as possible solution techniques, independent of programming language, programming paradigms, computer hardware or any other implementation technique.

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Remember the concepts of arrays, pointers, and structures	[R]
CO2	Apply the linear data structures to solve various problems	[AP]
CO3	Implement the complex data structures such as trees	[AP]
CO4	Able to compare, implement and know when to apply sorting and searching algorithm	[AN]
CO5	Understand and apply the concepts of graphs in different scenarios	[AP]
CO6	Develop efficient algorithms for different applications	[C]

Course Contents:

FUNDAMENTALS OF DATA STRUCTURES: Importance of Algorithms and Data Structures, Classification of Data Structures, Introduction to Time and Space Complexity , Asymptotic Notations, Introduction to Array and Pointer implementation, Structures, Recursion. **LISTS, STACKS AND QUEUES:** Abstract Data Type (ADT), The List ADT-Singly, Doubly, Circular Linked List, Stack ADT- Stack operations and its applications, Queue ADT-Queue, Circular Queue, Priority Queue, Applications. **TREES AND HASHING:** Binary Trees, Expression Trees, Tree Traversals, Binary Search Trees, AVL Trees, Hashing, Binary Heap. **SORTING AND SEARCHING:** Sorting-Selection, Insertion, Bubble, Quick, Merge sort, Searching-Linear, Binary. **GRAPHS:** Graph Traversal, Topological Sort, Shortest Path Algorithms: Dijkstra's Algorithm, Minimum Spanning Tree: Prim's and Kruskal's Algorithm, Applications of graph, Bi-Connectivity.

Total Hours: 75

Lab Component

1. Arrays, Pointers and Structures
2. List ADT
3. Stack ADT
4. Queue ADT
5. Binary Search tree
6. Tree traversal
7. Searching
8. Sorting
9. Minimum Spanning Tree
10. Dijsktra's Algorithm

Text Books:

1 Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein,"Introduction to Algorithms" , Paper Back 2010, Third edition, MIT Press, 2010(Reprint)

2 M. A. Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education Asia, 2007

Reference Books:

1 V. Aho, J.E. Hopcroft and J. D. Ullman," Data Strucures and Algorithms", Pearson India, Ist Edition, 2002.
2 Y. Langsam, M. J. Augenstein and A. M. Tenenbaum, "Data Structures using C", Pearson Education Asia, 2009.
3 Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures – A Pseudocode Approach with C", Thomson Brooks / COLE, 2004.
4 J. Tremblay, P. Soresan, "An introduction to data structures with Applications", McGraw-Hill, 2nd edition, 2007.

Web References:

1 http://www.amazon.in/Data-Structures-Algorithms-Made Easy/dp/0615459811/ref=sr_1_1?ie=UTF8&qid=1474906913&sr=8-1&keywords=karumanchi-C++edition
2 http://www.amazon.in/Data-Structures-Algorithms-Made-Easy/dp/1466304162/ref=sr_1_2?ie=UTF8&qid=1474906913&sr=8-2&keywords=karumanchi-java edition
3 http://nptel.ac.in/courses//106103069/
4 http://web.stanford.edu/class/cs97si/

Online Resources:

1 https://www.coursera.org/learn/data-structures
2 https://www.coursera.org/specializations/data-structures- algorithms
3 http://nptel.ac.in/courses//data-structures

Assessment Methods & Levels (based on Blooms' Taxonomy)					
Summative assessment based on Continuous and End Semester Examination					
Bloom's Level	**Continuous Assessment**				**End Semester Examination (Theory) [40 marks]**
	Theory			**Practical**	
	CIA1 [6 marks]	**CIA2 [6 marks]**	**Term End Assessment [8 marks]**	**Rubric based CIA [40 Marks]**	
Remember	30	20	20	-	10
Understand	20	0	10	20	10
Apply	50	40	40	20	40
Analyse	0	40	30	30	40
Evaluate	0	0	0	-	0
Create	0	0	0	30	0

17CS205 DIGITAL PRINCIPLES AND SYSTEMS DESIGN 3/0/2/4

Nature of Course: G (Theory analytical)

Pre Requisites: 17PH102 - Engineering Physics

Course Objectives:

1. To introduce the principles of digital logic and minimize the logic expression
2. To enable the students to understand the operation of various combinational logic circuits
3. To enable the students to understand the principles of flip flops and to realise one flip flop from another
4. To prepare the students to apply flip flop concepts in designing registers and counters
5. To allow students to design synchronous and asynchronous sequential circuits

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Examine the structures for various number systems , their conversions and use of various logic gates with different input patterns.	[R]
CO2	Understand the various methods to simplify Boolean Functions	[U]
CO3	Explain the conceptual design of Programmable Logic Devices	[U]
CO4	Demonstrate the functionality of various flip flops and the conversion between them	[AP]
CO5	Use the flip flops to design and construct the various types of shift registers and Counters	[AP]
CO6	Analyse and design different combinational logic circuits	[AN]
CO7	Analyse and design different Sequential logic circuits	[AN]
CO8	Construct and test simple logic circuits	[C]

Course Contents:

Introduction: Number Systems- Binary codes – Binary Arithmetic - Boolean algebra - Boolean functions – K Maps **Logic Gates:** Synthesis of Logic Circuits using NAND/NOR gates (Two Level/Multilevel Implementation). **Combinational Logic:** Analysis and Design Procedures, Circuits for Arithmetic Operations, Multiplexer, Demultiplexer, Decoder, Encoders, and their use in logic synthesis, Hazards in combinational circuits. **Synchronous Sequential Logic:** Latches, Flip flops, Analysis and Synthesis of clocked sequential circuits, State table reduction..**Registers and Counters:** Registers, Shift Registers, Ripple Counters, Synchronous Counters, Special Counters. **Memory:** RAM-ROM -Memory Decoding. **Programmable Logic Devices:** Programmable Read Only Memory, Programmable Logic Array, Programmable Array Logic.

Total Hours: 75

Lab Component

1.Realization of Boolean Functions using Logic Gates

2.Analysis and Synthesis of Combinational Logic Circuits

a) Code Converter
b) Parity Generator and Checker
c) Two bit magnitude comparator
d) Arithmetic Circuits
e) Multiplexer

3.Analysis and Synthesis of Shift Register

4. Analysis and Synthesis of Asynchronous/ Synchronous Counter

5.Testing/Tracing Logic Circuits

6.Schematic Review of Logic Circuits

7.Mini Project

Text Books:

1. M. Morris Mano, Michael D.Ciletti., "Digital Design",5thEdition, Pearson education,2013
2. C. H. Roth Jr., Larry L. Kinney "Fundamentals of Logic Design", 7th Edition, Cengage Learning, 2014

Reference Books:

1. Donald D.Givone, "Digital Principles and Design", 7th Edition, McGraw-Hill, 2010.
2. Donald P leach, Albert Paul Malvino, GoutamSaha,"Digital Principles and Application", 8th Edition., McGraw Hill education (India) Private Limited, 2015

Web References:

1. http://nptel.ac.in/course.php?disciplineId=117

Online Resources:

1. http://www.nesoacademy.org/electronics-engineering/digital-electronics/digital
2. http://www.digital.iitkgp.ernet.in/dec/index.php

Assessment Methods & Levels (based on Blooms' Taxonomy)					
Summative assessment based on Continuous and End Semester Examination					
Bloom's Level	**Continuous Assessment**				**End Semester Examination (Theory) [40 marks]**
	Theory			**Practical**	
	CIA1 [6 marks]	**CIA2 [6 marks]**	**Term End Assessment [8 marks]**	**Rubric based CIA [40 Marks]**	
Remember	20	-	10	-	10
Understand	30	20	20	-	10
Apply	50	40	40	30	40
Analyse	-	40	30	20	40
Evaluate	-	-	-	20	-
Create	-	-	-	30	-

17CS206 **OBJECT ORIENTED PROGRAMMING USING JAVA** **3/0/0/3**

Nature of Course : F (Theory Programming)

Pre requisites : 17CS201- Problem Solving Techniques and C Programming

Course Objectives:

1. To understand Object Oriented programming concepts like Data Abstraction Encapsulation
2. To analyze different types of constructor, Inheritance and polymorphism
3. To understand and apply package, Interface and Applet concepts
4. To know the fundamental concepts of collection framework and multithreading in solving real world problems

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Identify and reproduce the features of Object Oriented programming paradigm.	[R]
CO2	Interpret the fundamental concepts of collection framework algorithms and its uses.	[U]
CO3	Understand the basis of Package, multithreading, and interface concepts	[U]
CO4	Use I/O functionality to code basic file operations and experiment with exceptions handling.	[AP]
CO5	Apply the concepts of Applets, AWT and Event handling mechanism to solve a given problems.	[AP]
CO6	Analyze the usage of different kinds of inheritance and constructor in real world scenario	[AN]

Course Contents:

Introduction to Object Oriented Programming: Object oriented programming features - Merits and demerits of object oriented methodology – Overview of object oriented programming languages-C++.**JAVA:** Introduction to java programming – Features of java-Classes and objects - Arrays -Methods-Constructor-Access Specifier - Nested Classes-Inner Classes -Command line arguments**. Inheritance, packages and Interface**: Inheritance types-Method overriding - Abstract Classes- Packages-Interfaces-Strings. **Exceptions and I/O handling:** Exception handling fundamentals-I/O basics – Reading console input – Writing console output-Files- **Applets, AWT and Event Handling:** Applet classes-AWT-event handling –multithreaded programming- Collection framework-JDBC Connectivity

Total Hours: 45

Text Books:

1. Herbert Schildt." The Complete Reference C++" , 5th Edition, MH, 2012.
2. Herbert Schildt, "Java : The Complete Reference", 9th edition, TMH, 2014.

Reference Books:

1. Scott Mayers, Effective Modern C++ ", O'Reilly Media , 1st Edition ,2014
2. Paul Deitel, Harvey Deitel, "Java How To Program", 10th Edition, Prentice Hall Publications,2014.
3. Y. Daniel Liang ,"Introduction to Java Programming", 9th Edition , Prentice Hall Publications ,2015

Web References:

1. http://www.nptel.ac.in
2. http://www.javaworld.com

Online Resources:

1. https://www.coursera.org/learn/c-plus-plus-a
2. https://www.coursera.org/learn/c-plus-plus-b
3. https://www.coursera.org/learn/object-oriented-java
4. https://www.coursera.org/specializations/java-object-oriented

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17CS305 OPERATING SYSTEMS LABORATORY 0/0/3/2

Nature of Course: M (Practical Application)

Co Requisites : Operating Systems

Course Objectives:

1. To design, simulate and debug various functionalities of operating System such as system calls, Process Synchronization Process Scheduling
2. To apply and analyse Deadlock, Memory Management and Disk Scheduling Techniques for real world problems
3. To analyse behaviour of simulation models using GDB debugger

Course Outcomes

Upon completion of the course, students shall have ability to

CO1	Demonstrate the use of basic unix commands and shell programming	[AP]
CO2	Apply synchronization techniques to processes	[AP]
CO3	Write programs for disk scheduling, Memory management and File organization Techniques	[AP]
CO4	Practice simple applications using operating system functionalities and debug using GDB debugger.	[AP]
CO5	Analyse the efficiency of CPU Scheduling algorithms	[AN]
CO6	Analyse the efficiency of Deadlock Prevention and avoidance mechanisms.	[AN]

List of Experiments

1. Analysis and Synthesis of Basic Linux Commands
2. Programs using Shell Programming
3. Implementation of Unix System Calls
4. Simulation and Analysis of Non Pre emptive and Pre emptive CPU Scheduling Algorithms
5. i. Simulation of Producer – Consumer Problem using Semaphores
   ii. Implementation of Dining Philosopher's Problem to demonstrate Process Synchronization
6. Simulation of Banker's Algorithm for Deadlock Avoidance
7. Analysis and Simulation of Memory Allocation and Management Techniques
8. Implementation of Page Replacement Techniques
9. Simulation of Disk Scheduling Algorithms
10. Implementation of File organization Techniques
11. Design an efficient Traffic Control System to avoid traffic congestion in Metro Cities. Use Process Synchronization, Scheduling, Deadlock and Memory Management concepts to implement the system. Use GDB tool to debug the system designed

Total Hours 45

Text Books:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts" 9th Edition, John Wiley, 2013
2. D.M.Dhamdhere, "Operating systems- A Concept based Approach", 2nd Edition, Tata Mc – Graw Hill, 2010.

Reference Books:

1. Andrew S. Tanenbaum, "Modern Operating Systems", 4th Edition, Pearson Education/PHI 2014.
2. Gary Nutt, "Operating Systems", 3rd Edition, Pearson Education, 2004.

3. Harvey M. Deital, "Operating Systems", 3rd Edition, Pearson Education, 2004.
4. Tanenbaum,"Modern Operating Systems," , 3rd Edition, Pearson Edition, 2007.

Web References:

1. nptel.ac.in/courses/Web course./Operating%20Systems
2. http://geeksforgeeks.org/Operating Systems/

Online Resources:

1. https://www.udacity.com/course/introduction-to-operatingsystems

Assessment Methods & Levels (based on Bloom'sTaxonomy)		
Summative assessment based on Continuous and End Semester Examination		
Bloom's Level	**Rubric based Continuous Assessment[60 marks] (in %)**	**End Semester Examination [40 marks] (in %)**
Remember	-	-
Understand	-	-
Apply	70	60
Analyse	30	40
Evaluate	-	-
Create	-	-

17CS207 **JAVA PROGRAMMING LABORATORY** **0/0/3/2**

Nature of Course: K (Problem Programming)
Co Requisites : Object Oriented Programming using JAVA
Course Objectives:

1. To Analyze different kinds of constructor, Inheritance and polymorphism
2. To know the fundamental concepts of Applet and Multithreading concepts.
3. To understand the database connectivity concepts using JDBC

Course Outcomes
Upon completion of the course, students shall have ability to

CO1	Understand the usage of Applet and event handling mechanism	[U]
CO2	Demonstrate the use of object oriented concepts in real world problems	[AP]
CO3	Apply the concepts of inheritance, constructor, exception handling	[AP]
CO4	Construct java programs to solve the given problems using basic programming Constructs	[C]
CO5	Develop and debug java programs using Package, multithreading,Exceptions and interface concepts	[C]

List Of Experiments

1. Implementation of Election Contest using class and object.
2. Implementation of Toll Booth using Constructors
3. Develop staff management system for demonstrating the concept of Hierarchial Inheritance.
4. Implementation of Single and Multilvel Inheritance for library management systems
5. Implementation of String Operations
6. Implementation of exception handling mechanism using try and catch block
7. Design Java Package for numbers. Develop two different classes that belongs to two package, one to check whether the given string is palindrome or not and the other to check whether the given number is odd or even and access these package using one main file
8. Develop Applet Programming for loading graphic components
9. Implementation of Action and Mouse events
10. Implementation of tourism information system using JDBC.
11. Implementation of Multi-threading for generation of Prime numbers and Fibonacci Series.

Total Hours 45

Reference Books:

1. Herbert Schildt, "Java : The Complete Reference", 9th edition, TMH, 2014
2. Paul Deitel, Harvey Deitel, "Java How To Program", 10th Edition, Prentice Hall Publications,2014.
3. Y. Daniel Liang ,"Introduction to Java Programming",9th Edition , Prentice Hall Publications ,2015

Web References:

1. http://www.nptel.ac.in
2. http://www.javaworld.com

Online Resources:

1. https://www.coursera.org/learn/object-oriented-java
2. https://www.coursera.org/specializations/java-object-oriented

Assessment Methods & Levels (based on Bloom'sTaxonomy)

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Rubric based Continuous Assessment[60 marks] (in %)	End Semester Examination [40 marks] (in %)
Remember	-	-
Understand	20	20
Apply	50	50
Analyse	-	-
Evaluate	-	-
Create	30	30

17MA110	PROBABILITY AND STATISTICS	3/2/0/4

Nature of Course	J(Problem analytical)
Prerequisites	Linear Algebra, Calculus and its applications Integral Calculus and Laplace Transform

Course Objectives:

1	To study the basic probability concepts.
2	To understand and have a well – founded knowledge of standard distributions which can be used to describe real life phenomena.
3	To acquire skills in handling situations involving more than one random variable.
4	To learn the concept of testing hypothesis using statistical analysis.

Course Outcomes :
Upon completion of the course, students shall have ability to

CO1	To recall the concepts of basic probability	[R]
CO2	To understand how to handle situations involving random variable	[U]
CO3	To apply the probability concepts in transition from real problem to a probability model	[AP]
CO4	To use distribution in cluster analysis of similar binary variables	[AP]
CO5	To derive the logic and attain the knowledge of hypothesis testing.	[AP]

Probability- Probability concepts-Addition and Multiplication law of probability – Conditional probability - Total probability theorem - Bayes theorem – **Random Variables**- One dimensional random variable - Probability mass function - Probability density function – Discrete and continuous random variables – **Standard distributions**-Discrete distributions - Binomial – Poisson – Geometric – Continuous distributions - Uniform – Exponential - Normal distributions – MGF- Simple problems-**Two dimensional random variables**-Joint distributions - Marginal and conditional distributions – Covariance – Correlation- Regression- Multiple correlation – **Statistics-**Introduction to Statistics-Measures of central tendency**- Testing of hypothesis**- Test statistics for small samples: Student's t-test-F-test- χ^2-test- Test statistics for large samples: Z test.

Total Hours	60

Text Books:

1.	Gupta, S.C., &Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand & sons, 2000,Reprint 2014
2.	Peebles Jr. P.Z., —Probability Random Variables and Random Signal Principles,Tata McGraw-Hill Pubishers, Fourth Edition, New Delhi, 2016(Chapters 6, 7 and 8)
3.	Palaniammal, S., —Probability and Random Processes, Prentice hall of India, New

	Delhi, 2014
Reference Books:	
1.	Ross, S., —A First Course in Probability, Ninth edition, Pearson Education, Delhi, 2014.
2.	Henry Stark and John W. Woods —Probability and Random Processes with Applications to Signal Processing
3.	***Richard A. Johnson , Irwin Miller, John Freund," Miller & Freund's Probability and Statistics for Engineers",Ninth edition,2016***
Web References:	
1	http://nptel.ac.in/courses/111104079/
2	http://nptel.ac.in/video.php/subjectId=117105085
3	http://nptel.ac.in/syllabus/111105041/
4	http://freevideolectures.com/Course/3028/Econometric-Modelling/22#
Online Resources:	
1	www.edx.org/Probability
2	https://ocw.mit.edu/courses/.../18-440-probability-and-random-variables-spring-2014/
3	https://onlinecourses.nptel.ac.in/noc15_ec07/

Assessment Methods & Levels (based on Blooms' Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1	Remember	Class room or online Quiz	2
CO2	Understand	Class presentation	4
CO3& CO4	Apply	Powerpoint Presentation / Group Activities	8
CO5	Apply	Group Assignment	6

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination (60 Marks)
	CIA1 (6 Marks)	CIA2 (6 Marks)	Term End Assessment (8 Marks)	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	50	50	50	50
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CS306	FUNDAMENTALS OF OPEN SOURCE SOFTWARE	3/0/2/4

Nature of Course: F (Theory Programming)

Prerequisites : -

Course Objectives:

1	To recognize the basics of open source software
2	To identify the significance of open source software licensing strategies and its tools.
3	To illustrate python programming
4	To practice programs using R language

Course Outcomes

Upon completion of the course, students shall have ability to

CO1	Describe the necessity of open source software.	[U]
CO2	Employ python language to solve real world problems	[AP]
CO3	Create applications using R programming language	[AP]

Course Contents

Introduction: History and evolution of FOSS - Design Logic, Source Code, Binary Code - Examples of OSS products – Applications, OSS Tools. Classification of FOSS and Licensing: Free Software - Proprietary Software - Other existing Software models -Open Standards - Open Content - Benefits and Shortcoming - Strengths and weakness -Comparison of FOSS and Proprietary software – Licensing : Types of licensing - Commercial License versus Open Source License – OSS Licensing –Types of licenses - licensing strategies. Python: Introduction – Variables – Constants – Types and Operators: Python Syntax-Indentation, Multiple Line Spanning-Python Object Types- Python Numbers – Strings , List, Tuples, dictionary – Function. **R Programming** History and Overview – R Nuts and Bolts- Getting Data In and Out of R- Interfaces to the Outside World- Subsetting R Objects- Vectorized Operations- Dates and Times- Managing Data Frames with the dplyr package- Control Structures- Functions- Scoping Rules of R- Loop Functions- Debugging- Profiling R Code

List of Experiments

1. Cron Scheduling
   - List , edit and remove cron tab entries
   - Prompt before deleting cron tab
   - Schedule a Job for Specific Time
   - Special Strings for Common Schedule & Multiple commands
2. Simple Python programs
   - Addition of 3 numbers using text boxes
   - Multiplication table
   - Factorial of a number
3. R Programming
   - R Nuts and Bolts
   - Reading and Writing data
   - List, Matrix operations
   - Control structures, Functions, Loops
   - Debugging

Total Hours	**75**

Text Books:

1. Kenneth Wong and PhetSayo , “Free and Open Source Software A general Introduction” IOSN

APDIP, 2004
2. Wesley J. Chun, “Core Python Programming”, Pearson Education , 2012
3. Roger D Peng., “R Programming for Data Science”, Lean Publication, 2015

Reference Books:

1. Colin Gillespie, Robin Lovelace, “Efficient R Programming: A Practical Guide to Smarter Programming”, O’ Reilly Publications, 2016

Web References:

1. https://opensource.com/resources/what-open-source
2. http://freevideolectures.com/blog/2015/05/free-courses-learn-scripting-language/

Online Resources:

1. https://www.coursera.org/learn/interactive-python-1
2. https://www.coursera.org/courses?query=R

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Continuous Assessment			Rubric Based CIA [40 Marks]	End Semester Examination [40 Marks]
	CIA1 [6 Marks]	CIA2 [6 Marks]	Term End Assessment [8 Marks]		
Remember	30	30	20	-	20
Understand	70	30	30	20	30
Apply	-	40	50	80	50
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

17CS307	DATABASE MANAGEMENT SYSTEMS	3/0/0/3
Nature of Course	:G (Theory analytical)	
Prerequisite	-	

Course Objectives:

1	To discuss the fundamentals of data models to conceptualize and depict a database system using ER diagram.
2	To illustrate the relational database implementation using SQL with effective relational database design concepts.
3	To explain the fundamental concepts of transaction processing- concurrency control techniques and recovery procedure
4	To demonstrate Query evaluation and optimization techniques.

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Distinguish database systems from file systems and describe data models and DBMS architecture.	[U]
CO2	Identify the basic issues of transaction processing and concurrency control.	[U]
CO3	Demonstrate with understanding of SQL Programming language and apply normalization theory.	[AP]
CO4	Practice the query evaluation techniques, query optimization and familiar with basic database storage structures and access techniques.	[AP]
CO5	Analyze and derive an information model expressed in the form of an entity relation diagram and transform into a relational database schema.	[A]

Course Contents :

Introduction to DBMS & Data Models: Introduction– Characteristics of databases –File systems vs Database systems- Evolution of DBMS – Users of database systems- Three level DBMS Architecture and Data Abstraction- Database system architecture Introductions to data models – Benefits of data model – Phases of data modeling- Entity–Relationship model – E-R Diagrams – Extended E-R Diagram – Evaluating data model quality - The relational Model – Schema – Keys- Relational Algebra – Domain Relational Calculus- Tuple Relational Calculus - Fundamental operations. **Normalization and SQL fundamentals:** Introduction - Codd's rule– Undesirable Properties of Relations – Functional Dependency- Single Valued Dependency Single valued Normalization (1NF, 2NF 3NF & BCNF)- Desirable properties of Decompositions – De-normalization- SQL fundamentals – Views - Integrity – Procedures, Functions, Cursor and Triggers- Advanced SQL features –Embedded SQL **Database Implementation and Recent Trends:** Dynamic SQL- Transaction Concepts – Transaction model – ACID Properties – Serializability –Transactions as SQL statements –B+ Trees - Introduction to Query Processing – Issues in query optimization – Steps in query processing Distributed database Implementation- Concurrent transactions - Concurrency control – Lock based protocols- Recovery System – Failure classification- NoSQL, NoSQL Categories-MongoDB

Total Hours:	**45**

Text Books:	
1	Gupta G K, “Database Management Systems”, Tata McGraw Hill Education Private Limited, New Delhi, 2011.
2	Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Sixth Edition, Tata McGraw Hill, 2011.
Reference Books:	
1	Database Systems, 6th edition, Ramez Elmasri, ShamkatB.Mavathe, Pearson Education, 2013.
2	Raghu Ramakrishnan, Gehrke, “Database Management Systems”, Third Edition, McGraw Hill, 2006
3	Peter rob, Carlos Coronel, “Database Systems – Design, Implementation and Management”, 9th Edition, Thomson Learning, 2009.
\Web References:	
1	www.tutorialspoint.com/dbms/
2	https://alison.com/courses/IT-Management-Software-and-Databases
3	https://mva.microsoft.com/en-us/training-courses/database-fundamentals-8243?l=TEBiexJy_5904984
4	http://www.sqlcourse.com/
5	https://university.mongodb.com/
6	http://www.edureka.co/mongodb
7	https://www.lynda.com/NoSQL-training-tutorials/1473-0.html
Online Resources:	
1	http://nptel.ac.in/video.php?subjectId=106106093
2	https://www.udemy.com/database-management-system/
3	http://www.nptelvideos.in/2012/11/database-management-system.html
4	https://www.coursera.org/learn/database-management
5	https://www.edx.org/school/mongodbx

Assessment Methods & Levels (based on Blooms’Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom’s Level	Assessment Component	Marks
CO1	Understand	Online Quiz	3
CO2	Understand	Technical Presentation	3
CO3	Apply	Group Assignment	5
CO4	Apply	Group Assignment	5
CO5	Analyse	Surprise Test	4

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	
Remember	-	-	-	-
Understand	80	40	40	40

Apply	20	60	40	40
Analyse	-	-	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

17CS310	DATABASE MANAGEMENT SYSTEMS LABORATORY	0/0/3/2

Nature of Course	M (Practical application)
Pre requisites	-

Course Objectives:

1	To discuss the fundamentals of data models to conceptualize and depict a database system using ER diagram.
2	To illustrate the relational database implementation using SQL with effective relational database design concepts.
3	To explain the fundamental concepts of transaction processing- concurrency control techniques and recovery procedure
4	To demonstrate Query evaluation and optimization techniques.

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Practice ER diagrams for real world applications	[AP]
CO2	Select suitable SQL commands to manage the database	[A]
CO3	Apply concurrency control and recovery mechanisms for practical problems.	[AP]
CO4	Create databases using MongoDB	[AP]
CO5	Design effective Databases for enterprise applications.	[AP]

List of Experiments:

1. Conceptual Database design using E-R DIAGRAM
2. Implementation of SQL commands DDL, DML, DCL and TCL
3. Queries to demonstrate implementation of Integrity Constraints
4. Practice of Inbuilt functions
5. Implementation of Join and Nested Queries AND Set operators
6. Implementation of virtual tables using Views
7. Practice of Procedural extensions (Procedure, Function, Cursors, Triggers)
8. Document Database creation using MongoDB
9. Study of Cloud Storage
10. Mini Project (Application Development using Oracle DB)

i)IT Training Group Database ii) Blood Donation System iii)Salary Management System iv)Traffic Light Information System	
Total Hours:	**45**

Reference Books:	
1	Gupta G K, "Database Management Systems", Tata McGraw Hill Education Private Limited, New Delhi, 2011.
2	Peter rob, Carlos Coronel, "Database Systems – Design, Implementation and Management", 9th Edition, Thomson Learning, 2009.
3	RamezElmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Fourth Edition , Pearson/ Addisionwesley, 2007.
Web References:	
1	http://nptel.ac.in/video.php?subjectId=106106093
2	http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-830-database- systems-fall-2010/
3	www.tutorialspoint.com/dbms/
4	http://www.edureka.co/mongodb
5	https://www.lynda.com/NoSQL-training-tutorials/1473-0.html

Assessment Methods & Levels (based on Bloom'sTaxonomy)		
Summative assessment based on Continuous and End Semester Examination		
Bloom's Level	**Rubric based Continuous Assessment[60 marks] (in %)**	**End Semester Examination [40 marks] (in %)**
Remember	-	-
Understand	20	20
Apply	60	60
Analyse	20	20
Evaluate	-	-
Create	-	-

17CS308	COMPUTER ARCHITECTURE	3/0/0/3

Nature of Course	C (Theory Concept)
Pre requisites	-

Course Objectives:

1	To explain the concepts of the basic structure and operation of a digital computer.
2	To discuss the working of different types of arithmetic operations.
3	To demonstrate the different types of control and the concept of pipelining.
4	To illustrate the working of different types of memories, virtual memory and memory mapping techniques
5	To identify the different types of communication with I/O devices and standard I/O interfaces

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Describe the design functionalities of various components and units of digital computers	[U]
CO2	Explain the logical design of arithmetic operators and abstract the concepts of hardware components.	[U]
CO3	Categorize the hazards of pipelining technique and its impact in high performance processors.	[A]
CO4	Illustrate various memory components and memory mapping techniques including Cache and virtual memory.	[AP]
CO5	Infer the processor concepts by introducing multi-core, cluster, shared and distributed architecture concepts	[U]

Course Contents:

Course Contents:

Architecture: Functional units, Basic operational concepts, Bus structures, Memory locations and addresses ,Instruction and instruction sequencing, Addressing modes and Assembly language

Arithmetic Unit: Addition and subtraction of signed numbers **–** Design of Fast adders **–** Multiplication of signed numbers, Fast multiplication, Integer division, Floating point numbers and operations**. Processing:** Execution of a Complete Instruction, Hardwired Control, Micro and **Nano Programmed Control. Pipelining:** Basic Concepts, Data Hazards, Instruction Hazards, Influence On Instruction Sets, Data Path And Control Consideration and Superscalar Operation. Intel Pentium Processor Architecture & Working, Sun Ultra Sparc, Sandiego Super Computer Center **Memory:** Basic concepts ,Semiconductor RAMs , ROMs ,Cache memories, Performance consideration, Virtual memory and Memory Management requirements**. Multicore Architecture**: Secondary storage Multicore Processors, Centralized and Distributed shared -memory architecture, Cluster computers, Accessing I/O devices, Interrupts,Direct Memory Access, HP Moonshot

Total Hours:	**45**

Text Books:

1	Carl Hamachar, Zvonco Vranesic and Safwat Zaky, Computer Organization, McGraw- Hill, 6th Edition 2012.
2	John P. Hayes, Computer Architecture and Organization, McGraw-Hill 3rd edition, 2013
Reference Books:	
1.	David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Elsevier, 4th edition 2012.
2.	Avi Silberschatz, Peter Galvin, Greg Gagne, Operating System Concepts, Wiley Asia 2nd Edition
3.	William Stallings, Operating Systems: Internals and Design Principles, Prentice Hall of India, 8th edition , 2012
4.	John L. Hennessy and David A. Patterson, Computer Architecture: A Quantitative Approach, Morgan Kaufmann, 5th edition 2011
5.	John Paul Shen and Mikko H. Lipasti, Modern Processor Design: Fundamentals of Superscalar Processors, Tata McGraw-Hill, 1st edition 2013
6.	M. J. Flynn, Computer Architecture: Pipelined and Parallel Processor Design, Narosa Publishing House
7.	Kai Hwang, Advanced Computer Architecture: Parallelism, Scalability, Programmability, McGraw-Hill reprint 2011
Web References:	
1	http://www.hp.com/hpinfo/newsroom/press_kits/2013/hpmoonshot2013/DS_Moonshot_System.pdf
2	https://www.hpe.com/h20195/v2/getpdf.aspx/c04168328.pdf?ver=11
3	http://documents.opto22.com/casestudies/2183_Case_Study_San_Diego_Supercomputer_Center.pdf
Online Resources:	
1	https://www.coursera.org/learn/making-architecture
2	https://www.coursera.org/learn/comparch
3	http://nptel.ac.in/video.php?subjectId=106102062
4	http://nptel.ac.in/courses/106102062/

Assessment Methods & Levels (based on Blooms'Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1	Understand	Online Quiz	**3**
CO2	Understand	Online Quiz	**3**
CO3	Analyse	Problem Solving	**5**
CO4	Apply	Group Assignment	**5**
CO5	Understand	Case Study	**4**

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination
	CIA1	CIA2	Term End Assessment	
Remember	20	20	20	10

Understand	80	40	40	40
Apply	-	40	40	30
Analyse	-	-		20
Evaluate				
Create				

17CS309	DESIGN AND ANALYSIS OF ALGORITHMS	3/0/0/3

Nature of Course	G (Theory analytical)
Pre requisites	C Programming, Data Structures

Course Objectives:

1	To discuss asymptotic analysis for computer algorithms.
2	To examine the different algorithm design techniques.
3	To analyze the efficiency of various algorithm design techniques for the same problem.
4	To inspect the limitations of Algorithm's power.

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Identify the general principles and algorithm design techniques for developing efficient algorithms.	[U]
CO2	Compute the time and space complexities of algorithms.	[AP]
CO3	Analyze and choose appropriate design techniques as per efficiency requirements.	[A]
CO4	Interpret the limitations of algorithm's power and to choose suitable approximation algorithms.	[AP]

Course Contents:

Algorithm Analysis: Importance - Role of algorithms in computing **- Fundamentals of algorithmic problem solving Analysis of algorithm efficiency: The Analysis Framework –Asymptotic Notations and Basic efficiency classes** - Mathematical analysis for Recursive and Non-recursive algorithms - Empirical analysis of algorithm. **Brute Force Approach:** Selection Sort - Bubble Sort - Sequential Search - String Matching. **Decrease and Conquer Technique:** Insertion sort - Topological sort. **Divide and Conquer Technique:** Merge sort - Quick sort - Binary search - Strassen's Matrix Multiplication. **Dynamic Programming:** Knapsack Problem and Memory functions - Optimal Binary Search Trees - Warshall's and Floyd's Algorithms. **Greedy Technique:** Prims Algorithms - Kruskal's Algorithm - Dijkstra's Algorithm - Huffman Trees and Codes.**Limitations of Algorithm power:** Lower- Bound Arguments - Decision Trees - P, NP and NP-Complete Problems. **Backtracking:** n - Queens Problem - Hamiltonian Circuit Problem - Subset Sum Problem. **Branch and Bound Technique:** Assignment Problem - Knapsack Problem - Travelling Salesman Problem. **Approximation Algorithms:** Vertex-cover problem - Travelling Salesman Problem. **Iterative Improvement: The maximum flow problem. Self-Study: Game tree using Backtracking.**

Total Hours:	**45**

Text Books:

1	Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Publications, 3rd Edition, 2012
2	Thomas H. Cormen, Charles E. Leiserson, R.L. Rivest, "Introduction to Algorithms",

	Prentice Hall of India Publications, 3rd Edition, 2009.
Reference Books:	
1	Ellis Horowitz, Sartaj Sahni and SanguthevarRajasekaran, "Computer Algorithms/ C++", Second Edition, Universities Press, 2008.
2	Sara Baase and Allen Van Gelder, **"**Computer Algorithms: Introduction to Design and Analysis", Pearson Publications, 3rd Edition, 2008.
Web References:	
1	https://www.cs.usfca.edu/~galles/visualization/Algorithms.html
2	https://onlinecourses.nptel.ac.in/noc16_cs04/preview
Online Resources:	
1	https://www.coursera.org/learn/introduction-to-algorithms
2	https://www.edx.org/course/algorithms-iitbombayx-cs213-3x

Assessment Methods & Levels (based on Blooms'Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1	Remember	Group Presentation	5
CO2	Apply	Assignment	5
CO3	Analyze	Tutorial	5
CO4	Apply	Quiz	5

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination (60 Marks)
	CIA1 (6 Marks)	CIA2 (6 Marks)	Term End Assessment (8 Marks)	
Remember	10	10	10	10
Understand	20	20	20	20
Apply	40	40	40	40
Analyse	30	30	30	30
Evaluate	-	-	-	-
Create	-	-	-	-

17CS311	ALGORITHMS LABORATORY	0/0/3/2

Nature of Course	: L (Problem experimental)

Course Objectives:

1	To examine the various algorithm design techniques.
2	To employ efficient algorithms for solving a problem and analyze the complexity.

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Apply different problem solving techniques to find a solution to a problem.	[AP]
CO2	Examine the solutions and test code with best, worst and average case inputs.	[A]
CO3	Analyze the time and space complexities of different algorithms designed to solve a problem.	[A]
CO4	Choose a suitable algorithm for a problem.	[AP]

List of Experiments:

1. Implement recursive and non-recursive algorithms for an application and analyze the same.
2. Implement and analyze Sorting, Searching and String matching algorithms using Brute Force approach.
3. Design algorithms using Divide and Conquer technique for different real -world scenarios.
4. Use different algorithms find the valuable set of items in a Knapsack. Analyze the same.
5. Implement and analyze an algorithm to find the shortest path between every pair of cities using Dynamic Programming.
6. Using different algorithms based on Greedy technique, implement and analyze a real world application as the one given below.

Scenario:

For a large local area network with a lot of switches, implement an algorithm to find the minimum number of packets that need to be relayed across the network and avoid multiple copies of the same packet from arriving via different paths.

7. Use suitable algorithms to deal with the following Scenario and analyze the same.

Scenario:

A vendor car has capacity 'K' kg. There are some bundles having respective weights c_1, c_2,…,c_n kg which are to be transported by that vendor car. The problem is to pick up those bundles and load them in the car so that the car capacity is maximum utilized, if not fully.

8. Implement an algorithm for the Huffman-tree construction. Analyze the time efficiency class of the algorithm for constructing a Huffman tree as a function of the alphabet's size.
9. Implement a suitable Backtracking algorithm to find a tour.

Scenario:

A person has to travel from island 'A' to another island 'B' crossing 'n' bridges and return to 'A'. A person can plan a walk in such a way that he will cross each of these bridges once but not more than once.

10. Implement a suitable Branch and Bound algorithm to find the shortest tour.

Scenario:

A robot is involved in cutting the metal surface with laser. The sequence of movements for the robot arm should be minimal.

11. Implement N-Queens problem using backtracking.
12. Incorporating the problem solving techniques, develop a mini project.

Total Hours:	**45**

Text Books:

1	Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Publications, 3rd Edition, 2012.
2	Thomas H. Cormen, Charles E. Leiserson, R.L. Rivest, "Introduction to Algorithms", Prentice Hall of India Publications, 3rd Edition, 2009.

Reference books

1	Horowitz, S. Sahni and S. Rajasekaran, "Computer Algorithms," 2 nd Edition, Galgotia Publications, 2008.
2	Sara Baase and Allen Van Gelder, "Computer Algorithms: Introduction to Design and Analysis", Pearson Publications, 3rd Edition, 2008.

Web References:

1	https://www.cs.usfca.edu/~galles/visualization/Algorithms.html

Online Resources:

1	https://www.coursera.org/learn/introduction-to-algorithms
2	https://onlinecourses.nptel.ac.in/noc16_cs04/preview
3	https://www.edx.org/course/algorithms-iitbombayx-cs213-3x

Assessment Methods & Levels (based on Bloom'sTaxonomy)

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Rubric based Continuous Assessment[60 marks] (in %)	End Semester Examination [40 marks] (in %)
Remember	-	-
Understand	-	-
Apply	60	60
Analyse	40	40
Evaluate	-	-
Create	-	-

17MA114	FOURIER SERIES AND COMPUTATIONAL METHODS (CSE & IT)	3/2/0/4
Nature of Course	J(Problem analytical)	
Pre requisites	17MA101-Linear Algebra and Differential Calculus 17MA104-Integral Calculus and Laplace Transform	

Course Objectives:

1	To study the concept of mathematical formulation of certain practical problems in terms of partial differential equations and solving them for physical interpretation
2	To understand the concept of Fourier series and the frequently needed practical harmonic analysis that an engineer may have to make from discrete data
3	To understand the basics of Z – transform and its applicability to discretely varying functions
4	To study the concept of finding the roots of nonlinear (algebraic and transcendental) equations and solutions of large system of linear equations and Eigen values of the matrix
5	To find numerical solution to partial differential equations

Course Outcomes:
Upon completion of the course, students shall have ability to

CO1	Recall concepts of partial differential equations, properties of definite integrals and summation of series	[R]
CO2	Formulate certain problems in terms of difference equations and solve them using Z-transform technique	[U]
CO3	Find Fourier series solution to the engineering problems involving partial differential equations	[AP]
CO4	Apply numerical methods to solve algebraic, transcendental and simultaneous equations	[AP]
CO5	Use numerical methods to solve partial differential equations by finite difference method	[AP]

Course Contents:

Partial Differential Equations - Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions- Lagrange's linear equations –Linear homogeneous partial differential equations of second and higher order with constant coefficients- **Fourier series** - Dirichlet's conditions- General Fourier Series – Odd and Even Functions- Half range sine series and cosine series –Parseval's Identity- Harmonic analysis - **Z- Transforms -** Definition - Z-transform of Standard functions-Properties (excluding proof) **– Inverse Z- transform-** Convolution theorem(Statement)- Formation of difference equations- Solution of difference equations using Z-transform Techniques- **Numerical solution to algebraic and transcendental equations**-Regula-Falsi method - Newton-Raphson method –Gauss Elimination method -Gauss Jordan method – Gauss Jacobi method - Gauss Seidel method – Inverse of a matrix by Gauss Jordan method – Eigen value of a matrix by power method-**Numerical solution to PDE**- Finite difference technique-Laplace Equation-Liebmann's Iteration Process-Parabolic Equation –Bender-Schmidt's Difference Equation-Crank-Nicolson's Difference Equation-Hyperbolic Equation

Total Hours:	**75**

Text Books:

1	Kreyszig. E, "Advanced Engineering Mathematics", 10th Edition, John Wiley and Sons (Asia) Limited, Singapore, 2014.
2	Grewal. B.S, "Higher Engineering Mathematics", 43rd Edition, Khanna Publications,

	Delhi, 2014.
3	Grewal B.S., Numerical methods in Engineering and Science. 10th edition, Khanna Publishers, 2014
Reference Books:	
1	Veerarajan. T, "Transforms and Partial differential equations", 2rd edition, Tata McGraw-Hill Publishing Company Ltd., reprint,2015
2	Glyn James, —Advanced Modern Engineering Mathematics, Pearson Education, 4th edition, 2012
3	Jain M.K. Iyengar, K & Jain R.K., Numerical Methods for Scientific and Engineering Computation, New Age International (P) Ltd, Publishers 2013
Web References:	
1	http://nptel.ac.in/courses/122107036/
2	http://nptel.ac.in/video.php?subjectId=122107037
3	http://nptel.ac.in/video.php?subjectId=117102060
Online Resources:	
1	https://www.coursera.org/learn/integration-calculus
2	https://alison.com/courses/Strand-5-Higher-Level-Functions-and-Calculus/reviews/649/

Assessment Methods & Levels (based on Blooms' Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1	Remember	Class room or online Quiz	2
CO2	Understand	Class presentation/Powerpoint Presentation	4
CO3	Apply	Group Activities	6
CO4& C05	Apply	Group Assignment	8

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination
	CIA1	CIA2	Term End Assessment	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	50	50	50	50
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CS312	THEORY OF COMPUTATION	3/0/0/3

Nature of Course	J (Problem Analytical)

Course Objectives:

1	To describe various Computing models like Finite Automata, Regular Expression, Grammars, Pushdown Automata, and Turing Machines.
2	To introduce formal languages such as Regular languages, Context free languages and Recursive languages and their properties
3	To provide knowledge on pumping lemma and its application in formal languages.

Course Outcomes:
Upon completion of the course, students shall have ability to

CO1	Construct a Finite Automata and Regular expression for a Regular language	[AP]
CO2	Construct a Grammar and Push Down Automata for a Context Free language	[AP]
CO3	Apply pumping lemma to Regular Languages and Context Free Languages	[AP]
CO4	Explain the properties of Regular Languages and Context Free Languages	[U]
CO5	Construct a Turing Machine for a recursive language	[AP]

Course Contents:

REGULAR LANGUAGES : Mathematical preliminaries and notations **–** Central concepts of automata theory **– Finite Automata** -Deterministic Finite Automata - Nondeterministic Finite Automata **–** Equivalence of DFA and NFA **–**Finite Automata with Epsilon transitions - Applications of FA. **Regular Expressions –** Finite Automata and Regular Expressions **–**Applications of Regular Expressions - Regular Grammars:Properties of regular languages: Pumping lemma for regular languages **–** Closure properties of regular languages **–**Equivalence and Minimization of Finite Automata.

CONTEXT FREELANGUAGES:Context Free Grammars (CFG) – Parse Trees - Ambiguity in Grammars and languages**–** Applications of Context Free Grammars **– Pushdown automata** (PDA) **–** Languages of a PDA -Equivalence of PDA's and CFG's-Properties of Context Free Languages: Normal Forms (CNF, GNF) for Context Free Grammars - Pumping lemma for CFL's - Closure properties of CFL .

TURING MACHINES: Introduction **–** Formal Definition - Design of TM - Computable Functions-Variants of TM, Introduction to Recursive and Recursively Enumerable languages.

Total Hours:	**60**

Text Books:

1.	Hopcroft, J.E. Motwani, R. and Ullman, J.D "Introduction to Automata Theory, Languages and Computations", 3rd Edition, Pearson Education (ISBN 1292039051), 2014
2.	Martin, J., "Introduction to Languages and the Theory of Computation", 3rd Edition, TMH, 2007.

Reference Books:

1	Kamala Krithivasan and Rama. R, "Introduction to Formal Languages, Automata Theory and Computation", Pearson Education 2009
2	Lewis, H. and Papadimitriou, C.H "Elements of the Theory of Computation", 2nd Edition, Pearson Education/PHI, 2003

3	Greenlaw, “Fundamentals of Theory of Computation, Principles and Practice”, Elsevier, 2008
4	Peter Linz, —An Introduction to Formal Language and Automatall, Narosa Publishers, New Delhi, 2011

Web References:

1	https://nptel.ac.in/courses/106104028/
2	https://nptel.ac.in/courses/106103070/3
3	https://nptel.ac.in/courses/106104028/34

Assessment Methods & Levels (based on Blooms’Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom’s Level	Assessment Component	Marks
CO1	Understand	Quiz	2
CO2	Apply	Assignment	5
CO3	Apply	Assignment	5
CO4	Understand	Quiz	3
CO5	Apply	Team Design	5

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	CIA III [8 marks]	
Remember	20	20	20	20
Understand	20	20	20	20
Apply	60	60	60	60
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CS208	MICROPROCESSORS AND MICROCONTROLLERS	3/0/0/3

Nature of Course	:G(Theory Concept)
Pre requisites	:

Course Objectives:

1. To understand the architecture and Instruction set of 8086 and 8051
2. To develop the programming abilities to work on 8086 microprocessor and microcontrollers
3. To know about different peripheral devices and their interfacing to 8051 & ARM Processor
4. To understand the architecture and programming of ARM Processor
5. To apply and understand the principles and working of Arduino Processor.

Course Outcomes:
Upon completion of the course, students shall have ability to

CO1	Understand the operations of microprocessor architecture 8086 and write the assembly language programming	[U]
CO2	Understand the concepts of microcontroller 8051 and apply the programming concepts in microcontroller.	[AP]
CO3	Design 8051 microcontroller and to interface the controller with the external circuits.	[AP]
CO4	Understand the concepts of ARM architecture and interfacing with external circuit.	[U]
CO5	Study of IoT application Arduino processor and its architecture	[U]

Course Contents:

ORGANIZATION AND ARCHITECTURAL FEATURES OF 8086 MICROPROCESSOR
The instruction set, Addressing modes; Interrupts, Assembly language programming of 8086.

MICROCONTROLLER
Architecture of 8051, Special Function Registers (SFRs), I/O Pins Ports and Circuits, Instruction set, Interrupts, Assembly language programming**.** 8051 interfacing - LCD & Keyboard Interfacing, ADC, DAC &Sensor Interfacing- Temperature, pressure, gas sensor , External Memory Interface and Stepper Motor

ARM PROCESSOR
The ARM architecture, ARM Bus architecture ARM7TDMI, Processor Fundamentals, ARM Instruction Set, Memory Mapping, The Thumb Instruction Set, Interfacing of sensors, Transducers, actuators, Interfacing of sensors- Temperature, pressure, Seven segment display, A/D and D/A Converters with ARM**.** IOT Processors - Arduino Architecture, Basic programming- LED blinking, Fading, Traffic Light, LCD Display

Total Hours:	**45**

Text Books:

1. A.K.Ray&K.M.Bhurchandi, "Advanced Microprocessors and peripherals-Architectures, Programming and Interfacing", Third edition, TMH, 2012 Reprint.
2. Mohamed Ali Mazidi, Janice GillispieMazidi, "The 8051 microcontroller and embedded systems", Pearson Education,2006
3. Andrew N.Sloss, Dominic Symes and Chris Wright " ARM System Developer"s Guide : Designing and Optimizing System Software" , First edition, Morgan Kaufmann Publishers, 2004.
4. Simon Monk "Programming Arduino getting started with sketches", The McGraw-Hill, 2012.

Reference Books:

1. Yu-cheng Liu, Glenn A.Gibson, "Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design", PHI 2003
2. Steve Furber , "ARM System –On –Chip architecture", Addision Wesley, 2000.
3. MassiomiBanzi and Michael Shiloh, " Make: Getting Started with Arduino", 3rd Edition.

Web References:

1. http://nptel.ac.in/courses/108107029/
2. http://www.eeherald.com/section/design-guide/esmod.html
3. https://www.edx.org/course/embedded-systems-shape-world-utaustinx-ut-6-03x
4. https://www.udemy.com/mcu_msp430/

Online Resources:

1.	https://www.coursera.org/learn/raspberry-pi-interface/home/welcome
2.	http://www.multisoftvirtualacademy.com/8051-microcontroller-online-training.php

Assessment Methods & Levels (based on Bloom's Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1	Understand	Quiz	**4**
CO2	Apply	Tutorial	**4**
CO3	Apply	Group Assignment	**3**
CO4	Understand	Assignment	**5**
CO5	Understand	Seminar	**4**

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	CIA-III [8 marks]	
Remember	25	20	30	30
Understand	25	30	30	30
Apply	50	50	40	40
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

17CS313	COMPUTER NETWORKS	3/0/0/3
Nature of Course:	**C (Theory Concept)**	
Course Objectives:		
1.	To explain networks, topologies and the key concepts.	
2.	To discuss the layered communication architectures and its functionalities.	
3.	To demonstrate the concepts of error control, addressing and routing mechanisms.	
4.	To identify the functions, protocols and communication between layers.	
5.	To describe user-oriented services and advanced networking technologies.	
Course Outcomes: **Upon completion of the course, students shall have ability to**		
CO1	Describe the fundamentals of data communications, topologies and functions of layered model.	[U]
CO2	Practice the error detection and correction methods and explain data link layer functionalities.	[AP]
CO3	Examine the logical addressing schemes and routing strategies.	[A]
CO4	Discuss the process-to-process delivery models and congestion control principles.	[U]
CO5	Describe the services of application layer and emerging networking technologies.	[U]

Course Contents:

Data communications and physical layer: Introduction, history and development of computer networks, networks topologies, ISO/OSI model and protocols. Different types of transmission media, errors in transmission: attenuation, noise. Repeaters. Encoding (NRZ, NRZI, Manchester, 4B/5B). MAC Layer: Aloha, TDMA, CDMA, CSMA/CD, CSMA/CA.

Data Link Layer and Network layer: Error detection (Parity, CRC, Hamming code), **Sliding Window,** Stop and Wait protocols, LAN: Design, specifications of popular technologies, switching, Ethernet, Gigabit Ethernet, Bluetooth, Wi-Fi, Wi-Max, FDDI, PPP, HDLC, bridging and SDN.Internet Protocol, IPv6, ARP, DHCP, ICMP, Distance vector routing, Link state routing, Classless Inter-domain routing, RIP, OSPF, BGP, Subnetting, Network Address Translation.

Transport layer: UDP, TCP, Connection establishment and termination, , flow and congestion control, timers, retransmission, TCP extensions, Quality of Service(QoS), Socket Programming. Application Layers: DNS, E-Mail -SMTP, MIME, POP3, IMAP, FTP, HTTP, WWW,, Firewalls.ISDN: Introduction,ISDN Services, DSL Technology

Total Hours:	**45**

Text Books:

1.	Behrouz A. Forouzan, “Data communication and Networking”, 5th Edition, Tata McGraw-Hill, 2016.
2.	AS Tanenbaum, DJ Wetherall, “Computer Networks”, 5th Edition, Prentice-Hall, 2016.
3.	Thomas D. Nadeau and Ken Gray, “SDN: Software Defined Networks”, O’Reilly Media, Inc., 2013

Reference Books:	
1.	Peterson & Davie, "Computer Networks, A Systems Approach", 3rd Edition, Harcourt, 2013
2.	William Stallings, “Data and Computer Communications”, 8th Edition, PHI, 2006
3.	Bertsekas and Gallagher “Data Networks, PHI, 2000
4.	JF Kurose, KW Ross, “Computer Networking: A Top-Down Approach”, 5th Edition, Addison-Wesley, 2009.
5.	W Stallings, “Cryptography and Network Security, Principles and Practice”, 5th Ed., Prentice-Hall, 2010
6.	Paul Goransson and Chuck Black ,”Software Defined Networks: A Comprehensive Approach”, Morgan Kaufmann Publications, 2014.
7.	Gary Lee, “Cloud Networking - Understanding Cloud-based Data CenterNetworks”,Elsevier, 2014
Web References:	
1.	https://www.howtoforge.com/tutorial/software-defined-networking-sdn-architecture-and-role-of-openflow/
2.	https://www.sdxcentral.com/sdn/network-virtualization/definitions/data-center-networking-explained/
Online Resources:	
1.	http://nptel.ac.in/courses/106105082/
2.	https://nptel.ac.in/courses/106105183/
3.	https://www.udacity.com/course/computer-networking--ud436
4.	https://www.free-online-training-courses.com/networking/

Assessment Methods & Levels (based on Blooms’ Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom’s Level	Assessment Component	Marks
CO1	Understand	Online Quiz	**3**
CO2	Apply	Assignment	**4**
CO3	Analyse	Case Study	**5**
CO4	Understand	Class Presentation	**4**
CO5	Understand	Class Presentation	**4**

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Continuous Assessment			End Semester Examination
	CIA1 [6 Marks]	CIA2 [6 Marks]	CIA III [8 Marks]	
Remember	20	20	20	20
Understand	50	30	40	40
Apply	30	30	30	30
Analyse	-	20	10	10
Evaluate	-	-	-	-
Create	-	-	-	-

17CS314	ARTIFICIAL INTELLIGENCE	3/0/2/4

Nature of Course	: G (Theory analytical)
Pre requisites	: 17MA107-Discrete Structures

Course Objectives:

1. To understand fundamental concepts in Artificial Intelligence.
2. To understand the problem solving techniques and knowledge representation.
3. To design intelligent components or programs to meet desired needs.
4. To implement, and evaluate a computer-based intelligent systems.

Course Outcomes

Upon completion of the course, students shall have ability to

CO1	Recognize the various types and working units of an expert systems	[R]
CO2	Interpret the logic behind the building of knowledge base and knowledge representation.	[U]
CO3	Apply suitable learning methodology while designing systems based on their applications.	[AP]
CO4	Demonstrate ideas behind different algorithms and their use.	[AP]
CO5	Apply different logical formalisms and decision taking in planning problems.	[AP]

Course Contents:

Agents: Intelligent Agents, Agents and environments, The nature of environments, structure of agents, Problem Solving, problem solving agents, example problems, searching for solutions, uninformed search strategies.

Searching techniques: Informed search strategies, heuristic function, local search algorithms and optimistic problems, local search in continuous spaces. Constraint satisfaction problems (CSP), Backtracking search, Adversarial Search, Optimal decisions in games, Alpha – Beta Pruning, games that include an element of chance.

Knowledge Representation: Introduction to Logical Agents, First order logic, Syntax and semantics for first order logic, Knowledge engineering in first order logic, Inference in First order logic , prepositional versus first order logic , unification and lifting , forward chaining, backward chaining.

Learning: Learning from observations, forms of learning, Inductive learning, Learning decision trees, Ensemble learning, Knowledge in learning, Logical formulation of learning. Statistical learning, Learning with complete data, Learning with hidden variable, Instance based learning, Artificial Neural networks, Kernel Machines, Information retrieval, Information Extraction.Expert System - Representing and using domain knowledge, expert system shells, and knowledge acquisition. Prolog.

Case study: Self driving vehicles

Lab Component

1.	Study of PROLOG. Write the following programs using PROLOG.
2.	Depth First search.

3.	Best First Search.
4.	Travelling sales person problem
5.	8-queens problem
6.	Genetic Algorithm or Simulated annealing algorithm
7.	Simple Expert system using decision tree
8.	Expert system using supervised learning
Total Hours:	**75**

Text Books:	
1	Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", 3rd Edition, Pearson Education / Prentice Hall of India, 2014.
2	Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2001.
Reference Books:	
1	Elaine Rich and Kevin Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw-Hill, 2013.
2	George F. Luger, "Artificial Intelligence-Structures and Strategies for Complex Problem Solving", Pearson Education / PHI, 2002.
Web References:	
1	http://nptel.ac.in/courses/106106126/
2	http://nptel.ac.in/video.php?subjectId=106105079

Assessment Methods & Levels (based on Blooms' Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment				End Semester Examination (Theory) [40 marks]
	Theory			Practical	
	CIA-I [6 marks]	CIA-II [6 marks]	CIA III [8 marks]	Rubric based CIA [40 Marks]	
Remember	20	10	10	-	10
Understand	60	30	20	30	20
Apply	20	30	30	30	30
Analyse	-	30	40	40	40
Create	-	-	-	-	-

17CS209	MICROPROCESSOR LABORATORY	0/0/3/2

Nature of Course : L (Problem experimental)

Course Objectives:

1	To understand the basic programming of Microprocessors and Micro Controllers.
2	To solve various real time problems using Micro controllers and Micro – processors.

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Write the assembly language programming using 8086 Microprocessor.	[AP]
CO2	Able to program using 8051 microcontroller and Interface 8051 with other devices.	[AP]
CO3	Solve real time problems using Arduino Processor.	[AP]
CO4	Program using ARM and to do interfacing with external circuit.	[AP]

Course Content:

Assembly Language programs using 8086, Assembly Language programs using8051, interfacing 8086- stepper motor, interfacing 8051- ADC and PPI, Basic Programming with Arduino- Simple chat Server- Traffic light controller- Gas sensor - Basic programming using ARM- Data Transceiver in ARM using UART

List of Experiments:

S.No.	List of Experiments:	BT
1.	Assembly Language programs using 8086.	[AP]
2.	Assembly Language programs using 8051.	[AP]
3.	Stepper motor control using 8086 Microprocessor.	[AP]
4.	Interfacing 8051 with ADC.	[AP]
5.	Basic Programming with Arduino Kit	[AP]
6.	Design of a Traffic light controller with Arduino.	[AP]
7.	Design a Simple chat Server using Arduino.	[AP]
8.	Basic programming using ARM Processor.	[AP]

Total Hours: 45

Reference Books:

1	A.K.Ray&K.M.Bhurchandi, “Advanced Microprocessors and peripherals- Architectures, Programming and Interfacing”, Third edition, TMH, 2012 Reprint.
2	Mohamed Ali Mazidi, Janice GillispieMazidi, “The 8051 microcontroller and embedded systems”, Pearson Education,2006.
3	Andrew N.Sloss, Dominic Symes and Chris Wright “ ARM System Developer‟s Guide : Designing and Optimizing System Software” , First edition, Morgan Kaufmann Publishers, 2004.
4	Simon Monk “Programming Arduino getting started with sketches”, The McGraw-Hill, 2012.
5	Yu-cheng Liu, Glenn A.Gibson, “Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design”, PHI 2003
6	Steve Furber , “ARM System –On –Chip architecture”, Addision Wesley, 2000.

Web References:	
1	https://www.coursera.org/learn/raspberry-pi-interface/home/welcome
Online Resources:	
1	http://nptel.ac.in/courses/108107029/

Assessment Methods & Levels (based on Bloom's Taxonomy)		
Summative assessment based on Continuous and End Semester Examination		
Bloom's Level	**Rubric based Continuous Assessment [60 marks] (in %)**	**End Semester Examination [40 marks] (in %)**
Remember	-	-
Understand	10	10
Apply	40	40
Analyse	30	30
Evaluate	20	20
Create	-	-

17CS315	COMPUTER NETWORKS LAB	0/0/3/2

Nature of Course : L (Problem experimental)

Course Objectives:

1	To learn socket programming
2	To study and learn the network simulation tools
3	Hands-on Experience on various networking protocols and tools

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Implement various networking protocols using sockets	[AP]
CO2	Analyse the performance of the protocols and algorithms in different layers	[AN]
CO3	Ability to implement algorithms in simulation tools	[E]
CO4	Analyse the network performance using tools and apply the solutions to the problems incurred	[AP]

Course Contents:

1.Study of system administration and network administration
2.Study of socket programming and client server model using UDP and TCP
3.Implementation of Sliding window protocol and stop and wait protocol
4.Write a code simulating PING and TRACEROUTE commands
5.Applications using TCP Sockets like
  a. File transfer
  c. Remote command execution
  d. Chat
  e. Concurrent server
6.Create a socket for HTTP for webpage upload and download
7.Implementation of Subnetting
8.Applications
  a. DNS
  b. SNMP
9.Study of Network Simulator(NS)
10.Study of Wire Shark Tool for SDN and Hypervisor for Network Virtualization.
11. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer.
  i. Link State routing ii. Flooding iii. Distance vector

Total Hours: 45

Reference Books:

1	Craig Hunt, " TCP/IP Network Administration ", O'Reilly Media, 3rd Edition 2002
2	Kenneth L. Calvert, Michael J. Donahoo, "TCP/IP Sockets in Java: Practical Guide for Programmers" , Imprint: Morgan Kaufmann 2008
3	Elliotte Rusty Harold, "Java Network Programming, Developing Networked Applications", O'Reilly Media, 2013
4	Esmond Pitt, "Fundamental Networking in Java", Springer.

5	James F. Kurose, Keith W. Ross, "Computer Networking: A Top-down Approach, Pearson Education, Limited, 6th edition,2012

Web References:	
1	Spoken-tutorial.org
Online Resources:	
1	https://www.coursera.org/learn/object-oriented-java
2	http://nptel.iitm.ac.in

Assessment Methods & Levels (based on Bloom's Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Rubric based Continuous Assessment [60 marks] (in %)	End Semester Examination [40 marks] (in %)
Remember	-	-
Understand	10	10
Apply	40	40
Analyse	30	30
Evaluate	20	20
Create	-	-

17CS316	COMPILER DESIGN	3/0/0/3
Nature of Course	D (Theory Design)	
Pre requisites	17CS312-Theory of Computation, Programming , Computer Architecture	

Course Objectives:

1	To introduce the major concept areas of language translation and compiler design
2	To understand, design and construct a lexical analyzer and parser.
3	To employ code generation schemes
4	To perform optimization of codes and gain knowledge about runtime environments
5	To provide practical programming skills necessary for constructing a compiler using LEX and YACC tools

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Construct a lexical analyzer to identify the tokens in a program	[AP]
CO2	Construct a parser through the application of grammar.	[AP]
CO3	Understand intermediate code generation and symbol table organization techniques	[U]
CO4	Construct a compiler for a small language with code generation and optimization strategies	[AP]

Course Contents:

Introduction to compilers and Syntax analysis :: Phases of a compiler; Cousins of the Compiler; Grouping of Phases; Compiler construction tools , Lexical Analysis , Role of Lexical Analyzer ; Input Buffering; Specification of Tokens; Recognition of Tokens A language for Specifying Lexical Analyzer; Finite Automata - From a regular expression to an NFA and DFA.Syntax Analysis,Role of the parser; Writing Grammars; Context-Free Grammars; Top Down parsing ; Recursive Descent Parsing ; Predictive Parsing ; Bottom-up parsing ; Shift Reduce Parsing ; LR Parsers; SLR Parser; Canonical LR Parser ; LALR Parser; YACC- parser generators.

Intermediate code generation and Code Generation: Intermediate languages; Declarations ; Assignment Statements; Boolean Expressions; Case Statements ; Back patching. Type Checking: Type system; Type checker; Type expression ;Type conversion. Issues in the design of code generator – The target machine – Runtime Storage management – Basic Blocks and Flow Graphs– A simple Code generator – Peephole Optimization

Code Optimization and Run Time Environments- Introduction– Principal Sources of Optimization – Optimization of basic Blocks – DAG representation of Basic Blocks - Introduction to Global Data Flow Analysis – Runtime Environments – Source Language issues – Storage Organization – Storage Allocation strategies – Access to non-local names – Parameter Passing, Error detection and recovery.

Total Hours:	**45**

Text Books:

1.	Alfred Aho, Ravi Sethi, Jeffrey D Ullman, Monica S. Lam,"Compilers Principles, Techniques and Tools" , 2nd Edition, Pearson Education Asia, 2012

Reference Books:

2	C. N. Fischer and R. J. LeBlanc, “Crafting a compiler with C”, Benjamin Cummings, 2010
3	HenkAlblas and Albert Nymeyer, “Practice and Principles of Compiler Building with C”,PHI, 2001
4	Kenneth C. Louden, “Compiler Construction: Principles and Practice”, Thompson Learning, 2003
5	Dhamdhere, D. M., "Compiler Construction Principles and Practice", 2nd edition, Macmillan India Ltd., New Delhi, 2008
Web References:	
1	gatecse.in/category/compiler-design/
2	www.tutorialspoint.com/compiler_design
Online Resources:	
1	http://nptel.ac.in/syllabus/syllabus.php?subjectId=106108113
2	nptel.ac.in/courses/106104123/

Assessment Methods & Levels (based on Blooms’ Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom’s Level	Assessment Component	Marks
CO1	Apply	Tutorial	5
CO2	Apply	Quiz	5
CO3	Understand	Case Study	5
CO4	Apply	Group Assignment	5

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Continuous Assessment (20)			End Semester Examination(40)
	CIA-I [6 marks]	CIA-II [6 marks]	CIA III [8 marks]	
Remember	-	-	-	-
Understand	40	20	40	40
Apply	60	80	60	60
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CS317	SOFTWARE DEVELOPMENT	3/0/0/3

Nature of Course	:G (Theory)
Pre requisites	: 17CS301Computer Science Essentials, 17CS206-Object Oriented Programming using Java

Course Objectives:

1	To discuss the essence of agile development methods.
2	Carry out all stages of an agile software process in a team, to produce working Software.
3	Provide practical knowledge of how to manage a project using Scrum framework.
4	Use test driven development to ensure software quality.
5	Should be able to demonstrate a more advanced capability to apply lean and agile development techniques to solve complex problems.

Course Outcomes:
Upon completion of the course, students shall have ability to

CO1	Describe the driving forces and adopting business value of Agile approaches to software development.	[U]
CO2	Discuss the Agile development practices.	[U]
CO3	Drive development with unit tests using Test Driven Development.	[AP]
CO4	Apply design principles and refactoring to achieve Agility.	[AP]
CO5	Deploy automated build tools, version control and continuous integration	[AP]
CO6	Perform testing activities within an Agile project.	[U]

Course Contents:

Traditional SDLC Models: Waterfall model, Incremental model, Iterative model, RAD model - **Fundamentals of Agile:** The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management, Design and development practices in Agile projects, Test Driven Development, Continuous Integration, Refactoring, Pair Programming, Simple Design, , Agile Testing, Agile Tools

Agile Scrum Framework: Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles – Product Owner, Scrum Master, Scrum Team, Scrum case study, Tools for Agile project management

Agile Testing: The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), xUnit framework and tools for TDD, Testing user stories - acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester.

Agile Software Design and Development: Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles, Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control.

Industry Trends: Market scenario and adoption of Agile, Agile ALM, Roles in an Agile project, Agile applicability, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile projects on Cloud, Balancing Agility with Discipline, Agile rapid development technologies.

		Total Hours:	**45**
Text Books:		
1	**Agile Software Development with Scrum**By Ken Schawber, Mike Beedle, Pearson	
2	**Agile Testing: A Practical Guide for Testers and Agile Teams**By Lisa Crispin, Janet Gregory, Addison Wesley	
Reference Books:		
1	**Agile Software Development, Principles, Patterns and Practices**By Robert C. Martin Publisher: Prentice Hall	
2	**Agile Software Development: The Cooperative Game**By Alistair Cockburn Publisher: Addison Wesley	
3	**User Stories Applied: For Agile Software**By Mike Cohn Publisher: Addison Wesley	
Web References:		
1	www.it-ebooks.info/tag/agile	
2	martinfowler.com/agile.htmlwww.tutorialspoint.com/dbms/	
Online Resources:		
1	www.umsl.edu/~sauterv/analysis/Fall2013Papers/Buric/-5-references.html	
2	https://www.codeproject.com › Development Lifecycle › Design and Architecture	
3	https://www .agilemethodology.org	
4	https://www.versionone.com › Agile 101	
5	https://www .scrummethodology.com	

Assessment Methods & Levels (based on Blooms'Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1	Understand	Online Quiz	3
CO2	Apply	Group Assignment	5
CO3	Apply	Group Assignment	5
CO4,CO5	Apply	Case study	4
CO6	Understand	Online Quiz	3

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination
	CIA-I [6 marks]	CIA-II [6 marks]	CIA III [8 marks]	
Remember	-	-	-	-
Understand	80	40	40	40
Apply	20	60	40	40
Analyse	-	-	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

17CS318	DATA ANALYTICS	3/0/0/3
Nature of Course	G (Theory analytical)	
Pre requisites	-	

Course Objectives:

1	To explain different kinds and sources of Big data.
2	To discuss about different data analytics techniques.
3	To employ very large data sets to make business decisions.
4	To explain dimensionality reduction for big data.
5	To analyze tools and techniques to extract useful information from complex data stores.

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Interpret big data analytics frameworks such as Hadoop Ecosystem and Spark architecture and apply for any specific case studies.	[AP]
CO2	Use real-time analytical methods on streaming datasets to react quickly to customer needs.	[AP]
CO3	Analyze and develop transferable skills needed to create and architect big data systems.	[A]
CO4	Describe about a wide range of big data tools and techniques	[U]
CO5	Analyze big data problems by identifying key requirements, alternative solutions and evaluation methods.	[A]

Course Contents:

Introduction to big Data: Big Data Overview **–** State of the practice in Analytics - Key Roles for the New Big Data Ecosystem - Examples of Big Data Analytics. **MapReduce and the New Software Stack:** Distributed File Systems **–** MapReduce - Algorithms Using MapReduce - Extensions to MapReduce - The Communication Cost Model - Complexity Theory for MapReduce**Finding similar items**: Applications of Near-Neighbor Search - Shingling of Documents - Similarity-Preserving Summaries of Sets - Locality sensitive hashing - distance measures- applications. **Mining data streams:** Stream Data Model - sampling, filtering, counting distinct elements, estimating moments, Counting Ones in a Window, Decaying Windows **Mining frequent itemsets:** Market **–**basket model, A- priori algorithm, Handling Larger Datasets, Limited pass algorithms, Counting Frequent Items in a Stream. **Advanced Analytics-Technology and Tools: MapReduce and Hadoop**:Analytics for Unstructured Data **–** Introduction to Pig, Hive, HBase, Mahout, NoSQL **Case study:** recommendation systems, Content-Based Recommendations, Collaborative Filtering, Dimensionality Reduction,spark architecture ,graph analytics.

Total Hours:	**45**

Text Books:

1	EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015. (Chapter 1 and Chapter 10)
2	Jure Leskovec, AnandRajaraman, Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, Second Edition, 2014. (Chapter 2 ,3, 4 , 6 and 9)

Reference Books:

1	Bart Baesens , “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications“, Wiley Publishers, 2014
2	Bill Franks, “Taming the Big Data Tidal Wave: Finding pportunities in Huge Data

	Streams with Advanced Analytics", John Wiley & sons, 2012
Web References:	
1	https://bigdatauniversity.com/
2	http://www.statistics.com/data-analytics- courses
3	www.ibm.com/Data Analytics/
Online Resources:	
1	https://www.edx.org/course/subject/data-analysis- statistics
2	https://www.coursera.org/browse/data-science/data- analysis?languages=en
3	http://online-learning.harvard.edu/course/big- data-analytics

Assessment Methods & Levels (based on Blooms'Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1	Apply	Quiz	5
CO2	Apply	Group Assignment	5
CO3	Analyze	Class Presentation	5
CO4&CO5	Analyze	Case study	5

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination (60 Marks)
	CIA1 (6 Marks)	CIA2 (6 Marks)	CIA 3 (8Marks)	
Remember	10	10	-	10
Understand	10	10	20	20
Apply	40	20	30	30
Analyse	40	60	50	40
Evaluate	-	-	-	-
Create	-	-	-	-

17CS319	VIRTUALIZATION AND CLOUD	3/0/0/3

Nature of Course	: F (Theory Programming)
Pre requisites	: Computer Networks/ Computer Architecture

Course Objectives:

1.	To explain the basic concepts of cloud infrastructure such as cloud models, services and virtualization.
2.	To identify various solutions for the real time business scenario.
3.	To describe about procedures to implement virtual data centre environment.
4.	To design and configure virtual data centre environment.
5.	To identify Next generation Data center technologies and Cloud API's.

Course Outcomes:
Upon completion of the course, students shall have ability to

CO1	Describe the characteristics of cloud infrastructure and virtualization	[R]
CO2	Describe the virtual data centre's functionalities and cloud computing.	[U]
CO3	Apply configuration procedures to implement virtual data centre environment.	[AP]
CO4	Recognize cloud infrastructure management services and policies.	[R]
CO5	Identify the Next generation technologies with cloud environments.	[A]

Course Contents:

Module 1 - Journey to the Cloud: Drivers for cloud computing - **Cloud Computing Primer**: Definition and Characteristics, Deployment models **–** Private, Public, Hybrid and Community Cloud, Service Models**–** SaaS, PaaS, and IaaS, Cloud Economics and Challenges. **Introduction to Data Center's**: Key Elements of Data Center - Application, DBMS, Compute, Storage and Network: Architecture Of Storage, Analysis and Planning. Storage Network Design Considerations; NAS and FC SANs, Hybrid Storage Networking Technologies (iSCSI, FCIP, FCoE)- Intelligent Storage System. Introduction to Virtualization- Building Cloud Infrastructure **–**A Phased Approach from Classic Data Center to Virtual Data Center - Para Virtualization - Full virtualization - Hardware Assisted Virtualization **–** Benefits

Module 2- Virtualization: Types - **Virtualized Data Center (VDC) – Compute:** Compute Virtualization Benefits, Hypervisor Types, Virtual Machine (VM) and its Resources, VM Resource Management, Physical to Virtual Conversion **–** Process, Benefits and Considerations. **Virtualized Data Center – Storage:** Storage Virtualization Benefits, Storage for VMs, Block and File Level Storage Virtualization, Virtual Provisioning **–** Benefits and Best Practices, Storage Tiering**. Virtualized Data Center – Networking:** Network Virtualization Benefits, VDC Network Infrastructure Components, VLANS, and Network Traffic Management Techniques. **Virtualized Data Center – Desktop and Application:** Desktop, Application, and User State Virtualization **–** Benefits, Tools, and Deployment Methods.

Module 3 - Public Cloud Services: Amazon Web Services (AWS) - Working with AWS, Amazon Elastic Compute Cloud (Amazon EC2)- Launching EC2 in AWS, Amazon Simple Storage Service (Amazon S3), IOT in AWS**- Advanced Topics in Cloud Computing:** Introduction to big data, Big data on AWS, Azure, Google's cloud solutions.

	Total Hours:	**45**
Text Books:		
1	Cloud Infrastructure and Services Participant Guide Volume 1 & 2 (EMC Education Services,Oct 2011)	
2	M. Haines, S. Kaplan, D. Epping and B. Lin," Cloud Computing with VMware vCloud Director" (Short Topics in System Administration) (Kindle eBook, 2011, ISBN 978-1-931971-83-6)	
3	S.R. Smoot and N. K. Tan," Private Cloud Computing: Consolidation, Virtualization, and Service-Oriented Infrastructure" (Elsevier, 2012, ISBN: 978-0-12-384919-9)	
4	RajkumarBuyya, Christian Vacchiola, S ThamaraiSelvi, "Mastering Cloud computing", McGraw Hill, 2013	
5	Barrie Sosinsky, "Cloud Computing Bible", Wiley Publishers, 2010	
6	K. Chandrasekaran, "Essentials of Cloud Computing", CRC Press, 2014.	
Reference Books:		
1	J. Rhoton, R Haukioja,"Cloud Computing Architected: Solution Design Handbook" (Recursive Press, 2011, ISBN 978-0-9563556-1-4)	
2	T. Petrocelli,"Data Protection and Information Lifecycle Management"(Prentice Hall, 2006, ISBN 0131927574)	
Web References:		
1	http://www.nptel.ac.in	
2	http://www.brainbell.com/tutors/A+/Hardware/Preventive_Maintenance.htm	
3	http://www.technologystudent.com/elec1/dig1.htm	
Online Resources:		
1	https://www.edx.org/course/introduction-cloud-infrastructure-linuxfoundationx-lfs151-x	
2	https://www.aws.training/training.com	

Assessment Methods & Levels (based on Blooms' Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1	Remember	Quiz	**2**
CO2	Understand	Quiz	**3**
CO3	Apply	Group Assignment	**5**
CO4	Apply	Technical Presentation	**5**
CO5	Analyse	Technical Presentation	**5**

Summative Assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination [60]
	CIA1 [6]	CIA2 [6]	CIA3 [8]	
Remember	50	30	30	30
Understand	50	50	40	40
Apply	-	20	20	20
Analyse	-	-	10	10
Evaluate	-	-	-	-

Create	-	-	-	-

17CS320 **COMPILER DESIGN LAB** **3/0/0/3**

Nature of Course :L (Programming)

Course Objectives:

1. To learn the concept of token separation.
2. To study the working of LEX and YACC tools.
3. To understand the construction of various types of parsers.
4. To understand the various phases of compilers.

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1 Implement a lexical analyzer which generates tokens for C statements using C and LEX tool. [AP]
CO2 Implement syntax Analyzers using C and YACC tool [AP]
CO3 Construct Symbol table using C Language [AP]
CO4 Implement Front end and Back end of a compiler for simple C statements [AP]

Course Contents:

1. Implementation of lexical analyzer using C and LEX TOOL.
2. Implementation of a calculator that takes an expression (with digits, + and *), computes and prints its value, using YACC.
3. Implementation of a parser using LEX and YACC.
4. Implementation of symbol table
5. Implementation of Predictive parsing.
6. Implementation of Shift Reduce Parsing Algorithm.
7. Implementation of LR parsing.
8. Implement the front end of a compiler that generates the three address code for a simple language with:
   One data type integer, arithmetic operators, relational operators, variable declaration statement, one conditional construct, one iterative construct and assignment statement.
9. Implement the back end of the compiler which takes the three address code as input and produces assembly language instructions that can be assembled and run using an 8086 assembler. The target assembly instructions can be simple move, add, sub, and jump.
10. Implementation of the code optimizer phase of a compiler that eliminates dead code and common sub-expressions.

Total Hours: 45

REFERENCES:

1. Alfred V. Aho, Jeffrey D Ullman, “Compilers: Principles, Techniques and Tools”, Pearson Education Asia, 2012
2. C. N. Fischer and R. J. LeBlanc, “Crafting a compiler with C”, Benjamin Cummings, 2010.

Web References:

1. gatecse.in/category/compiler-design/
2. www.tutorialspoint.com/compiler_design

Online Resources:

1. https://nptel.ac.in/courses/106108052/

Assessment Methods & Levels (based on Bloom'sTaxonomy)		
Summative assessment based on Continuous and End Semester Examination		
Bloom's Level	**Rubric based Continuous Assessment[60 marks] (in %)**	**End Semester Examination [40 marks] (in %)**
Remember	-	-
Understand	20	20
Apply	50	50
Analyse	30	30
Evaluate	-	-
Create	-	-

17CS321	CASE TOOLS LABORATORY	0/0/3/2

Nature of Course	M (Practical application)

Course Objectives:

1	To identify the team role and the individual tasks
2	To categorize user stories and facilitate project estimation
3	To identify sprint backlog and start sprint
4	Apply Test Driven Development for developing working model

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Illustrate the Agile Scrum development practices.	[AP]
CO2	Select automated build tools, version control and continuous integration.	[A]
CO3	Examine testing activities within an Agile project using JUnit.	[A]
CO4	Apply Jenkins for Continuous Integration Process	[AP]

List of Experiments:

1. Understand a given business scenario and identify product backlog, user stories and sprint tasks
2. Define user stories for a given feature
3. Fill user stories, sprint schedule and sprint tasks in an Agile tool such as AgileFant
4. Write unit tests aligned to xUnit framework for TDD
5. Refactor a given design for next sprint requirements
6. Execute continuous integration using a tool such as Jenkins

Total Hours:	**45**

Reference Books:

1	**Agile Software Development with Scrum**By Ken Schawber, Mike Beedle Publisher: Pearson
2	**Agile Testing: A Practical Guide for Testers and Agile Teams**By Lisa Crispin, Janet Gregory Publisher: Addison Wesley

Web References:

1	www.it-ebooks.info/tag/agile
2	http://martinfowler.com/agile.html
3	www.tutorialspoint.com/dbms/

Assessment Methods & Levels (based on Bloom'sTaxonomy)

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Rubric based Continuous Assessment[60 marks] (in %)	End Semester Examination [40 marks] (in %)
Remember	-	-

Understand	20	20
Apply	50	50
Analyse	30	30
Evaluate	-	-
Create	-	-

17CS322	CLOUD AND DATA ANALYTICS LAB	0/0/3/2

Nature of Course	L (Problem experimental)
Pre requisites	Data Mining techniques and numerical methods

Course Objectives:

1	To introduce tools like Hadoop, NoSQL and MapReduce, to manage and analyze big data .
2	To demonstrate the Hive/HBase tool to work on unstructured data.
3	To explore and analyse the statistical data and to implement various case studies using R programming
4	To understand the concepts of VM installation, cloud configuration and storage Management applications.

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Develop algorithms for manipulating, storing, and analyzing big data.	[AP]
CO2	Set up Virtual Machines and Virtual Storage Management Applications	[U]
CO2	Analyse the fundamentals and operating mechanisms of Hadoop.	[A]
CO3	Manage and store the structured and unstructured data in various platforms using Hive/HBase tools.	[AP]
CO4	Investigate various case studies and report statistical results with appropriate visualization using R programming	[A]

List of Experiments:

1. Case study on type 1 hypervisor and type 2 hypervisor
2. Installation and configuration of Hadoop.
3. Implementation of a virtualized data centre
4. Creating a warehouse application in a website
5. Implementation of network traffic management technique in a virtual machine
6. Deploy the Hadoop tool and use its function for analysing data
7. Deploy Oracle NoSQL database and process unstructured data
8. Demonstrate the functions of HIVE tool
9. Statistical analysis using R programming
10. Make Intelligent Business Decisions using Association Rule mining using R programming
11. Cluster the customers based on buying behaviour using HIVE/Hadoop
12. Case Studies on student selecting higher education and tweets Whatsapp and Facebook text classification in social media using R programming.

Total Hours:	**45**

Text Books:

1	Michael Minelli, Michehe Chambers, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business", 1st Edition, AmbigaDhiraj, Wiely CIO Series, 2013.
2	ArvindSathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", 1st Edition, IBM Corporation, 2012.

Reference Books:

1	Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, 1st Edition, Wiley and SAS Business Series, 2012.
2	Tom White, “Hadoop: The Definitive Guide”, 3rd Edition, O’reilly, 2012
Web References:	
1	http://www.coreservlets.com/hadoop-tutorial/
2	http://www.javatpoint.com/hive
3	https://www.tutorialspoint.com/hbase/
Online Resources:	
1	http://www.javatpoint.com/nosql-databases
2	https://www.globus.org/sites/default/files/150421_Globus_BioIT2015_Workshop.pdf

Assessment Methods & Levels (based on Bloom’sTaxonomy)

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Rubric based Continuous Assessment[60 marks] (in %)	End Semester Examination [40 marks] (in %)
Remember	-	-
Understand	-	-
Apply	40	40
Analyse	30	30
Evaluate	20	20
Create	10	10

17CS323	INTERNET OF THINGS	3/0/0/3
Nature of Course	D (Theory Application)	
Pre requisites	16CS208-Microprocessors & Microcontrollers	
Course Objectives:		
1	To understand the fundamentals of Internet of Things.	
2	To understand the design methodology of IoT.	
3	To build a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.	
4	To apply the concept of Internet of Things in the real world applications	
Course Outcomes: **Upon completion of the course, students shall have ability to**		
CO1	Attain the fundamental knowledge on Internet of Things	U
CO2	Determine the market perspectives on Internet of Things.	U
CO3	Build basic IoT systems using Raspberry Pi, Arduino on Embedded Platform.	AP
CO4	Design and develop a real world IoT systems	AP
Course Contents:		
FUNDAMENTALS OF IOT - Introduction **–** Characteristics - Physical design - Protocols **–** Logical design **–** Enabling technologies **–** IoT Levels **–** Domain Specific IoTs **–** IoTvs M2M. **IOT DESIGN METHODOLOGY -** IoT systems management **–** IoT Design Methodology **–** Specifications Integration and Application Development. **BUILDING IOT WITH RASPBERRY PI -** Physical device **–** Raspberry Pi Interfaces **–** Programming **–** APIs / Packages **–** Web services. **BUILDING IOT WITH ARDUINO –** Physical Device - Interfaces - Arduino IDE **–** Programming: Digital IO **–**Analog IO **–** Serial Communication - Programming with ESP8266 NodeMCU. **IOT on CLOUD** - Connecting IoT to cloud **–** Cloud Storage for IoT **–** Data Analytics for IoT **–** Software & Management Tools for IoT. **CASE STUDIES:** Weather Monitoring System **–** Smart Lighting - Air pollution Monitoring System **–** Smart Plant irrigation System **–** Forest Fire Detection System.		
	Total Hours:	**45**
Text Books:		
1	ArshdeepBahga and Vijay Madisetti, **"Internet of Things: A Hands-on Approach"**, Universities Press, 2015, ISBN: 978-81-7371-954-7.	
2	Dr. Simon Monk, **"Programming the Raspberry Pi: Getting Started with Python"**, Second Edition, McGraw-Hill Education, 2016.	
Reference Books:		
1	Raj Kamal, **"Internet of Things",** Edition 1, McGraw Hill Education, 2017, ISBN: 9789352605224.	

2	Gaston C. Hillar**"Internet of Things with Python",** Packt Publishing, 2016.
3	AdrianMcEwen, **"Designing the Internet of Things",** Wiley Publishers, 2013, ISBN: 978-1-118-43062-0.
4	MarcoSchwartz,**"InternetofThingswiththeArduinoYun",**PacktPublishing,2014.
Web References:	
1	www.ptc.com › Internet of Things (IoT)
2	http://wwwusers.di.uniroma1.it/~spenza/files/labIoT2015/Lab-IoT-1.pdf
3	http://www.nptel.ac.in
Online Resources:	
1	http://www.iotlab.eu/
2	http://www.libelium.com/resources/top_50_iot_sensor_applications_ranking/

Assessment Methods & Levels (based on Blooms'Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1, CO2	Understand	Online Quiz	5
CO2, CO3	Understand, Apply	Group Assignment	5
CO4	Apply	Mini Project	10

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination
	CIA1	CIA2	CIA3	
Remember	-	-	-	-
Understand	50	40	40	50
Apply	50	60	60	50
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CS324	WEB TECHNOLOGY	3/0/0/3

Nature of Course	F (Theory programming)
Pre requisites	FUNDAMENTALS OF OPEN SOURCE SOFTWARE

Course Objectives:

1	To impart the knowledge of web services in the era of social web.
2	To comply software development skills using Java Network Programming for Real World Applications
3	To recognize the user experience design methodologies like AJAX and Responsive Web Design.
4	To relate web data using XML and devise web pages using JSP and Servlets.

Course Outcomes:
Upon completion of the course, students shall have ability to

CO1	Incorporate aesthetics and formal concepts of layout and organization to design websites that effectively communicate using visual elements.	[R]
CO2	Illustrate the Messaging Protocols and networking concepts using Java Network programming.	[U]
CO3	Ability to comprehend approaches for providing security for XML documents as well as messages enhanced among web services.	[U]
CO4	To design and develop web based systems using technologies like JSP, Servlet.	[AP]

Course Contents :

Web Essentials: History of Web and Internet - HTTP Request and Response Message - Introduction to Client - Server Computing: Web Client - Web Servers - IIS, PWS and Apache - virtual reality over the web. Markup Languages: Traditional HTML and XHTML: Basic HTML Syntax and Semantics- Lists - Tables - Forms- HTML5 Document Structure Changes - CGI Scripts- Style Sheets: CSS3 Emerging Features - Case Study (Building a Responsive Web Site From Scratch).

Java Network Programming & Web Data Representation: Java Network Programming: Looking up Internet Address - Socket programming - Client/Server programs - E-mail client - SMTP - POP3 programs - web page retrieval. Web Data Representation**:** XML - Documents and Vocabularies - Namespaces - JavaScript and XML - Ajax - Node.js - React.js - Angular.js - DOM based XML processing Event - SAX - Transforming XML Documents - Displaying XML Documents in Browsers - Simple Object Access Protocol (SOAP) - Case Study (Vue.js).

Java Servlets & JSP: Java Servlets:Architecture - Overview - A Servlet - Generating Dynamic Content - Life Cycle - Handling HTTP GET and POST Requests - Parameter Data - Sessions - Cookies - URL Rewriting - Other Capabilities – Multi-Tier Application (JDBC) - Case Study - Related Technologies. JSP: Introduction to Java Server Page (JSP) - JSP and Servlets JSP Applications - Basic JSP - JavaBeans Classes and JSP - Model - View - Controller Paradigm - Case Study (Book Store Web Application).

Total Hours:	**45**

Text Books:

1	Thomas a Powell, 'HTML & CSS: The Complete Reference', 5th Edition, Tata McGraw Hill Education Private Limited, 2010.
2	Elliotte Rusty Harold, 'Java Network Programming', 4th Edition, O'Reilly Publishers, 2014.
3	DeitelDeitel Goldberg, 'Internet and World Wide Web – How to program', 5th Edition,

	Prentice Hall Publishers, 2012.
Reference Books:	
1	Herbert Schildt, "The Complete Reference - Java2", Tata McGraw - Hill, 9th Edition,2015.
2	Black Book, "Java Server Programming", Dreamtech Press, 2008.
3	“Virtual Reality Technology” by GrigoreBurdea and Philippe Coiffet. Wiley-IEEE, 2017.
Web References:	
1	http://www.w3schools.com/
2	http://www.webbasedprogramming.com
3	https://xwss.java.net/
4	https://nptel.ac.in/courses/106105084/
Online Resources:	
1	http://www.aitel.hist.no/prosjekter/ekstern/mecpol/poi/lessons/08/
2	www.laureateci.it/insegna/programrete/lab /ichapter_21.pdf

Assessment Methods & Levels (based on Blooms’Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom’s Level	Assessment Component	Marks
CO1	Remember	Quiz	5
CO2	Understand	Coding	5
CO3	Understand	Class Presentation	5
CO4	Apply	Group Project	5

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	CIA III [8 marks]	
Remember	20	40	20	20
Understand	80	60	40	40
Apply	-	-	40	40
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CS325	INTERNET OF THINGS LABORATORY	0/0/3/2

Nature of Course	L (Problem Experimental)

Course Objectives:

1.	To learn the Physical architecture and Interfaces of Arduino and Raspberry Pi
2.	To build a small low cost embedded system using Arudino, Raspberry PI
3.	To build a small low cost IoT system using Arduino – NodeMCU and Raspberry PI
4.	To apply the concept of Internet of Things in the real world scenario.

Course Outcomes:
Upon completion of the course, students shall have ability to

CO1	Attain the fundamental knowledge on Internet of Things	U
CO2	Configure the IoT modules such as Ardunio, Raspberry Pi.	U
CO2	Build basic IoT systems using Raspberry Pi, Arduino on Embedded Platform.	AP
CO3	Design and develop a real world IoT systems	AP

List of Experiments:

1. Basic Programming using Arduino/NodeMCU
2. Basic Programming using Raspberry Pi.
3. Design and development of Waether Monitoring System.
4. Design and development of Air Pollution identification System.
5. Design and development of Automatic Irrigation system
6. Design and Development of Theft Identification alert system
7. Design and Development of health abnormal alert system

Total Hours:	**45**

Text Books:

1	ArshdeepBahga and Vijay Madisetti, **"Internet of Things: A Hands-on Approach"**, Universities Press, 2015, ISBN: 978-81-7371-954-7.
2	Dr. Simon Monk, **"Programming the Raspberry Pi: Getting Started with Python"**, Second Edition, McGraw-Hill Education, 2016.

Reference Books:

1	Raj Kamal, **"Internet of Things",** Edition 1, McGraw Hill Education, 2017, ISBN: 9789352605224.
2	Gaston C. Hillar**"Internet of Things with Python",** Packt Publishing, 2016.
3	AdrianMcEwen, **"Designing the Internet of Things",** Wiley Publishers, 2013, ISBN: 978-1-118-43062-0.
4	MarcoSchwartz,**"InternetofThingswiththeArduinoYun",**PacktPublishing, 2014.

Web References:	
1	www.ptc.com › Internet of Things (IoT)
2	http://wwwusers.di.uniroma1.it/~spenza/files/labIoT2015/Lab-IoT-1.pdf
3	http://www.nptel.ac.in
Online Resources:	
1	http://www.iotlab.eu/
2	http://www.libelium.com/resources/top_50_iot_sensor_applications_ranking/

17CS326	WEB TECHNOLOGY LABORATORY	0/0/3/2

Nature of Course : L(Problem Experimental)

Course Objectives:

1.	To create and validate dynamic web pages using HTML and CSS.
2.	To comply the working of network using Java Network Programming for Real World Applications.
3.	To design web data using XML and devise web pages using JSP and Servlets.

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Design and implement dynamic websites with good aesthetic sense of designing and latest technical know-how's.	[U]
CO2	Create fully functional website using MVC.	[C]
CO3	Get introduced in the area of Game Programming using Java Game Programming and XML.	[C]

Course Contents:

1. Create a website using HTML and all types of CSS.
   - To embed an image map in a web page.
   - To fix the hot spots.
   - Show all the related information when the hot spots are clicked.
2. Java game programming and XML (XSL, XSLT): 2D, 3D Graphics, Event Handling and developing
   Online Games.
3. Write programs in Java using Servlets : To invoke servlets from HTML forms.
4. Client /Server Programs using JAVA.
5. Programs using AJAX.
6. Write programs in Java to create three-tier applications using JSP and Databases
   - For conducting on line examination.
   - For displaying student mark list. Assume that student information is available in a database which has been stored in a database server.

Total Hours: 45

Reference Books:

1. Thomas a Powell, 'HTML & CSS: The Complete Reference', 5th Edition, Tata McGraw Hill Education Private Limited, 2010.
2. Elliotte Rusty Harold, 'Java Network Programming', 4th Edition, O'Reilly Publishers, 2014.
3. DeitelDeitel Goldberg, 'Internet and World Wide Web – How to program', 5th Edition, Prentice Hall Publishers, 2012.
4. Herbert Schildt, "The Complete Reference - Java2", Tata McGraw - Hill, 9th Edition,2015.
5. Black Book, "Java Server Programming", Dreamtech Press, 2008.

Web Reference:

1. http://www.w3schools.com/
2. http://www.webbasedprogramming.com
3. https://xwss.java.net/

4. https://nptel.ac.in/courses/106105084/

Assessment Methods & Levels (based on Blooms' Taxonomy)		
Summative assessment based on Continuous and End Semester Examination		
Bloom's Level	**Rubric based Continuous Assessment [60 marks] (in %)**	**End Semester Examination [40 marks] (in %)**
Remember	-	-
Understand	20	20
Apply	-	-
Analyse	-	-
Evaluate	-	-
Create	40	20

17CS401	WIRELESS NETWORKS	3/0/0/3

Nature of Course	C (Theory Concept)
Pre requisites	NIL

Course Objectives:

1	To recognizethe Wireless networks, protocol stack and standards.
2	To illustrate the fundamentals of 3G Services, its protocols and applications.
3	To apply the fundamentals of 4G Networks, its architecture and applications

Course Outcomes:
Upon completion of the course, students shall have ability to

CO1	Identify the latest 3G / 4G and WiMax networks and its architecture.	[U]
CO2	Implement wireless network environment for any application using latest wireless protocols and standards.	[AP]
CO3	Determine the different type of applications for smartphones and mobile devices with latest network strategies.	[AP]

Course Contents:

WIRELESS LAN- Introduction, WLAN technologies: Infrared, UHF narrowband, spread spectrum,IEEE802.11: System architecture, protocol architecture, physical layer, MAC layer, 802.11b, 802.11a **–**Hiper LAN: WATM, BRAN, HiperLAN2 **–** Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security , IEEE802.16,WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX.

MOBILE NETWORK LAYER-Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation,Mobile IP session initiation protocol, mobile adhoc network: Routing, Destination Sequence distance vector, Dynamic source routing. Mobile Transport Layer **-**TCP enhancements for wireless protocols , Traditional TCP: Congestion Control, fast retransmit/fast recovery, Implications of mobility , Classical TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, Transaction oriented TCP , TCP over 3G wireless networks. Mobile Application Layer: Mobile computing platforms (android), energy efficiency of apps.

WIRELESS WIDE AREA NETWORK-Overview of UTMS Terrestrial Radio access network, UMTS Core network Architecture: 3G,MSC, 3G,SGSN, 3G,GGSN,SMS,GMSC/SMS,IWMSC, Firewall, DNS/DHCP, High speed Downlink packet access (HSDPA), LTEnetwork architecture and protocol. **4G NETWORKS -**4G vision **–** 4G features and challenges, Applications of 4G **–** 4G Technologies: Multicarrier Modulation, Smart antenna techniques, OFDM,MIMO systems, Adaptive Modulation and coding with time slot scheduler, Cognitive Radio.

Total Hours:	**45**

Text Books:

1.	Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education 2012.
2.	Vijay Garg , "Wireless Communications and networking", First Edition, Elsevier 2007.

Reference Books:

1	Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, “3G Evolution HSPA and LTE for Mobile Broadband”, Second Edition, Academic Press, 2008.
2	Anurag Kumar, D.Manjunath, Joy kuri, “Wireless Networking”, First Edition, Elsevier 2011.
3	Simon Haykin , Michael Moher, David Koilpillai, “Modern Wireless Communications”, First Edition,Pearson Education, 2013.
Web References:	
1	http://nptel.ac.in/syllabus/syllabus.php?subjectId=117999903
2	http://nptel.ac.in/courses/106105081/23
Online Resources:	
1	https://www.tutorialspoint.com/wireless_communication
2	http://www.l-com.com/content/Article.aspx?Type=L&ID=210

Assessment Methods & Levels (based on Blooms’Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom’s Level	Assessment Component	Marks
CO1	Understand	Classroom or Online Quiz	5
CO2	Apply	Class Presentation/Power point presentation	5
CO3	Apply	Group Assignment	10

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Continuous Assessment			End Semester Examination
	CIA1(10)	CIA2(10)	CIA3(10)	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	50	50	50	50
Analyze	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CS402	CRYPTOGRAPHY AND NETWORK SECURITY	3/0/0/3
Nature of Course	C (Theory Concept)	
Pre requisites	Computer Networks	
Course Objectives:		
1	To perceive different types of modern cryptographic techniques.	
2	To study the concepts of public key encryption and number theory.	
3	To analyze authentication standards and applications.	
4	To comprehend the network security and applications.	
5	To grasp the concepts of main security threats and techniques to diminish threats in communication networks.	
Course Outcomes: **Upon completion of the course, students shall have ability to**		
CO1	Identify computer and network security threats, classify the threats and develop a security model to prevent, detect and recover from the attacks.	[AP]
CO2	Encrypt and decrypt messages using block ciphers, sign and verify messages using well known signature generation and verification algorithms.	[R]
CO3	Illustrate the number theory & generate the public key.	[U]
CO4	Analyze existing authentication and key agreement protocols; identify the weaknesses of these protocols.	[A]
CO5	Download and install an e-mail and file security software, PGP, and efficiently use the code to encrypt and sign messages.	[AP]
Course Contents:		
Course Contents with Course Outcomes/Blooms Taxonomy/Assessment Methods **Encryption techniques:** Security goals-OSI Security Architecture(attacks,Services,Mechanisms)- **Symmetric ciphers:** Classical Encryption techniques- Block Cipher Principles - Data Encryption Standard-Triple DES- Advanced Encryption Standard- Block cipher modes of operations **Asymmetric ciphers:** Fermat's theorem-Testing of primality- Chinese remainder theorem- Diffie-Hellman key Exchange **–** Elliptic Curve Architecture and Cryptography-public-key cryptography and RSA **Message Authentication Codes:** Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions,MD5 message Digest algorithm - Secure Hash Algorithm (SHA)-RIPEMD **–** HMAC- Digital Signatures standards **Key Management and distribution:** Symmetric key distribution-Public key distribution-X.509 Certificates-Public key Infrastructure **Electronic Mail Security**: PGP **–** S/MIME **IP Security:** Architecture-Authentication header-Encapsulating security payloads **Web Security:** SSL,TLS,SET **System Security:** Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls. Trusted systems **–** Practical implementation of cryptography and security.		
	Total Hours:	**45**
Text Books:		
1	William Stallings, "Cryptography and Network Security **–** Principles and Practices", 5th edition,Prentice Hall of India,2011.	
2	Behrouz A.Forouzon,"Cryptography and network security", 2nd edition, Tata McGraw-Hill, 2010.	

Reference Books:	
1	AtulKahate, “Cryptography and Network Security”, 2nd edition, Tata McGraw-Hill, 2009.
2	Bruce Schneier, “Applied Cryptography”, 2nd edition, John Wiley & Sons Inc, 2007.
3	Charles B. Pfleeger, Shari Lawrence Pfleeger, “Security in Computing”, 4th Edition, Pearson Education, 2007.
Web References:	
1	http://www.iitg.ac.in/icdcn2006/isg.pdf
2	http://www.tutorialspoint.com/cryptography/
3	http://www1.se.cuhk.edu.hk/~eclt5740/
Online Resources:	
1	http://nptel.ac.in/courses/106105031/
2	http://www.nptelvideos.in/2012/11/cryptography-and-network-security.html
3	http://freevideolectures.com/Course/3027/Cryptography-and-Network-Security
4	https://www.coursera.org/learn/crypto

Assessment Methods & Levels (based on Blooms’Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom’s Level	Assessment Component	Marks
CO1	Apply	Assignment	4
CO2	Remember	Problem Solving	4
CO3	Understand	Problem Solving	4
CO4	Analyse	Technical presentation	4
CO5	Apply	Tutorial	4

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Continuous Assessment			End Semester Examination [60]
	CIA1 [6]	CIA2 [6]	CIA 3 [8]	
Remember	20	20	10	10
Understand	80	40	40	40
Apply	-	40	30	30
Analyse	-	-	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

17CS403 **DISTRIBUTED SYSTEMS** **3/0/0/3**

Course Objectives:

- To understand the basics of networking and the protocols used in distributed environment.
- To have a basic understanding of the principles and practice in the area of Distributed Systems
- To evaluate the impact of memory on parallel/distributed algorithm formulations and validate their performance
- To gain knowledge on deadlock and how it is resolved in distributed system
- To gain knowledge of how to design and implement distributed algorithms
-

Course Outcomes

Upon completion of the course, students shall have ability to

CO1	Analyse various issues in the design and implementation of distributed	[A]
CO2	Categorize the various system models, communication between client and server	[U]
CO3	Apply the knowledge of deadlock methods and its algorithms	[AP
CO4	Understand the significance of distributed file system with real time applications	[U]

Course Contents

Definition of a distributed systems, Examples, Resource sharing and the Web, Challenges, System models, Architectural and fundamental models, Networking Interprocess communication, External data representation and marshalling, Client-server and Group communication.

Communication Introduction to Message Passing, Advantages and features of message passing, Message format, Message Buffering, Remote Procedure Call, Extended RPC Models, Remote Object Invocation, Message Oriented Communication. **Processes And Synchronization** Threads, code migration, clock synchronization, logical clocks, global state, Election algorithms, mutual exclusion, Distributed transaction. **Distributed Deadlock Detection** System model, Resources vs. communication deadlocks, deadlock prevention, avoidance, detection and resolution, Centralized deadlock detection, distributed deadlock detection, path pushing and edge chasing algorithm **Distributed Shared Memory** Introduction, General architecture of distributed shared memory, Design and implementation, Issues of DSM, Granularity, structure of shared memory space, consistency models, thrashing, advantages of Distributed AlgorithmsSynchronous network model - Algorithms: leader election, - Asynchronous network model - Asynchronousnetwork algorithms: leader

election in a ring and an arbitrary network. Case Study: CORBA(CORBA RMI and Services)

TotalHours 45

Text Books:

1. Andrew Tanenbaum, Maarten Van Steen, "Distributed System- Principals Paradigm", Maarten van SteenPublication,2016
2. Singhal and Shivratri, "Advanced Concept inOperating Systems", McGraw Hill,2015

Reference Books:

1. SunitaMahajan, Seema Shah, " Distributed Computing", Oxford, secondedition,2013
2. Pradeep K. Sinha "Distributed Operating Systems", Prentice Hall of IndiaPrivate,2012

Web References:

1. http://www.nptel.ac.in/courses/106106107/

Online Resources:

1. https://www.wiziq.com/tutorials/distributed-computing

Assessment Methods & Levels (based on Bloom'sTaxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outco	**Bloom's Level**	**Assessment Component**	**Marks**
C01	Analyse	Case Study	**5**
C02	Understand	Technical Presentation	**5**
C03	Apply	Group Assignment	**5**
C04	Understand	Online Quiz	**5**

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	**Continuous Assessment**			**EndSemesterExamination**
	CIA1(6)	**CIA2 (6)**	**CIA 3 (8)**	
Remember	10	25	40	40
Understand	30	15	40	40
Apply	0	10	10	10
Analyse	10	0	10	10
Evaluate	0	0	0	0
Create	0	0	0	0

17CS404	MOBILE APPLICATION DEVELOPMENT	3/0/0/3

Nature of Course	(E) Theory skill based

Course Objectives:

1	To be exposed to technology and business trends impacting mobile applications.
2	To express Mobile design Principles.
3	Create an application using multimedia Components.
4	To develop an application using specific mobile development frameworks

Course Outcomes:
Upon completion of the course, students shall have ability to

CO1	Describe the Mobile application development architecture	[U]
CO2	Construct the mobile application framework.	[AP]
CO3	Develop application for Android devices.	[AP]

Course Contents:

Introduction –Introduction to mobile application- Market values for mobile applications-System requirements for mobile application- Mobile application development architecture. Android Programming: Android toolkit, Java for android, components of an Android Application , Eclipse Concepts and Terminology, Eclipse Views and Perspectives, Eclipse and Android, Effective java for Android, Building a View, Fragments and Multiplatform Support, Drawing.
Designing Application Using Android: Developing user Interfaces-Layout **–**Input Controls and Events-Menus-Dialogs, Notification and Toasts **Multimedia & Services:** Lifecycle of a Service -GPS **–** Android location API- WIFI- Playing audio, video- Messaging and Telephony services.
Handling and Persistent Data : Introduction to SQLite -SQLite Programming-Android Database API-Connection and Operations **–**APK Conversion Process-App Publishing Guidance-Introduction to Fire Base -Case study-Application Development for Uplifting the Farmer through a Connected Eco System; Epidemiological Survey Application Builder.

Total Hours:	45

Text Books:

1.	Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012.
2.	Laird Dornin, G. Blake Meike, and Masumi Nakamura, Programming Android by ZigurdMednieks, O'Reilly Media, 2012.

Reference Books:

1	James Dovey and Ash Furrow, "Beginning Objective C", Apress, 2012.
2	Paul Deitel,HarveyDeitel, Android for programmers an app-driven approach Deitel developer series,AbbeyDeitel,Michael Morgano-2012

	Pearson Education, Inc
Web References:	
1	https://www.tutorialspoint.com/android/
2	https://www.journaldev.com/android
3	https://www.raywenderlich.com/5114-firebase-tutorial-for-android-getting-started
Online Resources:	
1	https://www.codementor.io/collections/learn-android-development-bwba0mlle
2	https://www.javatpoint.com/android-tutorials
3	https://nptel.ac.in/courses/106106156/

Assessment Methods & Levels (based on Blooms'Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1	Understand	Classroom or Online Quiz	5
CO2	Apply	Mini project	10
CO3	Apply	Group Assignment	5

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination
	CIA1 6	CIA2 6	CIA3 8	
Remember	20	20	20	20
Understand	40	40	40	40
Apply	20	20	20	20
Analyse	20	20	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

17CS405	Mobile Computing	3/0/0/3

Nature of Course	G (Theory analytical)
Prerequisites	NIL

Course Objectives:

1	To Describe the concepts of telecommunication networks.
2	To Explain the basic concepts of Mobile IP.
3	To Discuss the sessions of initiation protocol
4	To Explain mobile middleware and mobile operating system

Course Outcomes :

Upon completion of the course, students shall have ability to

CO1	To Explain the fundamentals of mobile communication	[U]
CO2	Summarize the significance of different layers in mobile system	[U]
CO3	To interpret the mobile middleware	[AP]
CO4	To illustrate mobile content applications	[AP]

Course Contents

TELECOMMUNICATION NETWORKS

Telecommunication systems –Spread spectrum techniques -GSM –GPRS –DECT –3G Wireless Systems-UMTS core Network Architecture –Satellite Networks -Basics –Parameters and Configurations.

MOBILE NETWORK LAYER

Introduction to Mobile IP –Components of mobile IP network -Agent Discovery –Registration –tunneling –security -Dynamic Host Configuration Protocol -Routing –DSDV –DSR –Alternative Metrics -Capacity Allocation –FAMA and DAMA

TRANSPORT AND APPLICATION LAYERS

Traditional TCP –Classical TCP improvements –Introductionto SIP, SIP Architecture, Applications, Services.

MOBILE MIDDLEWARE

Mobile middleware -Middleware for Application development –Adaptation –Mobile Agents -Service Discovery Middleware –Services -Garbage Collection–Enting -Security.

MOBILE OPERATING SYSTEMS

Android OS –Architecture –Security -ios -Palm OS -Windows CE -Symbion OS -Linux for Mobile DevicesCASE STUDY: Global System of Mobile Communication

Total Hours	45

Text Books:

1.	" Jochen Schiller, “Mobile Communications”, PHI/Pearson Education, 2nd Edition, 2008.

2.	" Professional Android Application Development " John Wiley & Sons, 18-Dec-2008 -Wiley India Edition

Reference Books:

1.	KavehPahlavan, PrasanthKrishnamoorthy, “Principles of Wireless Networks” , PHI/Pearson Education, 2003
2.	UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, ”Principles of Mobile Computing”, Springer, New York, 2003.
3.	HazysztofWesolowshi, “Mobile Communication Systems”, John Wiley and Sons Ltd, 2002.

Online Reference

1.	https://www3.nd.edu/~cpoellab/teaching/cse40814/Lecture1-Handouts.pdf
2.	https://lecturenotes.in/notes/10134-notes-for-mobile-computing-mc-by-annapurna-mishra
3.	https://www.cse.iitb.ac.in/~mythili/teaching/cs653_spring2014/index.html

Web Refererence

1.	https://onlinecourses.nptel.ac.in/noc16_cs13
2.	https://swayam.gov.in/course/3696-mobile-computing

Assessment Methods & Levels (based on Blooms’ Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom’s Level	Assessment Component	Marks
CO1	Understand	Online Quiz	4
CO2	Apply	Assignment	4
CO3	Analyze	Case Study	4
CO4	Understand	Assignment	4
CO5	Understand	Class Presentation	4

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Continuous Assessment			End Semester Examination (60 marks)
	CIA1 (6 marks)	CIA2 (6 marks)	CIA3 (8 marks)	
Remember	-	-	-	-
Understand	80	40	40	40
Apply	20	60	40	40
Analyse	-	-	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

17CS406	QUANTUM COMPUTING	3/0/0/3
Nature of Course	G (Theory analytical)	
Pre requisites	nil	
Course Objectives:		
1	Perceive the differences between classical and quantum computing.	
2	Calculate the outcome probabilities for quantum circuits using complex state vectors, unitary matrices, and Dirac notation.	
3	Gain knowledge about the quantum error and its correction.	
4	Apply postulates of finite dimensional quantum theory and identify universal gate sets for quantum and classical reversible computing.	
5	To analyze the quantum error and its correction.	
Course Outcomes: **Upon completion of the course, students shall have ability to**		
CO1	Comprehend basic concepts of quantum computing.	[U]
CO2	Relate the quantum model of computation to quantum mechanics	[U]
CO3	Apply the quantum computing algorithms and operations.	[AP]
CO4	Design and implement computer simulations of quantum circuits	[AP]

Course Contents:

FOUNDATION: Introduction &Overview of traditional computing –Qbits and pieces-Bloch Sphere-Quantum Mechanical Probabilities –Quantum behaviours-History of Quanta-Base states and superposition-Structural randomness-Measurements-Heisenberg'sUncertaintyPrinciple.

QUBITS AND QUANTUM MODEL OF COMPUTATION: Basic Vectors and Orthogonality-Inner product and Hilbert spaces-Matrices and tensors-Unitary Operators and projectors-Dirac Notation.Abramsky-Coecke semantics-No cloning Theorem-

QUANTUM ALGORITHMS:quantum entanglement-Bell states and Bell inequalities-Pauli, Hadamard, phase, CNOT, Toffoli gates-quantum teleportation -universality of two-qubit gates -reversible computing. - the Deutsch- Jozsa algorithm - Simon's algorithm and quantum Fourier Transform - eigenvalue estimation.Shor's period-finding algorithm-quantum key distribution (BB84, E91

QUANTUM ERROR CORRECTION AND QUANTUM COMPUTERS: Computational complexity - black-box model - lower bounds for searching - general black-box lower bounds - polynomial method - block sensitivity - adversary methods - classical error correction - classical three-bit code - fault tolerance- quantum error correction - three- and nine-qubit quantum codes - fault-tolerant quantum computation-Physical realization of quantum computers.

Total Hours:	**45**

Text Books:	
1	R. Phillip Kaye, Raymond Laflamme, and Michele Mosca (2007)." An Introduction to Quantum Computing". Oxford University Press.
2	Micheal A. Nielsen. &Issac L. Chiang, "Quantum Computation and Quantum Information", Cambridge University Press, Fint South Asian edition, 2002
3	P. Kaye, R. Laflamme, and M. Mosca, "An introduction to Quantum Computing", Oxford University Press, 1999
Reference Books:	
1	V. Sahni, "Quantum Computing", Tata McGraw-Hill Publishing Company, 2007.
2	M. A. Nielsen &I.Chuang, "Quantum Computation and Quantum Information",Cambridge University Press (2000).
3	McMahon, David (2008). Quantum Computing Explained. John Wiley & Sons, Inc
Web References:	
1	http://nptel.ac.in/courses/115101092/
2	https://www.scottaaronson.com/democritus/
3	https://www.edx.org/course/quantum-mechanics-quantum-computation-uc-berkeleyx- cs-191x
Online Resources:	
1	https://www.udemy.com/a-gentle-introduction-to-quantum-mechanics/
2	www.nptelvideos.com/physics/quantum_physics.php
3	https://quantum.class.stanford.edu
4	https://courses.cs.washington.edu/courses/cse599d/06wi
5	https://uwaterloo.ca/institute-for-quantum-computing/programs/.../current-courses
6	https://www.findamasters.com/search/courses.aspx?Keywords=quantum+computing
7	https://www.coursetalk.com/providers/coursera/courses/quantum-mechanics-and-quantum-computation

Assessment Methods & Levels (based on Blooms'Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1	Understand	Online Quiz	5
CO2	Understand	Technical Essay Writing	5
CO3	Understand	Group Assignment	5
CO4	Apply	Group Assignment	5

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester
	CIA1	CIA2	CIA3	

	(6 marks)	(6 marks)	(8 marks)	Examination
Remember	-	-	-	-
Understand	80	40	60	60
Apply	20	60	40	40
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CS407	ADVANCED JAVA PROGRAMMING	3/0/0/3
Nature of Course	: K (Problem Programming)	

Course Objectives:

1	To acquire knowledge in Collections and JDBC
2	To discuss basic principles of HTML, Java Script and XML
3	To gain knowledge to develop dynamic Web applications like servlet, jsp.
4	To introduce tools, technologies and framework hence Hibernate and Spring are Introduced to enhance web development skills.

Course Outcomes:
Upon completion of the course, students shall have ability to

CO1	Acquire the knowledge on wide range of classes in Collections and JDBC	[AP]
CO2	Analyze and construct web-based information systems to meet certain business needs using HTML5, CSS, JavaScript	[AP]
CO3	Design and develop interactive, client-side, server-side executable web applications using eclipse.	[A]
CO4	Explore the features of various platforms and frameworks like Hibernate, Spring, Struts used in web applications development	[A]

Course Contents:

Core Java - Overview of Java -Collections- JDBC **HTML5, XML, Java Script-** HTML5 common tags – List – Tables – Images – Forms – Frames-CSS- Introduction to Java Scripts -storing data (data types) - Objects- Properties-Events-Decision making-Looping-Functions-Array-Conversions-Processing HTML forms and validation using JavaScript-XML- DTD, XSD-XSLT-Well-formed XML, valid XML - **Servlets and JSP** - Overview of servlet-Servlet configuration-Servlet Architecture- Servlet life cycle-Servlet Request and Response- Generic Servlet ,Http Servlet- web.xml and its need -Servlet configuration-Session Tracking-servlet CRUD- Introduction to JSP – Problem with servlet -Life cycle of JSP- scripting Elements (Expression tag, scriptlets tag and declarations tag)-JSP Directive Elements-page directive - JSP objects- Action Elements – Sharing data Between JSP pages Case Study: Online Booking Web page. **Hibernate, Spring and struts-** Hibernate Introduction-features-Architecture-Mapping and Configuration Files in Hibernate - Hibernate O/R Mappings –Hibernate query language-Simple examples using hibernate-Spring Introduction- Architecture-IOC container- Dependency Injection Bean – Getting started with Spring MVC framework- Simple examples using Spring. Struts – Introduction, Struts framework core components – Installing and setting up struts – Getting started with struts.

Case study: College Website.

Total Hours:	**45**

Text Books:

1	Herbert Schildt, “Java The Complete Reference”, 8th Edition, McGraw-Hill Osborne Media, 2018.
2	Kathy Sierra, “SCJP/ OCJP Sun Certified Programmer for Java 6 Study Guide”, Dreamtech press, Kogent Learning Solutions Inc. 2011.
3	Bryan Basham, Kathy Sierra, Bert Bates, “Head First Servlets and JSP”, O' Reilly Media, 2011
4	Paul Deitel, “Internet & World Wide Web: How to Program”, Prentice Hall, 5th Edition, 2011.

5	Gavin King, Christian Bauer, “Java Persistence with Hibernate”, Dreamtechpress,Kogent Learning Solutions Inc. 2008.
6	Craig Walls, "Spring in Action", Manning, Dreamtech press, 2014
Reference Books:	
1	Cay S. Horstmann and Gary Cornell, “Core Java™, Volume I – Fundamentals” 9th Edition, Prentice Hall, 2012.
2	Cay S. Horstmann and Gary Cornell, “Core Java, Vol. 2: Advanced Features”, 9th Edition, Prentice Hall, 2013.
3	Robert W. Sebesta, “Programming the World Wide Web”, Addison -Wesley, 7thEdition, 2012.
4	UttamK.Roy, “Web Technologies”, Oxford University Press, 1st Edition, 2011.
5	Jon Duckett, ”Beginning HTML,XHTML,CSS & JavaScript”,wiley India pvt.Ltd 2010
Web References:	
1	https://www.udemy.com/java-tutorial/
2	http://www.studytonight.com/servlet/introduction-to-web.php
3	http://www.javatpoint.com/hibernate-tutorial
4	http://www.java4s.com/hibernate/
5	http://www.oracle.com/technetwork/java/javaee/jsp/index.html
6	http://www.oracle.com/technetwork/java/javaee/ejb/index.html
7	http://www.javatpoint.com/servlet-tutorial

Assessment Methods & Levels (based on Blooms’ Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom’s Level**	**Assessment Component**	**Marks**
CO1	Remember	Quiz	**3**
CO2	Apply	Coding	**3**
CO3	Apply	Class Presentation	**2**
CO4	Apply	Group Presentation	**2**
CO5	Analyze	Group Project	**5**
CO6	Analyze	Group Project	**5**

Summative assessment based on Continuous and End Semester Examination				
Bloom’s Level	**Continuous Assessment**			**End Semester Examination (Theory)[40 marks]**
	Theory			
	CIA1 (6 marks)	**CIA2 (6 marks)**	**CIA3 (8 marks)**	
Remember	**-**	**-**	**-**	-
Understand	20	30	-	-
Apply	80	70	80	60
Analyze			20	-
Evaluate	-	-	-	-
Create	-	-	-	40

17CS408	PYTHON PROGRAMMING	3/0/0/3

Nature of Course	: F (Theory Programming)

Course Objectives:

1 To construct Python program using loops and decision statements
2 To explain the functions and argument passing in Python
3 To interpret object oriented programming in Python
4 To describe how to design and program python applications

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Describe and demonstrate the use of built-in data structures list, tuples and dictionaries	[R]
CO2	Infer the principles of object-oriented programming and the interplay of algorithm in well-written modular code	[U]
CO3	Employ different file handling operations for solving problems in python	[AP]
CO4	Demonstrate significant experience with the concept of exception handling in Python program development environment	[AP]

Benchmark: SRM University,IIT Madras

Industry Expert: R.Mahesh Kumar, Technical Lead, Aruba Networks, Bangalore

Course Contents:

Basics and Control Statements:

Why and How is Python Different- Python Concepts - Dynamic vs Static Types-Interpreted vs Compiled-Prototyping-Procedural vs Object-Oriented. Comparison: C ,C++,Java ,C#,Python of Programming-Types and Operators: Python Syntax-Indentation, Multiple Line Spanning-Python Object Types- Python Numbers-Control Statements- Functions.

Collections in Python:

Strings-Basic string operations, Indexing and slicing strings, String Formatting, Combining and Separating Strings-Lists-List usage - Adding List Elements-Mutability-Methods. Dictionaries: Making a dictionary-Basic operations-Dictionary details-Operation. Tuples-Operations on Tuples-Set-Set operations

Files, Error Handling and Object oriented Features:

Files-File Operations -Files and Streams -Creating a File -Reading From a File- Iterating Through Files- Seeking-Serialization Statements-Exceptions-Object Oriented Features: Principles of Object Orientation - Creating Classes - Class Variables – Inheritance-Database Connectivity

	Total Hours:	**45**

Text Books:

1	Brian Heinold,"Introduction to Programming Using Python",Mount St. Mary's University, 2013.
2	Mark Lassoff,JuliusHernandez,"Introduction to python",2018 Edition.
3	Michael Dawson ,"Python Programming for the Absolute Beginner", 3rd Edition, 2010.

Reference Books:	
1	Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
2	Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011
Web References:	
1	https://www.python.org/
3	http://www.tutorialspoint.com/python/
Online Resources:	
1	https://nptel.ac.in/courses/106106145/
2	https://www.coursera.org/learn/python-programming

Assessment Methods & Levels (based on Blooms'Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1	Remember	Online Quiz	5
CO2	Understand	Class presentation	5
CO3	Apply	Assignment	5
CO4	Apply	Mini Project	5

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination (60 Marks)
	CIA1 (6 Marks)	CIA2 (6 Marks)	CIA3 (8 Marks)	
Remember	20	20	30	20
Understand	80	40	40	40
Apply	-	40	30	40
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CS409	COMPUTER GRAPHICS AND MULTIMEDIA	3/0/0/3
Nature of Course	C (Theory Concept)	
Pre requisites	-	

Course Objectives:	
1	To study the Graphics Display Systems andAlgorithms
2	To understand Computational Development of Graphics and Animations
3	To provide in depth knowledge of 2D and 3DApplications
4	To study and understand the basic concepts related to Multimedia including Data Standard, Compression Algorithms and latest technologies

Course Outcomes: **Upon completion of the course, students shall have ability to**		
CO1	Understand the basic concepts of computer graphicsand its output primitives.	[U]
CO2	Apply 2D and3Dtransformation techniques	[AP]
CO3	Develop a graphical applicationusingmultimediatools	[AP]
CO4	Examine various compression techniques and storage mechanism	[A]

Course Contents:

Introduction to Computer Graphics and Object Transformations: Overview of computer graphics- Computer Display Technologies, Graphics Software, Output Primitives: - Points & lines, Line drawing algorithms, Circle generation algorithm, Ellipse generating algorithm. Basic transformations, 2D Transformation,3D Transformation, Clipping operations, 3DObjectRepresentations, 3Dviewing,Projections,Visible Surface Identification Methods

Animations and Multimedia System Design: - Introduction to OpenGL programming and Animations- Introduction to Multimedia-Multimedia Applications-Multimedia Architecture-Technologies for Multimedia Data- File Format Standards-Multimedia Input Output Technologies-Multimedia Storage and Retrieval Technologies.

Compression Techniques and AuthoringSystems:LosslessandLossyCompression-Inter-FrameandIntra-FrameCompression Text Compression, Image Compression, Video Compression. Multimedia Authoring Systems and UserInterfaces. Designing simple Graphics Applications using OpenGL.

	Total Hours:	**45**

Text Books:

1	Donald Hearn and M.Pauline Baker," Computer graphics withopenGL", 4thEdition, Pearson education, 2011
2	Multimedia Systems Design-prabhatK. Andleigh, KiranThakrar- Dorling Kindesley Pearson Education,2015

Reference Books:

1	Foley, Vandam, Feiner, Hughes – "Computer Graphics principles (2^{nd}Edition.) – Pearson Education,2013

2	Elsom Cook – "Principles of Interactive Multimedia" – McGrawHill,2011
Web References:	
1.	http://en.wikipedia.org/wiki/Computer_graphics
2.	http://nptel.ac.in/video.php?subjectId=106106090
	http://graphics.ucsd.edu/courses/cse167_f06
Online Resources:	
1.	https://www.coursera.org/learn/interactive computer graphics
2.	https://www.coursera.org/courses?query= computer graphics&page=1&configure

Assessment Methods & Levels (based on Blooms' Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1	Understand	Quiz	5
CO2	Apply	Assignment	5
CO3	Apply	Case Study	5
CO4	Analysis	Problem Solving	5

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination (50 marks)
	CIA1 (6 marks)	CIA2 (6 marks)	CIA3 (8 marks)	
Remember	-	-	-	-
Understand	60	-	-	-
Apply	40	60	40	40
Analyse	-	40	60	60
Evaluate	-	-	-	-
Create	-	-	-	-

17CS410	IMAGE PROCESSING	3/0/0/3
Nature of Course	C (Theory Concept)	
Pre requisites	Data Structures	

Course Objectives:

1	To illustrate basic & advanced concepts of digital image processing
2	To apply wavelets, compression & segmentation concepts in real-time projects
3	To illustrate basic concepts of image restoration andfeature extraction
4	To develop image processing programs using MATLAB

Course Outcomes:
Upon completion of the course, students shall have ability to

CO1	To illustrate basic & advanced concepts of digital image processing	[U]
CO2	To apply wavelets, compression & segmentation concepts in real-time projects	[AP]
CO3	To illustrate basic concepts of image restoration andfeature extraction	[AP]
CO4	To develop image processing programs using MATLAB	[AP]

Course Contents:

Digital image processing basics: Fundamentals, Image acquisition, Sampling, Quantization, Mathematical tools, Intensity transformations and spatial filtering, Histogram processing, Lowpass&highpass spatial filters, Frequency domain – Preliminary concepts, DFT, DCT, Lowpass&highpass frequency domain filters, Image restoration and reconstruction. MATLAB tool for image processing – Basic image manipulations, DCT, DWT, Filters.

Image transformation, compression and segmentation: Wavelet transforms – Matrix-based transforms, Correlation, Walsh-Hadamard transform, Slant transform, Haar transform. Color image processing, color models, Image compression – Fundamentals, Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run-length coding, Block transform coding, JPEG standard. Image segmentation - Point, Line, and Edge Detection, Canny edge detector, Marr-Hildreth edge detector, Basic Global Thresholding. MATLAB tool for edge detection, color model and color conversion.

Image restoration andFeatureextraction:Degradation/restoration model – Noise model,Spatial filters, Frequency domain filters, Estimating the Degradation Function,Inverse filtering, Minimum mean square error (Wiener) filter, Feature extraction – Boundary preprocessing, Boundary feature descriptors, Region feature descriptors.

Total Hours:	**45**

Text Books:

1.	Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", 4th Edition, Pearson Education, 2018
2	Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, 2nd Edition, Tata McGraw-Hill, 2010
3	Scott E Umbaugh, "Digital Image Processing and Analysis: Applications with MATLAB and CVIP tools", CRC Press, 3rd Edition, 2017

Reference Books:	
1	Jason M. Kinser, "Image Operators: Image Processing in Python", CRC Press, 2018
2	S. Sridhar, “Digital Image Processing”, Oxforduniversity press, 2011
3	Annadurai S., Shanmugalakshmi R., “Fundamentals of Digital Image Processing”,PearsonEducation (Singapore) Pvt. Ltd., 2007
Web References:	
1.	https://nptel.ac.in/courses/117105079/
2.	https://nptel.ac.in/courses/117105101/
Online Resources:	
1.	http://www.imageprocessingplace.com/
2.	https://ocw.mit.edu/courses/media-arts-and-sciences/mas-622j-pattern-recognition-and-analysis-fall-2006/

Assessment Methods & Levels (based on Blooms’ Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom’s Level	Assessment Component	Marks
CO1	Understanding	Quiz	5
CO2	Apply	Assignment	5
CO3	Apply	Technical presentation	5
CO4	Apply	Mini-project	5

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Continuous Assessment			End Semester Examination
	CIA1 (6 marks)	CIA2 (6 marks)	CIA3 (8 marks)	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	50	50	50	50
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CS411	OPEN SOURCE WEB SERVICES	3/0/0/3
Nature of Course	G (Theory analytical)	
Course Objectives:		
1	To describe the details of web service technologies like WSDL,UDDI, SOAP	
2	To analyze how to implement and deploy web service client and server	
3	To examine interoperability between different frameworks	
Course Outcomes: **Upon completion of the course, students shall have ability to**		
CO1	Describe the fundamentals of web service and SOAP	[U]
CO2	Examine web service life cycle and enabling technologies like WSDL and UDDI	[A]
CO3	Practice WS client and server development for interoperable systems	[AP]

Course Contents:

Evolution and Emergence of Web Services : Introduction to Web Services **—** The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services. Web Services Architecture **—** Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication models, basic steps of implementing web services. Restful web services **–** Introduction, Creating Restful web services, Environmental setup, Resources, Messages, Addressing, Methods, Statelessness, Caching, Security.

Describing SOAP with web services: SOAP Message Structure, SOAP encoding, Encoding of different data types, SOAP message exchange models, SOAP communication and messaging, Java and Axis, limitations of SOAP. Describing Web Services **—** WSDL **—** WSDL in the world of Web Services, Web Services life cycle, anatomy of WSDL definition document, WSDL bindings, WSDL Tools, limitations of WSDL.

Discovering Web Services — Service discovery, role of service discovery in a SQA, service discovery mechanisms, UDDI **—** UDDI registries, uses of UDDI Registry, Programming with UDDI, UDDI data structures, Publishing API, Publishing, searching and deleting information in a UDDI Registry, limitations of UDD1.Java Web Services **–** JAX APIs **–** JAXP **–** JAX-RPC **–** JAXM **–** JAXR **–** JAXB. Web Services Security **—** XML security frame work, Goals of Cryptography, Digital signature, Digital Certificate, XML Encryption.

Case Study : Apache Tomcat Servlet, Jmeter,J2EE.

Total Hours:	**45**

Text Books:

1	R. Nagappan, R. Skoczylas, R.P. Sriganesh,"Developing Java Web Services ",Wiley

	India,2008
2	Ron Schmelzer et al. "XML and Web Services", Pearson Education, 2008.
3	James McGovern, Sameer Tyagi, Michael E Stevens, Sunil Mathew, "Java Web Services Architecture",Elsevier, 2003.
4	Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", Pearson Education, 2005.
Reference Books:	
1	Mark O' Neill, et al., "Web Services Security", Tata McGraw-Hill Edition, 2003
2	S. Chatterjee, J. Webber, "Developing Enterprise Web Services", Pearson Education, 2008.
3	S. Graham and others, "Building Web Services with Java", 2nd Edition, Pearson Edn.
4	D.A. Chappell & T. Jewell, "Java Web Services," O'Reilly,SPD.
5	G. Alonso, F. Casati and others, Web Services, Springer.
6	Heather Williamson, "XML, The Complete Reference", McGraw Hill Education, 2012.
7	Frank. P. Coyle, "XML, Web Services And The Data Revolution", Pearson Education, 2002.
Web References:	
1	http://nptel.ac.in/courses/106105084/16
2	https://www.tutorialspoint.com/soap
3	https://www.journaldev.com/9191/java-web-services-tutorial
Online Resources:	
1	https://www.w3schools.com/xml/xml_services.asp
2	www.journaldev.com › Java › Java EE
3	docs.oracle.com/javaee/6/tutorial/doc/gijti.html
4	www.guru99.com/web-services-tutorial.html
5	www.mkyong.com/tutorials/jax-ws-tutorials/
6	www.java4s.com/web-services/
7	https://www.tutorialspoint.com/uddi/index.htm

Assessment Methods & Levels (based on Blooms'Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1	Understand	Online Quiz	10
CO2	Analyse	Technical Presentation	5
CO3	Apply	Case Study	5

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA1 (6 marks)	CIA2 (6 marks)	CIA3 (8 marks)	
Remember	-	-	-	-

Understand	80	40	40	40
Apply	20	60	40	40
Analyse	-	-	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

17CS412	SOFTWARE TESTING AND QUALITY ASSURANCE	3/0/0/3

Nature of Course	:C (Theory Concept)

Course Objectives:

1	To discuss the different phases of testing to find the bugs.
2	To explain the different types of testing to ensure the end results meets the customer requirements.
3	To record the process flow of each testing.
4	To describe the different approaches of software quality assurance.

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Classify the different types of testing and identify the defects.	[U]
CO2	Describe the techniques involved in Black box testing and White box testing.	[U]
CO3	Summarize the concepts of higher order testing.	[U]
CO4	Employ the different software quality assurance techniques to ensure the software quality.	[AP]

Benchmark: NIT trichy,Waterloo University(Canada), SRM University

Course Contents:

Testing Fundamentals and testing techniques

Testing as an Engineering Activity – Testing as a Process- Testing Principles, Goals, Testing Life Cycle, Phases of Testing, Defects,Defect Life Cycle, Defect Report, Black box testing: Need of black box testing, Black box testing Concept, Requirement Analysis, Test case design criteria, Testing Methods, requirement based testing, Positive & negative testing, Boundary value analysis, Equivalence Partitioning class, state based or graph based, cause effect graph based, error guessing, documentation testing &domain testing, design of test cases, White box testing: Need of white box testing, Testing types, Test adequacy criteria, static testing by humans, Structure ,logic coverage criteria, Basis path testing, Graph metrics, Loop Testing, Data flow testing, Mutation Testing – Design of test cases. Testing of Object oriented systems , Challenges in White box testing ,.Case Study:Test case design using Black box testing techniques for data mart.

Metric tools and non functional testing:

DIAC Test organization, Structure of testing, Measurement tools, Testing metrics: Type of metric – Project, Progress, Productivity. Other Software Testing: GUI testing , Validation testing , Regression testing , Scenario testing ,Specification based testing , Adhoc testing , Sanity testing , Smoke testing , Random Testing. Advances in Software Testing Methods.

Software Quality management: Software quality , Quality attribute , Quality control & assurance , Methods of quality management , Cost of quality, Quality factor , project management , Software quality metrics , TQM , Six Sigma – SQA Model-ISO 9126, Capability Maturity Model(CMM), Capability Maturity Model Integration(CMMI), Software Test Quality Management(STQM) - Trends in software quality.

Total Hours:	**45**

Text Books:

1	Arun Kumar Khannur,"Software Testing, techniques and applications",2011, Pearson

2	NareshChauhan ," Software Testing Principles and Practices" , Oxford University Press, 2010.
3	Stephen H Kan," Metric and Model in Software Quality Engineering", Pearson, 2014
Reference Books:	
1	Ron Patton,"Software Testing", 2nd edition, Pearson, 2011.
2	M.G. Limaye ," Software Testing Principles and Tools" ,TMG Hill Publication,2009
3	RenuRajani, Pradeep Oak, "Software Testing – Effective Methods, Tools and Techniques", Tata McGraw Hill, 2004
Web References:	
1	http://www.aptest.com/resources.html
2	http://www.testingstuff.com/references.html
3	https://www.softwaretestinghelp.com/resources/
Online Resources:	
1	http://www.etestinghub.com/
2	https://nptel.ac.in/courses/106105150/

Assessment Methods & Levels (based on Bloom'sTaxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1	Understand	Quiz	**5**
CO2	Understand	Assignment	**5**
CO3	Understand	Class Presentation	**5**
CO4	Apply	Group Assignment	**5**

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	CIA III [8 marks]	
Remember	20	40	20	20
Understand	80	60	50	50
Apply	-	-	30	30
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CS413	Building Enterprise Applications	3/0/0 /3

Nature of Course	: C (Theory Concept)
Prerequisite	: Exposure to any object oriented programming language (such as Java) and RDBMS.

Course Objectives:

1. To process and develop large scale enterprise applications
2. To build multi-tier enterprise applications.
3. To explore construction and testing of enterprise application

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Relate the concept of Enterprise Analysis and Business Modelling.	R
CO2	Understand the process for developing large scale enterprise applications	U
CO3	Design and document the application architecture.	U
CO4	Perform Code review, Code analysis, build process	AP

Course Contents:

Introduction to enterprise applications & Inception: Introduction to enterprise applications and their types, software engineering methodologies, life cycle of raising an enterprise application, introduction to skills required to build an enterprise application, key determinants of successful enterprise applications, and measuring the success of enterprise applications. Inception of enterprise applications, enterprise analysis, business modelling, Types of business Information System, requirements elicitation, use case modeling, prototyping, non functional requirements, requirements validation, planning and estimation. Case Study: WebScarab, Jmeter, and Eclipse to raise enterprise applications

Enterprise Architecture & Designing Enterprise application: Concept of architecture, views and viewpoints, enterprise architecture, logical architecture, technical architecture - design, different technical layers, best practices, data architecture and design – relational, XML, and other structured data representations, Infrastructure architecture and design elements - Networking, Internetworking, and Communication Protocols, IT Hardware and Software, Middleware, Policies for Infrastructure Management, Deployment Strategy, Documentation of application architecture and design.

Construction, Testing and rolling out Enterprise application: Construction readiness of enterprise applications - defining a construction plan, defining a package structure, setting up a configuration management plan, setting up a development environment, introduction to the concept of Software Construction Maps, construction of technical solutions layers, methodologies of code review, static code analysis, build and testing, dynamic code analysis – code profiling and code coverage. Types and methods of testing an enterprise application, testing levels and approaches, testing environments, integration testing, performance testing, penetration testing, usability testing, globalization testing and interface testing, user acceptance testing, rolling out an enterprise application,Test Automation Tools(Appium,Test Studio). Case Study: Develop a simple android application do performance testing and penetration testing.

Total Hours:	45

Text Books:

1	AnubhavPradhan, Satheesha B. Nanjappa, Senthil K. Nallasamy, VeerakumarEsakimuthu, Raising Enterprise Applications, Wiley, 2010
2	Brett McLaughlin, Building Java Enterprise Applications, O'Reilly Media, 2002

Reference Books:	
1	SorenLauesen, Software Requirements: Styles & Techniques, Addison-Wesley Professi , 2001
2	Brian Berenbach, Daniel J. Paulish, JuergenKazmeier, Arnold Rudorfer, Software Systems Requirements Engineering: In Practice, McGraw-Hill/Osborne Media, 2009
3	Dean Leffingwell, Don Widrig, Managing Software Requirements: A Use Case Ap Edition, Pearson, 2003
4	Patton, Software Testing, 2nd edition, Pearson, 2005
5	VasudevaVarma, Software Architecture: A Case Based Approach, Pearson, 2007
6	SrinivasanDesikan, Software testing Principles and Practices, Oxford University Press,

Web References:
http://java.sun.com/blueprints/guidelines/designing_enterprise_applications_2e/)

Online Resources:
1. https://www.entrepreneur.com/slideshow/224155
2. https://www.peterindia.net/EnterpriseApplications.html

Assessment Methods & Levels (based on Bloom'sTaxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1	Remember	Online Quiz	5
CO2	Understand	Class Presentation/Power point presentation	5
CO4	Apply	Case Study	5
CO3	Understand	Group Assignment	5

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	CIA III [8 marks]	
Remember	20	40	20	20
Understand	80	60	40	40
Apply	-	-	40	40
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CS414	DATA WAREHOUSING AND MINING	3/0/0/3

Nature of Course	G (Theory analytical)
Pre requisites	16IT307-Database Management System

Course Objectives:

1	To learn the fundamentals of data warehouse and OLAP
2	To acquire knowledge in data pre-processing and association rule mining
3	To perform data classification and clustering
4	To gain knowledge about the emerging trends in data mining

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Design a data warehouse	[U]
CO2	Perform data pre-processing	[U]
CO3	Evaluate association, classification and clustering methods	[A]
CO4	Apply data mining techniques for real world problems	[AP]

Course Contents:

DATA WAREHOUSING - Basic Concepts – Architecture – Data warehouse modeling – Data cube and OLAP – Data warehouse design and usage – Framework for data warehouse design – Data warehouse design process - Data warehouse implementation – Efficient data cube computation – Indexing OLAP data – Efficient processing of OLAP queries – OLAP server architectures.

DATA MINING - Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data transformation and discretization – Mining frequent patterns, associations and correlations – Basic concepts - Frequent Item set mining methods .

CLASSIFICATION - Classification - Basic concepts - Decision Tree Induction – Bayesian Classification – Rule Based Classification – Model evaluation and selection – Techniques to improve classification accuracy – Bayesian belief networks - Classification by Back propagation – Support Vector Machines – Classification using frequent patterns – Lazy Learners – Other classification methods – Genetic algorithms – Rough set approach – fuzzy set approach.

CLUSTER ANALYSIS - Overview of basic clustering methods - Partitioning Methods – k-Means – k-Medoids- Hierarchical methods- Agglomerative & Divisive Clustering – Density-Based Methods – DBSCAN- Grid-Based Methods – STING –Evaluation of clustering – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis

CURRENT TRENDS - Graph mining – Temporal data mining – Spatial data mining – Distributed data mining – Web Mining - Privacy, security and legal aspects of data mining – Data mining applications – Financial data analysis – Telecommunication industry – Retail industry – Health care and biomedical research.

Total Hours:	**45**

Text Books:

1	Jiawei Han, MichelineKamber and JianPei,"Data Mining Concepts and Techniques", 3rd Edition, Elsevier, 2012.
2	M. Kantardzic, "Data Mining: Concepts, Models, Methods, and Algorithms", 2nd edition, Wiley-IEEE Press, 2011.

Reference Books:	
1	Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, McGraw Hill, 2012.
2	Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2012.
Web References:	
1	www.cs.purdue.edu/homes/clifton/cs490d/
2	www.tutorialspoint.com/data_mining/dm_cluster_analysis.htm
3	www.cs.waikato.ac.nz/ml/weka/
Online Resources:	
1	http://www.mhssce.ac.in/ACADEMIC/syllabus/comp/sem6.pdf

Assessment Methods & Levels (based on Blooms’Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom’s Level	Assessment Component	Marks
CO1	Understand	Online Quiz	5
CO2	Understand	Technical Presentation	5
CO3	Apply	Group Assignment	5
CO4	Analyse	Surprise Test	5

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Continuous Assessment			End Semester Examination
	CIA1 (6 marks)	CIA2 (6 marks)	CIA3 (8 marks)	
Remember	-	-	-	-
Understand	80	40	40	40
Apply	20	60	40	40
Analyse	-	-	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

17CS415	DESIGN PATTERN AND DESIGN THINKING	3/0/0/3
Nature of Course	K (Problem Programming)	
Pre requisites	NIL	

Course Objectives:

1	To identify the importance of design patterns
2	To Categorize and analyse the different aspects of how the objects interact with each other and with physical components of the design solutions.
3	To interpret the insight into design thinking with graphical interfaces to provide dynamism in transformations of a design product or a solution.

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Summarize the various design patterns and its purpose	[U]
CO2	Analyse the various behavioral aspects of design pattern to be solved	[AN]
CO3	Discriminate the importance of dynamic responsibility in evaluating the standard design patterns by invoking object oriented concepts.	[E]
CO4	Evaluate the different pattern interactions between various physicalcomponents and the user, managing a design solution through visual representations and simulation models.	[E]
CO5	Illustrate different transformations of a product or a service throughbrainstorming and incremental approach, etc.	[AP]

Course Contents:

Benchmark : NPTEL,CARNEGIE-MELLON UNIVERSITY

Introduction to Design patterns: Describing design pattern, Design problems, Design problems solved by design patterns, Selection of a design pattern, Usage of design patterns. **The catalog of design pattern:** Creational pattern, Structural pattern, Behavioural pattern, Class & object communication. **Case Study:** Designing a document editor. **Design Thinking:** Defining design thinking, needs, requirements. **Stages in design thinking:**Preliminaryimmersion,Reframing, Exploratory Research, Desk Research In-depth immersion.Interviews, Cultural Probes, Generative Sessions, A day in the Life, Shadowing. Analysis and Synthesis: Insight Cards, Affinity diagram, Conceptual Map, Guiding criteria, Personas, Empathy Map, User's journey, Blueprint. Ideation: Brainstorming, Co-creation workshop, Idea menu, Decision matrix. **Prototyping:** Paper prototyping, Volumetric model, Staging, Storyboard, Service prototyping. **Case Study:** Andorinha project.

Total Hours:	**45**

Text Books:

1.	Enrich Gamma, Richard Helm, Ralp Johnson and John Vissides, "Design Patterns: Elements ofreusable object oriented software", Pearson education, Oct 1994.
2	MaurícioVianna, YsmarVianna, Brenda Lucena and Beatriz Russo," Design thinking :Businessinnovation", MJV Technologies and innovation press, 2011.

Reference Books:

1	Alan Shalloway and James R. Trott," Design Pattern Explained: A new perspective on object oriented design", Addison Wesley publication, 2011
2	Tim Brown, "Change by Design: Design Thinking Transforms organizations and inspires

	innovations", Harper Collins publication, 2009
3	Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage",Harvard Business Press, 2009.
4	HassoPlattner,ChristophMeinel and Larry Leifer (eds), "Design Thinking: Understand – Improve –Apply", Springer, 2011.
Web References:	
1.	https://sourcemaking.com/design_patterns
2.	https://www.goodreads.com/book/show/8013346-design-thinking
3.	https://dschool.stanford.edu/sandbox/groups/designresources
4.	http://courses.washington.edu/art166sp/documents/Spring2012/readings/week_3/design_t
5.	https://www.coursera.org/learn/uva-darden-design-thinking-innovation.
Online Resources:	
1.	http://www.centrodeinnovacionbbva.com/en/ebook/ebook-design-thinking
2.	https://www.tutorialspoint.com/design_pattern/design_pattern_overview.htm
3.	http://www.oodesign.com/
4.	https://code.tutsplus.com/articles/a-beginners-guide-to-design-patterns--net-12752
5.	https://dzone.com/refcardz/design-patterns
6.	http://dschool.stanford.edu/dgift/
7.	https://hbr.org/2008/06/design-thinking
8.	http://www.creativityatwork.com/design-thinking-strategy-for-innovation/
9.	http://www.designthinkingforeducators.com/design-thinking/

Assessment Methods & Levels (based on Blooms' Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1	Understand	Quiz	5
CO2	Analyse	Class Presentation	5
CO3	Evaluate	Problem solving	5
CO4	Evaluate		
CO5	Apply	Case Study	5

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination (60 Marks)
	CIA1 (6 Marks)	CIA2 (6 Marks)	CIA3 (8 Marks)	
Remember	-	-	-	-
Understand	30	-	10	10
Apply	-	50	20	20
Analyse	30	-	20	20
Evaluate	40	50	50	50
Create	-	-	-	-

17CS416	DATA SCIENCE	3/0/0/3

Nature of Course	F (Theory Programming)
Pre requisites	-

Course Objectives:

1	To perceive in-depth knowledge of Data Science Life Cycle and Machine Learning Algorithms.
2	To provide exposure to real-time industry-based projects.
3	To equip the students with knowledge of various tools and techniques for Data Transformation.
4	To gain an insight into Data Visualization and Optimization techniques.

Course Outcomes:
Upon completion of the course, students shall have ability to

CO1	Understand types of data and its extraction methods.	[U]
CO2	Examine various Data Sets and to write programs in R.	[AP]
CO3	Understand the concepts of Machine Learning and various algorithms.	[U]
CO4	Categorize the scenario and apply algorithms efficiently.	[A]
CO5	Investigate various data visualization techniques.	[A]

Course Contents:

Introduction : Era of Data Science - Business Intelligence vs Data Science - Life cycle of Data Science - Tools of Data Science - Introduction to Big Data - Statistical Inference – Data Analysis Pipeline - What is Data Extraction - Types of Data - Raw and Processed Data - Data Wrangling.

R: Overview of R- Control Structures-functions-Looping-Simulation.

Machine Learning : Machine Learning Use-Cases - Machine Learning Process Flow - Machine Learning Categories - Supervised Learning algorithm: Linear Regression and Logistic Regression - Case Study : Implementation of Linear Regression model.

Classification & Clustering Techniques : Decision Tree - Algorithm for Decision Tree Induction - Creating a Perfect Decision Tree - Confusion Matrix - Random Forest - Navies Bayes - Support Vector Machine: Classification - K-means Clustering - C-means Clustering - Canopy Clustering - Hierarchical Clustering.

Text Mining : Text-Mining Introduction - Use cases - Text Mining Algorithms - Quantifying text - TF-IDF - Basic Charts and Plots- Priniciples of perception-Text data visualization-temporal data visualization.

Total Hours:	**45**

Text Books:

1	Mailund, Thomas , “Beginning Data Science in R” , 2017.
2	Nina Zumel, John Mount, “Practical Data Science with R” , 2014.
3	Davy Cielen , Arno Meysman , Mohamed Ali , “Introducing Data Science: Big Data, Machine Learning, and more, using Python tools”, First Edition.

Reference Books:	
1	Roger D. Peng, "R Programming for Data Science", 2012.
2	Jeffrey S. Saltz , Jeffrey M. Stanton, "An Introduction to Data Science", First Edition.
Web References:	
1	http://www.creativeblog.com/design-tools/data-visualization-712402
Online Resources:	
1	https://www.coursera.org/learn/r-programming

Assessment Methods & Levels (based on Blooms'Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1	Understand	Quiz	**5**
CO2	Apply	Quiz	**5**
CO3	Understand	Technical Presentation	**5**
CO4	Analyze	Group Assignment	**3**
CO5	Analyze	Group Assignment	**2**

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination
	CIA1 (6 marks)	CIA2 (6 marks)	CIA3 (8 marks)	
Remember	20	0	10	10
Understand	30	20	20	10
Apply	50	40	40	40
Analyse	0	40	30	40
Evaluate	0	0	0	0
Create	0	0	0	0

17CS417	USER EXPERIENCE DESIGN	3/0/0/3

Nature of Course	:G (Theory)

Course Objectives:

1	To understand user experience design principles & end users of the product
2	To understand various methodologies used in user experience research activity
3	To apply tools for testing user experience

Course Outcomes:
Upon completion of the course, students shall have ability to

CO1	Understand user experience design principles	[U]
CO2	Choose a right method for conducting user experience research activity	[U]
CO3	Analyze user experience & interpret the results of user experience research	[A]
CO4	To test user experience design using Morae tool.	[AP]

Course Contents:

Introduction to user experience: What is user experience, user-centered design, principles, life cycle, design thinking, variety of requirements, getting stakeholder buy-in for your activity, Learning about product users, Existing research, Learning about product, Special populations, Ethical & legal considerations.

User experience research activity: Methods, Diary studies, Interviews, Surveys, Card sort, Focus groups, Field studies, Evaluation methods, Differences among the methods, Choosing the right method.

Diary studies: Diary study formats, Sampling frequency, Preparing and conducting a diary study, data analysis & interpretation.

Interviews: Preparing & conducting an interview, Data analysis & interpretation, Case Study: Connecting Families: Importance of Including Children as Stakeholders

Surveys: Need, Survey awareness, Creating & distributing survey, Data analysis & interpretation.

Focus groups: Preparing & conducting focus group, Modifications, Data analysis & interpretation.

Case Study: Morae software for usability testing

Total Hours:	**45**

Text Books:

1	Kathy Baxter, Catherine Courage & Kelly Caine, "Understanding your users - A practical guide to user research methods", 2nd Edition, Morgan Kaufmann Publishers, Elsevier Inc., 2015.
2	Preece, Rogers & Sharp, “Interaction Design beyond human-computer interaction”, 4th Editon, John Wiley & Sons Ltd., 2015.

Reference Books:

1	Gavin Allanwood, Peter Beare, “User Experience Design – Creating designs users really love”, 1st Edition, Bloomsbury Publishers, 2014.
2	Patrick J. Lynch & Sarah Horton, “Web Style Guide – Foundations of User Experience Design”, 4th Edition, Yale University Press, 2016.
Web References:	
1	https://www.cmu.edu/dietrich/english/classroom_and_beyond/user-experiencelab/morae-documentation.pdf
2	http://download.techsmith.com/morae/docs/whitepapers/morae_overview_whitepaper.pdf
3	https://www.techsmith.com/tutorial-morae-documentation.html
Online Resources:	
1	http://www.ieee.org/about/webteam/resources/uxlab.html
2	http://usabilitygeek.com
3	http://www.allaboutux.org

Assessment Methods & Levels (based on Blooms’Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom’s Level	Assessment Component	Marks
CO1	Understand	Quiz	**5**
CO2	Understand	Assignment	**5**
CO3	Analyze	Case study	**5**
CO4	Apply	Quiz	**5**

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Continuous Assessment			End Semester Examination
	CIA1 (6 marks)	CIA2 (6 marks)	CIA3 (8 marks)	
Remember	20	40	20	20
Understand	80	60	40	40
Apply	-	-	40	40
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CS418	MACHINE LEARNING	3/0/0/3

Nature of Course:	G (Theory analytical)

Course Objectives:

1.	To discuss basic concepts of machine learning and its usage in real world scenarios
2.	To explain different supervised learning techniques, merits and demerits
3.	To describe about the Graphical models and their applicability to real world problems
4.	To employ discovering clusters in the given data and also apply different clustering algorithms in different datasets
5.	To interpret dimensionality reduction for the given data

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Infer the acquired knowledge on recalling the applications of machine learning	[U]
CO2	Interpret the concepts behind different types of learning and their appropriateness	[AP]
CO3	Apply appropriate learning technique for a given real world problem	[AP]
CO4	Analyse the observations for a given set of data	[A]
CO5	Discuss the effectiveness of different learning techniques for different kind s of data and applications	[U]

Course Contents:

Introduction to Machine Learning: what and why?, Designing a learning system, Issues. Examples of Machine Learning Applications, Overview: Supervised Learning, Learning Associations, Classification, Regression, Unsupervised learning, Semi Supervised learningand Reinforcement Learning.**Supervised Learning:** Generative vs discriminative learning, Gaussian mixture models, Decision Tree learning, Neural Networks- feed forward and backward propogation, Support vector machines, Instance based learning, Ensemble learning. **Graphical models:** Bayesian Learning, Markov random Fields, Hidden Markov model, Issues of HMM, conditional random fields. **Regression:** Linear regression, logistic regression, Overfitting, Model selection. **Unsupervised learning:** Discovering clusters, Discovering latent factors, Discovering graph structure, Dimensionality reduction-PrincipalComponentAnalysis
Case Studies: Classification, Regression, clustering and anomaly detection

	Total Hours:	**45**

Text Books:

1.	EthemAlpaydin, —Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)ll, Third Edition, MIT Press, 2014.
2.	Kevin P. Murphy, Machine Learning A probabilistic Perspective, MIT press, 2012
3.	RamezElmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Fourth Edition , Pearson / Addisionwesley, 2007

Reference Books:

3.	Christopher Bishop. Pattern Recognition and Machine Learning, Springer, 2006.

4.	Jason Bell, —Machine learning – Hands on for Developers and Technical Professionals‖, First Edition, Wiley, 2014
5.	Stephen Marsland, —Machine Learning – An Algorithmic Perspective‖, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
6.	Tom M. Mitchell – Machine Learning, MCGraw-Hill Science, 1997
Web References:	
1.	https://onlinecourses.nptel.ac.in/noc16_cs18/
2.	http://freevideolectures.com/Course/2257/Machine-Learning
3.	https://www.coursera.org/learn/machine-learning

Assessment Methods & Levels (based on Blooms' Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment				End Semester Examination [40 Marks]
	CIA1 [6 Marks]	CIA2 [6 Marks]	CIA3 [8 Marks]	Rubrics [40 marks]	
Remember	20	20	20		20
Understand	60	40	30	40	30
Apply	20	40	30	40	30
Analyse	-		20	20	20
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

17CS419	GAME THEORY AND ITS APPLICATIONS	3/0/0/3

Nature of Course:	C (Theory Concept)

Course Objectives:

1.	To express analytical skills into increasingly complex conflicts
2.	To identify logic and strategic decision making involved in the theory of games.
3.	To outline rational behaviour in strategically interdependent situations.
4.	To estimate theorize possible and probable strategies where information is incomplete.

Course Outcomes:
Upon completion of the course, students shall have ability to

CO1	Describe the basic knowledge of a "game" into a wide range of conflicts from the standpoint of rationality.	[R]
CO2	Recognize the strategic games between two and more agents in non cooperative scenario.	[U]
CO3	Employ Game Theory principles in workplace settings.	[AP]

Course Contents:

Introduction and Games with Perfect Information:
Introduction, Nash Equilibrium -Theory:, Strategic games , the Prisoner's Dilemma , Matching Pennies, the Stag Hunt , Best response functions, Dominated actions, Equilibrium in a single population: symmetric games and symmetric equilibria, Nash Equilibrium – Illustrations, Mixed Strategy Equilibrium:Strategic games in which players may randomize, Mixed strategy Nash equilibrium, Dominated actions, Equilibrium in a single population.

Extensive games with perfect information:
Strategies and outcomes, Subgame perfect equilibrium , backward induction , The ultimatum game, the holdup game, Stackelberg's model of duopoly, entry into a monopolized industry, electoral competition with strategic voters, committee decision-making, exit from a declining industry, Coalitional Games and the Core.

Games with Imperfect Information, variants and Extensions: Bayesian Games, Strictly Competitive Games and Maxminimization, Rationalizability, Evolutionary Equilibrium, Repeated games: The Prisoner's Dilemma, General Results, Bargaining.

Total Hours:	**45**

Text Books:

1.	Martin Osborne, 'An Introduction to Game Theory', published by Oxford University Press., 2012.
2.	Matsumoto, Akio and Szidarovszky, Ferenc,'Game Theory and Its Applications', McGraw Hill Education (India) Private Ltd., 2016.
3.	Jun Tanimoto, 'Fundamentals of Evolutionary Game Theory and its Applications', published by Springer Japan., 2015.

Reference Books:	
1.	Hans Peters, 'Game Theory - A Multi-Leveled Approach', Second Edition, published by Springer-Verlag Berlin Heidelberg.,2015.
2.	Steven Tadelis,'Game Theory An Introduction,, Princeton University Press, Princeton and Oxford, 2013.
3.	Avinash Dixit and Susan Skeath 'Games of Strategy', Second Edition. McGraw Hill Education India Private Ltd., 2013.
4.	Leyton-Brown, K., Shoham, Y., Essentials of Game Theory: A Concise, Multidisciplinary Introduction, Morgan & Claypool Publishers. 2008.
Web References:	
1.	https://en.wikipedia.org/wiki/Game_theory
2.	https://www.coursera.org/learn/game-theory-1
Online Resources:	
1.	http://www.economics.utoronto.ca/osborne/igt
2.	http://www.cse.iitd.ernet.in/~rahul/cs905/
3.	http://nptel.ac.in/syllabus/110104063/

Assessment Methods & Levels (based on Blooms' Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1	Remember	Quiz	**5**
CO2	Understand	Tutorial	**10**
CO3	Apply	Group Assignment	**5**

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination
	CIA1 [6 Marks]	CIA2 [6 Marks]	CIA III [8 Marks]	
Remember	40	40	20	20
Understand	60	60	40	40
Apply	-	-	40	40
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CS420	Business Intelligence	3/0/0/3
Nature of Course	C (Theory Concept)	
Pre requisites	-	

Course Objectives:

1	To learn the fundamentals of business intelligence
2	To acquire knowledge in data integration
3	To perform multi-dimensional data modelling
4	To explore enterprise reporting

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Recognize the needs of Business Intelligence	[R]
CO2	Understand the technology and processes associated with Business Intelligence Framework	[U]
CO3	Understanding the Data Warehouse implementation methodology, metrics to achieve business goal	[U]
CO4	Design an enterprise dashboard that depicts the key performance indicators which helps in decision making	[AP]

Course Contents:

Introduction to Business Intelligence : Introduction to OLTP and OLAP, BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components **–** BI Process, BI Technology, BI Roles & Responsibilities.

Introduction to Data Integration and Multi-Dimensional Data Modeling: Concepts of data integration need and advantages of using data integration, introduction to common data integration approaches, introduction to Extraction Transformation Loading(ETL) using SSIS, Introduction to data quality, data profiling concepts and applications.Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi dimensionalmodeling, concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema, introduction to business metrics and KPIs, creating cubes using SSAS.

Basics of Enterprise Reporting : Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, introduction to SSRS Architecture, enterprise reporting using SSRS.Case Study: A Comparative study of KPI dashboard tools.

Total Hours:	**45**

Text Books:

1	David Loshin, Business Intelligence, Morgan Kaufmann, 2nd Edition, 2012.
2	Mike Biere, Business intelligence for the enterprise, Prentice Hall Professional, 2003.

3	R.N.Prasad, SeemaAcharya, Fundamentals of Business Analytics, John Wiley & Sons, 2011
Reference Books:	
1	Larissa Terpeluk Moss, ShakuAtre, Business intelligence roadmap, Addison-Wesley Professional, 2003.
2	CindiHowson, Successful Business Intelligence: Secrets to making Killer BI Applications, McGraw Hill Professional,2013
3	Brain Larson, Delivering business intelligence with Microsoft SQL server 2008, McGraw Hill Professional,2016
4	Lynn Langit, Foundations of SQL Server 2005 Business Intelligence, Apress, 2007
5	Stephen Few, Information dashboard design, O'Reilly, 2006
6	Efraim Turban, Ramesh Sharda, DursunDelen, "Decision Support and Business Intelligence Systems", 10th Edition, Pearson 2014.
Web References:	
1.	www.wipro.com/documents/resource-center/library/bidw_bilogistics.pdf
2.	https://en.wikipedia.org/wiki/Business_intelligence
3.	http://www.webopedia.com
4.	*campusconnect.infosys.com/homedownloads/BI/Dashboard*
Online Resources:	
1.	https://www.coursera.org/learn/business-intelligence-tools
2.	https://www.coursera.org/courses?query=business%20intelligence
3.	https://www.coursera.org/specializations/data-warehousing

Assessment Methods & Levels (based on Blooms' Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1	Remember	Quiz	5
CO2	Understand	Writing Skills	5
CO3	Understand	Class Presentation	5
CO4	Apply	Assignment	5

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination (50 marks)
	CIA 1(10)	CIA 2(10)	CIA 3(10)	
Remember	60	-	-	-
Understand	40	60	40	40
Apply	-	40	60	60
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CS421	DEEP LEARNING	3/0/0/3

Nature of Course	G(Theory analytical)
Pre requisites	-

Course Objectives:

1	To explain the basic concepts of neural networks and deep networks.
2	To discuss the major architectures of deep networks.
3	To examine the core concepts in deep architecture tuning
4	To demonstrate the applications of deep learning.

Course Outcomes :

Upon completion of the course, students shall have ability to

CO1	Distinguish neural and deep networks.	[U]
CO2	Select the appropriate deep network architecture.	[U]
CO3	Analyze the performance of a deep learning network.	[A]
CO4	Apply deep learning for solving real world problems.	[AP]

Course Contents:

Foundations of Neural Networks - Neural Networks - Training Neural Networks **–** Activation Functions - Loss Functions - Hyperparameters. **Fundamentals of Deep Networks –** Defining Deep Learning - Common Architectural Principles of Deep Networks - Building Blocks of Deep Networks.**Major Architectures of Deep Networks** - Unsupervised Pre-Trained Networks - Convolutional Neural Networks - Recurrent Neural Networks - Recursive Neural Networks. **Tuning Deep Networks** - Basic Concepts in Tuning Deep Networks - Matching Input Data and Network Architectures - Relating Model Goal and Output Layers - Working with Layer Count, Parameter Count, and Memory - Weight Initialization Strategies - Using Activation Functions**.Applications**-Large-Scale deep learning **–** Computer Vision **–** Speech Recognition **–** Natural Language Processing-Recommender systems.

Case Study- Applications of Deep Learning in Health care.

Total Hours	**45**

Text Books:

1.	Adam Gibson, Josh Patterson, Deep Learning,O'Reilly Media, 2017.
2.	Ian Goodfellow, YoshuaBengio and Aaron Courville, Deep Learning, MIT Press, 2016.

Reference Books:

1.	Daniel Graupe, Deep Learning Neural Networks: Design and Case Studies, World Scientific Publishing , 2016.
2.	Yu and Li Deng, Deep Learning: Methods and Applications, Now Publishers Inc, 2014.
3.	Zurada, J.M. "Introduction to Artificial Neural systems", Jaico Publishing House, 2012.

Web References:

1	http://deeplearning.cs.cmu.edu/
2	http://deeplearning.net/

Online Resources:

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

2	https://www.udacity.com/course/deep-learning--ud730
3	https://bigdatauniversity.com/courses/introduction-deep-learning/
4	https://cognitiveclass.ai/courses/deep-learning-tensorflow/

Assessment Methods & Levels (based on Blooms' Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
CO1	Understand	Online Quiz	5
CO2	Understand	Assignment	5
CO3	Analysis	Case Study	5
CO4	Apply	Technical Presentation	5

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination (50 marks)
	CIA1 (10 marks)	CIA2 (10 marks)	CIA3 (10 marks)	
Remember	20	20	10	10
Understand	80	40	40	40
Apply	-	10	30	30
Analyse	-	30	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

17CS501 **INTERNET MARKETING AND E-COMMERCE** **3/0/0/3**

Nature of Course :C (Theory Concept)

Course Objectives:

1. To recognize how information technologies (IT) influence businesses and how they provide competitive advantages.
2. To gain knowledge about various electronic payment methods.
3. To identify desirable properties of secure communication and ways to achieve them.
4. To know about management's role in information security

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Demonstrate knowledge on recalling the Network and Internet concepts	[R]
CO2	Understand the methodologies for online business dealings.	[U]
CO3	Understand the role of Internet technology in E-Commerce.	[U]
CO4	Understand various aspects of E-Commerce.	[U]

Course Contents:

Introduction to Electronic commerce Benefits of Electronic commerce Impact of Electronic commerce Classification of Electronic commerce Application of Electronic commerce **Electronic Commerce: Business Models** Electronic Data Interchange EDI, Layered Architecture, Benefits of EDI, Applications of EDI Electronic Commerce: Architectural Framework **Network Infrastructure** LAN, ELAN, WAN, TCP/IP Reference Model, Domain Name System **Information Distribution and Messaging** FTP, WWW server, HTTP, Web Server **Information Publishing Technology** Information publishing, Web Browsers, HTML, Common Gateway, VRML **Electronic Commerce: Securing the Business on Internet** Why information on internet is vulnerable, Site Security, Protecting the Network, HTTP services **Electronic Commerce: Securing Network Transaction** Transaction Security, Cryptology, Cryptographic Algorithms, Public Key Algorithms, Digital Signature, Email Security Influence on supply chain Management **Electronic Payment System** Online, Pre Paid, Post paid payment system **Electronic Commerce: Influence on Marketing** Product, Physical Distribution Price Promotion **Electronic Commerce: Search Engine and Directory Services** Search engines, Search engines marketing, Internet Advertising Mobile Commerce: Introduction, Framework and Models **Agents in Electronic Commerce** Need for Agents Types of Agents, Standards and Protocols, Application.

Total Hours: 45

Text Books:

1 Bharath Baskar ,"Electronic Commerce: Framework, Technologies and Applications ",Tata 4e McGraw-Hill Education, 2013

Reference Books:

1 "Kamesh K.Bajaj and Debjani Nag, E-Commerce the Cutting Edge of Business", Tata McGraw Hill, 2005
2 Ravi Kalakota and Andrew B.Whinston,"Frontiers of E-Commerce", Pearson Education Asia,2006

3 Gary Schneider, "Electronic Commerce", 12th Edition, Cengage Learning, 2016

Web References:

1 nptel.ac.in/courses/106108102/34
2 nptel.ac.in/courses/106105084/35
3 nptel.ac.in/courses/106108102/37

Online Resources:

1 http://www.marketing-schools.org/types-of-marketing/internet-marketing.html
2 https://www.tutorialspoint.com/e_commerce/

Assessment Methods & Levels (based on Bloom's Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
CO1	Remember	Quiz	**5**
CO2	Understand	Writing Skills	**5**
CO3	Understand	Class Presentation	**5**
CO4	Understand	Group Assignment	**5**

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 marks]**
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	
Remember	20	40	40	40
Understand	80	60	60	60
Apply	-	-	-	-
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CS502 **GREEN COMPUTING** **3/0/0/3**

Nature of Course :C (Theory Concept)

Course Objectives:

1. To acquire knowledge to adopt green computing practices to minimize negative impacts on the environment
2. To infuse skill in energy saving practices in their use of hardware, examine technology tools that can reduce paper waste and carbon footprint by user.
3. To understand how to minimize equipment disposal requirements

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Demonstrate the benefits and policies of energy efficient computing.	[U]
CO2	Understand the change in processes and products to make them green safe and economically acceptable.	[U]
CO3	Apply the strategies of going Green for energy aware applications	[AP]
CO4	Devise energy efficient computing application	[A]

Course Contents:

FUNDAMENTALS: Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics. **GREEN ASSETS AND MODELING:** Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models. **GRID FRAMEWORK:** Virtualizing of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework. **GREEN COMPLIANCE:** Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies an Future.**CASE STUDIES:** The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

Total Hours: 45

Text Books:

1 Bhuvan Unhelkar, "Green IT Strategies and Applications-Using Environmental Intelligence", CRC Press, June 2016.

2 2. Woody Leonhard, Katherrine Murray, "Green Home computing for dummies", August 2009.

Reference Books:

1 Alin Gales, Michael Schaefer, Mike Ebbers, "Green Data Center: steps for the Journey", Shoff/IBM rebook, 2011.

2 John Lamb, "The Greening of IT", Pearson Education, 2009.

3 Jason Harris, "Green Computing and Green IT- Best Practices on regulations & industry", Lulu.com, 2008.

Carl speshocky, "Empowering Green Initiatives with IT", John Wiley & Sons, 2010.

Wu Chun Feng (editor), "Green computing: Large Scale energy efficiency", CRC Press, 2012.

Web References:

1 http://www.igi-global.com
2 http://www.washingtonpost.com

Online Resources:

1 https://cs.anu.edu.au
2 http://www.academia.edu

Assessment Methods & Levels (based on Bloom'sTaxonomy)				
Formative assessment based on Capstone Model (Max. Marks:20)				
Course Outcome	**Bloom's Level**	**Assessment Component**		**Marks**
CO1	Understand	Group Assignment		5
CO2	Understand	Technical Presentation		5
CO3	Apply	Online Quiz		5
CO4	Analyze	Case Study		5
Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 marks]**
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	
Remember				
Understand	50	40	60	60
Apply	40	40	20	20
Analyse	10	20	20	20
Evaluate	0	0	0	0
Create	0	0	0	0

17CS503 **INTRODUCTION TO PYTHON** **3/0/0/3**

Nature of Course: G (Theory Programming)

Pre requisites: Nil

Course Objectives:

1 To understand why Python is a useful scripting language for developers.
2 To learn how to design and program Python applications.
3 To learn how to design object-oriented programs with Python classes.
4 To learn how to use class inheritance in Python for reusability.

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Recognize and construct common programming idioms: variables, loop, branch, subroutine, and input/output	[U]
CO2	Solve problems requiring the writing of well-documented programs in the Python language, including use of the logical constructs & data structures	[AP]
CO3	Apply Python for developing applications using files	[AP]
CO4	Describe the principles of object-oriented programming and the interplay of algorithm in well-written modular code	[U]

Course Contents:

Introduction - Python Concepts - Dynamic vs. Static Types-Interpreted vs. Compiled-Procedural vs. Object-Oriented. **Types and Operators:** Python Syntax-Indentation, Multiple Line Spanning-Python Object Types- Python Numbers. **Strings**-Basic string operations, Indexing and slicing strings, String Formatting. **Functions** – User defined functions. **Lists** - List usage - Adding List Elements – Mutability - List Methods. **Tuples** – Immutability - Tuple methods. **Dictionary**: Making a dictionary - Basic operations - Dictionary details - Methods. **Files** - File Operations - Files and Streams - Creating a File – File opening modes - Reading from a File - Iterating through Files. **Object oriented programming –** Class, object, constructor, destructor, inheritance.

Total Hours: 45

Text Books:

1. Charles Dierbach, “Introduction to Computer Science Using Python: A Computational Problem-Solving Focus”, Wiley Publishers, 2013.
2. Brian Heinold, “Introduction to Programming Using Python”, Mount St. Mary’s University, 2013.
3. Michael Dawson, “Python Programming for the Absolute Beginner”, 3rd Edition, 2010.

Reference Books:

1 Allen Downey, Green Tea Press Needham, “Think Python, How to Think Like a Computer Scientist”, Massachusetts.
2 John Paul Mueller, “Beginning programming with Python for Dummies”, John Wiley & Sons

Web References:

1 https://www.python.org/

2 http://www.tutorialspoint.com/python/

3 https://numpy.org/

4 https://www.scipy.org/

5 https://matplotlib.org/tutorials/introductory/pyplot.html

Online Resources:

1 https://www.coursera.org/python

2 https://www.edx.org/python

Assessment Methods & Levels (based on Blooms'Taxonomy)				
Formative assessment based on Capstone Model (Max. Marks:20)				
Course Outcome	**Bloom's Level**	**Assessment Component**		**Marks**
CO1	Understand	Classroom or Online Quiz		5
CO2	Apply	Class Presentation/Power point presentation		5
CO3	Apply	Assignment		5
CO4	Analysis	Project		5
Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 Marks]**
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	50	50	50	50
Analyze	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CS504 SOFTWARE PRODUCT DEVELOPMENT AND MANAGEMENT 3/0/0/3

Nature of Course :G (Theory analytical)

Course Objectives:

1 To understand the fundamentals of product design, practical management concepts like leadership and motivation.

2 To induce entrepreneurial intent as well as understand the practical issues faced by entrepreneurs.

3 To practice software product management techniques in software development process.

4 To induce the qualities of software product manager in the software management process.

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Relate software product management to better software products	[U]
CO2	Recognize the role of a software product manager	[U]
CO3	Reflect on how management the principles will improve software projects	[AP]
CO4	Demonstrate various software design techniques in software	[AP]
CO5	Gauge the applicability of process models for a software development project.	[AN]

Course Contents : Software Product –Terms and Characterstics–External and Internal views – Software Product as type – Attributes of software products –Elements of Software Product Management –Role of software product manager – Framework – Market analysis – Product analysis – Product Strategy – Product planning – development-**Software Pricing**- Elements of product pricing – Product Pricing in corporate structure.Product Design – Importance – Objectives – Factors influencing product design – Characteristics of a good product design - **Product Development Process** – Sources of Ideas for designing new products – Stages in Product Design – Effect of Products Design on Product Cost. - Characteristics of Management – Managerial Skills – Contribution of F.W.Taylor and Henry Fayol – Industrial Ownership. - **Leadership Styles** – Qualities of Leadership – Morale – Motivation Theories (Maslow, Herzberg and ERG theory).

Total Hours: 45

Text Books:

1 Software Product Management and Pricing: Key Success Factors for Software Organization, Hans-Bernd Kittlaus, Peter N. Clough, 2011, Springer Science & Business Media.

2 Text book of production management, ShridharaBhat.K, 1st Edition, Himalaya Publishing House,2012.

Reference Books:

1 Industrial Engineering and Management, Khanna.O.P, 2nd Edition, Dhanpat Rai Publications, 2013.

2 Entrepreneurial Development, Jayshree Suresh, 5th Edition, Margham Publications,2010.

3 Entrepreneurship, Robert D. Hisrich, 6th Edition, Tata McGraw Hill Publications.,2014.

Web References:

1 http://nptel.ac.in/courses/106101061/29

2 http://nptel.ac.in/courses/106105087/

3 http://www.acm.org/about/se-code

Online Resources:

1 https://cs.stanford.edu/people/eroberts/cs181/projects/2010-11/Licensure/indexba53.html?page_id=2
2 https://www.uvic.ca/engineering/assets/docs/professional-behaviour.pdf

Assessment Methods & Levels (based on Blooms'Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
CO1	Understand	Online Quiz	3
CO2	Understand	Technical Presentation	3
CO3	Apply	Group Assignment	5
CO4	Apply	Group Assignment	5
CO5	Analyse	Surprise Test	4

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 marks]**
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	
Remember	-	-	-	-
Understand	80	40	40	40
Apply	20	60	40	40
Analyse	-	-	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

17CS505 **JAVA FUNDAMENTALS** **3/0/0/3**

Nature of Course :G (Theory Programming)

Course Objectives:

1. To gain insight knowledge of OOP concepts
2. To analyze different types of constructor, Inheritance and polymorphism
3. To understand and apply package, Interface and Applet concepts
4. To know the fundamental concepts of collection framework and multithreading in solving real world problems

Course Outcomes:

Upon completion of the course, students shall have ability to

CO1	Demonstrate the fundamental concepts of object oriented programming	[R]
CO2	Understand the basis of Package, multithreading, and interface concepts	[U]
CO3	Use I/O functionality to code basic file operations and experiment with exceptions handling.	[AP]
CO4	Apply the concepts of Applets, AWT and Event handling mechanism to solve a given problems.	[AP]

Course Contents: Overview of Object oriented programming features**- JAVA:** Introduction to java programming –Features of java- Classes and objects - Arrays –Methods - Constructor **-** Access Specifier – Nested Classes-Inner Classes -Command line arguments**.** Inheritance, packages and Interface: Inheritance types - Method overriding - Abstract Classes- Packages – Interfaces - Strings. **Exceptions and I/O handling:** Exception handling fundamentals - I/O basics – Reading console input – Writing console output - **Applets and Database Connectivity:** Applet classes - JDBC Connectivity.

Total Hours: 45

Text Books:

1. Herbert Schildt, “Java : The Complete Reference”, 9th edition, TMH, 2014.

Reference Books:

1. Paul Deitel, Harvey Deitel, ”Java How To Program”, 10th Edition, Prentice Hall Publications, 2014.
2. Y. Daniel Liang ,”Introduction to Java Programming”, 9th Edition , Prentice Hall Publications , 2015.

Web References:

1. http://www.nptel.ac.in
2. http://www.javaworld.com

Online Resources:

1. https://www.coursera.org/learn/object-oriented-java
2. https://www.coursera.org/specializations/java-object-oriented

Assessment Methods & Levels (based on Blooms'Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
CO1	Understand	Programming Tutorial	5
CO2	Understand	Programming Tutorial	5
CO3	Apply	Programming Tutorial	5
CO4	Apply	Programming Tutorial	5

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 marks]**
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	
Remember	30	10	20	20
Understand	70	60	50	50
Apply	-	30	30	30
Analyse	-	-		
Evaluate	-	-	-	-
Create	-	-	-	-