VIT®

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

SCHOOL OF INFORMATION TECHNOLOGY ENGINEERING

CURRICULUM AND SYLLABI

(2020-2021)

B.Tech Information Technology

(B.Tech IT)

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SCHOOL OF INFORMATION TECHNOLOGYENGINEERING

B.Tech Information Technology

VISION STATEMENT OF VELLORE INSTITUTE OF TECHNOLOGY

- Transforming life through excellence in education and research.

MISSION STATEMENT OF VELLORE INSTITUTE OFTECHNOLOGY

- **World class Education**: Excellence in education, grounded in ethics and critical thinking, for improvement of life.
- **Cutting edge Research**: An innovation ecosystem to extend knowledge andsolve critical problems.
- **Impactful People**: Happy, accountable, caring and effective workforce and students.
- **Rewarding Co-creations**: Active collaboration with national & international industries & universities for productivity and economic development.
- **Service to Society**: Service to the region and world through knowledge and compassion.

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SCHOOL OF INFORMATION TECHNOLOGYENGINEERING

B.Tech Information Technology

VISION STATEMENT OF THE SCHOOL OF INFORMATIONTECHNOLOGY AND ENGINEERING

- "To be a centre of excellence in education and research in Information and Technology, producing global leaders for improvement of the society"

MISSION STATEMENT OF THE SCHOOL OF INFORMATIONTECHNOLOGY AND ENGINEERING

- To provide sound fundamentals, and advances in Information Technology, Software Engineering, Digital Communications and Computer Applications by offering world class curricula.
- To create ethically strong leaders and trend setters for next generation IT.
- To nurture the desire among faculty and students from across the globe to perform outstanding and impactful research for the benefit of humanity and, to achieve meritorious and significant growth.

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SCHOOL OF INFORMATION TECHNOLOGYENGINEERING

B.Tech Information Technology

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

1. Graduates will be engineering practitioners and leaders, who would help solve industry's technological problems.

2. Graduates will be engineering professionals, innovators or entrepreneurs engaged in technology development, technology deployment, or engineering system implementation in industry.

3. Graduates will function in their profession with social awareness and responsibility.

4. Graduates will interact with their peers in other disciplines in industry and society and contribute to the economic growth of the country.

5. Graduates will be successful in pursuing higher studies in engineering or management.

6. Graduates will pursue career paths in teaching or research.

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SCHOOL OF INFORMATION TECHNOLOGYENGINEERING

B.Tech Information Technology

PROGRAMME OUTCOMES (POs)

PO_01: Having an ability to apply mathematics and science in engineering applications.

PO_02: Having a clear understanding of the subject related concepts and of contemporary issues and apply them to identify, formulate and analyse complex engineering problems.

PO_03: Having an ability to design a component or a product applying all the relevant standards and with realistic constraints, including public health, safety, culture, society and environment

PO_04: Having an ability to design and conduct experiments, as well as to analyse and interpret data, and synthesis of information

PO_05: Having an ability to use techniques, skills, resources and modern engineering and IT tools necessary for engineering practice

PO_06: Having problem solving ability- to assess social issues (societal, health, safety, legal and cultural) and engineering problems

PO_07: Having adaptive thinking and adaptability in relation to environmental context and sustainable development

PO_08: Having a clear understanding of professional and ethical responsibility

PO_09: Having cross cultural competency exhibited by working as a member orin teams

PO_10: Having a good working knowledge of communicating in English – communication with engineering community and society

PO_11: Having a good cognitive load management skills related to project management and finance

PO_12: Having interest and recognise the need for independent and lifelong learning

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B.Tech Information Technology

PROGRAMME SPECIFIC OUTCOMES (PSOs)

On completion of B. Tech. (Information Technology) programme, graduates will be able to

PSO1: Understand and justify the adaptation of appropriate emerging technologies by imbibing contemporary core IT competencies

PSO2: Analyze complex real world problems through agile techniques for socially acceptable design and develop solutions

PSO3: Be competitively employable or be an IT entrepreneur to face local and global challenges through professionalism

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SCHOOL OF INFORMATION TECHNOLOGYENGINEERING

B.Tech Information Technology

CREDIT STRUCTURE

Category-wise Credit distribution

Category	Credits
Programme core (PC)	**55**
Programme elective (PE)	**40**
University core (UC)	**53**
University elective (UE)	**12**
Non Credit Course	**5**
Total credits	**165**

DETAILED CURRICULUM

Programme Core

Course Code	Course Title	L	T	P	J	C
CSE1007	Java Programming	3	0	2	0	4
EEE1001	Basic Electrical and Electronics Engineering	2	0	2	0	3
ITE1001	Digital Logic and Microprocessor	3	0	2	0	4
ITE1002	Web Technologies	2	0	2	0	3
ITE1003	Database Management Systems	2	0	2	4	4
ITE1004	Data Structures and Algorithms	3	0	2	0	4
ITE1005	Software Engineering-Principles and Practices	3	0	0	0	3
ITE1006	Theory of Computation	3	0	0	0	3
ITE2001	Computer Architecture and Organization	3	0	0	0	3
ITE2002	Operating Systems	3	0	2	0	4
ITE3001	Data Communication and Computer Networks	3	0	2	0	4
ITE4001	Network and Information Security	3	0	0	4	4
MAT1014	Discrete Mathematics and Graph Theory	3	2	0	0	4
MAT2002	Applications of Differential and Difference Equations	3	0	2	0	4
MAT3004	Applied Linear Algebra	3	2	0	0	4

Programme Elective

Course Code	Course Title	L	T	P	J	C
CSE3501	Information Security Analysis and Audit	2	0	0	4	4
CSE3502	Information Security Management	2	0	0	4	4
ITE1007	Object Oriented Analysis and Design	3	0	0	4	4
ITE1008	Open Source programming	3	0	0	4	4
ITE1010	Digital Image Processing	3	0	0	4	4
ITE1011	Computer Graphics	3	0	0	4	4
ITE1014	Human Computer Interaction	3	0	0	4	4
ITE1015	Soft Computing	3	0	0	4	4
ITE1016	Mobile Application Development	3	0	0	4	4
ITE1017	Transformation Techniques	3	0	0	0	3
ITE2003	Principles and Practices of Communication System	3	0	0	4	4
ITE2004	Software Testing	3	0	0	4	4
ITE2005	Advanced Java Programming	3	0	2	0	4
ITE2006	Data Mining Techniques	3	0	0	4	4
ITE2009	Storage Technologies	3	0	0	4	4
ITE2010	Artificial Intelligence	3	0	0	4	4
ITE2011	Machine Learning	3	0	0	4	4
ITE2012	.Net Programming	3	0	2	0	4
ITE2013	Big Data Analytics	3	0	0	4	4
ITE2014	Software Project Management	2	0	0	0	2
ITE2015	Information System Audit	2	0	0	0	2
ITE3002	Embedded Systems	3	0	2	0	4
ITE3003	Parallel Processing	3	0	0	4	4
ITE3004	Distributed Systems	3	0	0	4	4

ITE3005	Information Coding Theory	3	0	0	4	4
ITE3007	Cloud Computing and Virtualization	3	0	0	4	4
ITE3008	Information Retrieval	3	0	0	4	4
ITE4002	Network Management Systems	3	0	0	4	4
ITE4003	Internet of Things	3	0	0	4	4
ITE4004	Wireless Mobile Networking	3	0	0	4	4
ITE4010	Network Programming, Protocols and Standards	3	0	0	4	4

University Core

Course Code	Course Title	L	T	P	J	C
CHY1701	Engineering Chemistry	3	0	2	0	4
CSE1001	Problem Solving and Programming	0	0	6	0	3
CSE1002	Problem Solving and Object Oriented Programming	0	0	6	0	3
ENG1901	Technical English - I	0	0	4	0	2
ENG1902	Technical English - II	0	0	4	0	
ENG1903	Advanced Technical English	0	0	2	4	
FLC4097	Foreign Language Course Basket	0	0	0	0	2
ENG1000	Foundation English - I	0	0	4	0	2
ENG2000	Foundation English - II					
HUM1021	Ethics and Values	2	0	0	0	2
ITE1901	Technical Answers for Real World Problems (TARP)	1	0	0	4	2
ITE1902	Industrial Internship	0	0	0	0	1
ITE1903	Comprehensive Examination	0	0	0	0	1
ITE1904	Capstone Project	0	0	0	0	12
MAT1011	Calculus for Engineers	3	0	2	0	4

MAT2001	Statistics for Engineers	3	0	2	0	4
MGT1022	Lean Start-up Management	1	0	0	4	2
PHY1701	Engineering Physics	3	0	2	0	4
PHY1901	Introduction to Innovative Projects	1	0	0	0	1
STS4097	Soft Skills	0	0	0	0	6

Non – Credit Course

Course Code	Course Title	L	T	P	J	C
CHY1002	Environmental Sciences	3	0	0	0	3
EXC4097	Co-Extra Curricular Basket	0	0	0	0	2

CHY1701	Engineering Chemistry	L	T	P	J	C
		3	0	2	0	4
Pre-requisite	**Chemistry of 12th standard or equivalent**	**Syllabus version**				
		1.1				

Course Objectives:

1. To impart technological aspects of applied chemistry
2. To lay foundation for practical application of chemistry in engineering aspects

Expected Course Outcome:

1. Recall and analyze the issues related to impurities in water and their removal methods and apply recent methodologies in water treatment for domestic and industrial usage
2. Evaluate the causes of metallic corrosion and apply the methods for corrosion protection of metals
3. Evaluate the electrochemical energy storage systems such as lithium batteries, fuel cells and solar cells, and design for usage in electrical and electronic applications
4. Assess the quality of different fossil fuels and create an awareness to develop the alternative fuels
5. Analyze the properties of different polymers and distinguish the polymers which can be degraded and demonstrate their usefulness
6. Apply the theoretical aspects: (a) in assessing the water quality; (b) understanding the construction and working of electrochemical cells; (c) analyzing metals, alloys and soil using instrumental methods; (d) evaluating the viscosity and water absorbing properties of polymeric materials

Module:1	**Water Technology**	**5 hours**

Hardness of water - hardness causing impurities, pH, DO, TDS, COD and BOD in water; Estimation of hardness by EDTA method-numerical problems. Boiler troubles - scale, sludge, priming, foaming, caustic embrittlement and boiler corrosion; Internal conditioning – Phosphate and calgon conditioning methods

Module:2	**Water Treatment**	**8 hours**

Water treatment for Industrial purpose: External softening methods: Lime Soda process-numerical problems, Zeolite process and ion exchange including mixed bed ion exchange processes. Steps involved in treatment of water for municipal supply – Water purification for domestic purpose - Activated carbon filtration, UV treatment, Ozonolysis, Reverse osmosis.

Module:3	**Corrosion**	**6 hours**

Types and mechanism – dry and wet corrosion; Forms of corrosion [Differential aeration, pitting, Galvanic and stress corrosion cracking]; Factors affecting corrosion

Module:4	**Corrosion Control**	**4 hours**

Corrosion control methods: Inhibitors – anodic and cathodic and their action; Cathodic protection – sacrificial anodic and impressed current protection methods. Corrosion protection coatings: galvanizing and tinning; electroplating-processes and typical applications; Advanced coating processes – Basic concepts of PVD and CVD

Module:5	**Electrochemical Energy Systems**	**6 hours**
Basic concepts of cells and batteries-nominal voltage, operating voltage, capacity, self-discharge, depth of discharge, energy density, service life, shelf life. Working and applications of primary cells - Alkaline cells -and Li-primary cells. Secondary cells and batteries - Ni-MH cells; Rechargeable lithium cells – chemistry and applications. Fuel cells – Electrochemistry of a H_2–O_2 fuel cell, Basics of solid oxide fuel cells-applications		
Module:6	**Fuels and Combustion**	**8 hours**
Calorific value - Definition of LCV, HCV. Measurement of calorific value using bomb calorimeter and Boy's calorimeter including numerical problems. Combustion of fuels - minimum quantity of air by volume and by weight-Numerical problems. Knocking and chemical structure, octane number and cetane number and their importance; Biodiesel-synthesis, advantages and commercial applications		
Module:7	**Polymers**	**6 hours**
Thermoplastic & Thermo setting resins – comparative properties. Properties and engineering applications of ABS, PVC,Teflon and Bakelite. Compression, injection, extrusion, Transfer moulding methods of plastics. Conducting polymers: Intrinsic, extrinsic and doped polymers - Polyacetylene-mechanism of conduction- Applications of conducting polymers in LEDs, Mobile phones		
Module:8	**Contemporary issues:**	**2 hours**
Lecture by Industry Experts		
	Total Lecture hours:	**45 hours**

Text Book(s)

1. Sashi Chawla, A Text book of Engineering Chemistry, Dhanpat Rai Publishing Co., Pvt. Ltd., Educational and Technical Publishers, New Delhi, 3rd Edition, 2015.
2. O.G. Palanna, McGraw Hill Education (India) Private Limited, 9th Reprint, 2015.
3. B. Sivasankar, Engineering Chemistry 1st Edition, Mc Graw Hill Education (India), 2008

Reference Books

1. O.V. Roussak and H.D. Gesser, ***Applied Chemistry-A Text Book for Engineers and Technologists***, Springer Science Business Media, New York, 2nd Edition, 2013.
2. S. S. Dara, ***A Text book of Engineering Chemistry,*** S. Chand & Co Ltd., New Delhi, 20th Edition, 2013.

Mode of Evaluation: Internal Assessment (CAT, Quizzes, Digital Assignments) & FAT

List of Challenging Experiments (Indicative)

	Experiment title	Hours
1.	Estimation of Dissolved Oxygen by Winkler's Method	1 h 50 min
2.	Softening of Water through Zeolite Resin – Assessment of Total Hardness using EDTA Method	1 h 50 min
3.	Water Preservation through Smart Materials	1 h 50 min
4.	Construction and Working of an Electrochemical Cell	1 h 50 min
5.	Irrigation Water - Sulphate ion Analysis by Conductometry	1 h 50 min
6.	Estimation of Calcium Hardness in Water by Flame Photometry	1 h 50 min
7.	Estimation of Nickel in a Ni-plated Material for Corrosion Protection by Colorimetry	1 h 50 min
8.	Analysis of Iron in Steel by Potentiometric Method	1 h 50 min

9.	Determination of Aromatic Content in Diesel by Aniline Point Measurement			1 h 50 min
10.	Engineering Polymers - Viscosity and Molecular Weight Analysis			1 h 50 min
11.	Lab Scale Production of Biodiesel from Plant Seeds (demo experiment)			3 hours
			Total Laboratory Hours	18 hours
Mode of Evaluation: Viva-voce and Lab performance & FAT				
Recommended by Board of Studies	12.08.2017			
Approved by Academic Council	46th ACM	Date	24-8-17	

CHY1002	Environmental Sciences	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	**Chemistry of 12th standard or equivalent**	**Syllabus version**				
		V:1.1				

Course Objectives:

1. To make students understand and appreciate the unity of life in all its forms, the implications of life style on the environment.
2. To understand the various causes for environmental degradation.
3. To understand individuals contribution in the environmental pollution.
4. To understand the impact of pollution at the global level and also in the local environment.

Expected Course Outcome:

Students will be able to

1. Students will recognize the environmental issues in a problem oriented interdisciplinary perspectives
2. Students will understand the key environmental issues, the science behind those problems and potential solutions.
3. Students will demonstrate the significance of biodiversity and its preservation
4. Students will identify various environmental hazards
5. Students will design various methods for the conservation of resources
6. Students will formulate action plans for sustainable alternatives that incorporate science, humanity, and social aspects
7. Students will have foundational knowledge enabling them to make sDound life decisions as well as enter a career in an environmental profession or higher education.

Module:1	Environment and Ecosystem		7 hours

Key environmental problems, their basic causes and sustainable solutions. IPAT equation. Ecosystem, earth – life support system and ecosystem components; Food chain, food web, Energy flow in ecosystem; Ecological succession- stages involved, Primary and secondary succession, Hydrarch, mesarch, xerarch; Nutrient, water, carbon, nitrogen, cycles; Effect of human activities on these cycles.

Module:2	Biodiversity		6 hours

Importance, types, mega-biodiversity; Species interaction - Extinct, endemic, endangered and rare species; Hot-spots; GM crops- Advantages and disadvantages; Terrestrial biodiversity and Aquatic biodiversity – Significance, Threats due to natural and anthropogenic activities and Conservation methods.

Module:3	Sustaining Natural Resources and Environmental Quality	7 hours

Environmental hazards – causes and solutions. Biological hazards – AIDS, Malaria, Chemical hazards- BPA, PCB, Phthalates, Mercury, Nuclear hazards- Risk and evaluation of hazards. Water footprint; virtual water, blue revolution. Water quality management and its conservation. Solid and hazardous waste – types and waste management methods.

Module:4	**Energy Resources**		**6 hours**
Renewable - Non renewable energy resources- Advantages and disadvantages - oil, Natural gas, Coal, Nuclear energy. Energy efficiency and renewable energy. Solar energy, Hydroelectric power, Ocean thermal energy, Wind and geothermal energy. Energy from biomass, solar- Hydrogen revolution.			
Module:5	**Environmental Impact Assessment**		**6 hours**
Introduction to environmental impact analysis. EIA guidelines, Notification of Government of India (Environmental Protection Act – Air, water, forest and wild life). Impact assessment methodologies. Public awareness. Environmental priorities in India.			
Module:6	**Human Population Change and Environment**		**6 hours**
Urban environmental problems; Consumerism and waste products; Promotion of economic development – Impact of population age structure – Women and child welfare, Women empowerment. Sustaining human societies: Economics, environment, policies and education.			
Module:7	**Global Climatic Change and Mitigation**		**5 hours**
Climate disruption, Green house effect, Ozone layer depletion and Acid rain. Kyoto protocol, Carbon credits, Carbon sequestration methods and Montreal Protocol. Role of Information technology in environment-Case Studies.			
Module:8	**Contemporary issues**		**2 hours**
	Total Lecture hours:	**45 hours**	

Text Books

1. G. Tyler Miller and Scott E. Spoolman (2016), Environmental Science, 15th Edition, Cengage learning.
2. George Tyler Miller, Jr. and Scott Spoolman (2012), Living in the Environment – Principles, Connections and Solutions, 17th Edition, Brooks/Cole, USA.

Reference Books

1. David M.Hassenzahl, Mary Catherine Hager, Linda R.Berg (2011), Visualizing Environmental Science, 4thEdition, John Wiley & Sons, USA.

Mode of evaluation: Internal Assessment (CAT, Quizzes, Digital Assignments) & FAT

Recommended by Board of Studies	12.08.2017		
Approved by Academic Council	No. 46	Date	24.08.2017

CSE1001	Problem Solving and Programming	L	T	P	J	C
		0	0	6	0	3
Pre-requisite	**NIL**	**Syllabus version**				
		1.00				

Course Objectives:

1. To develop broad understanding of computers, programming languages and their generations
2. Introduce the essential skills for a logical thinking for problem solving
3. To gain expertise in essential skills in programming for problem solving using computer

Expected Course Outcome:

1. Understand the working principle of a computer and identify the purpose of a computer programming language.
2. Learn various problem solving approaches and ability to identify an appropriate approach to solve the problem
3. Differentiate the programming Language constructs appropriately to solve any problem
4. Solve various engineering problems using different data structures
5. Able to modulate the given problem using structural approach of programming
6. Efficiently handle data using flat files to process and store data for the given problem

List of Challenging Experiments (Indicative)

1	Steps in Problem Solving Drawing flowchart using yEd tool/Raptor Tool	4 Hours
2	Introduction to Python, Demo on IDE, Keywords, Identifiers, I/O Statements	4 Hours
3	Simple Program to display Hello world in Python	4 Hours
4	Operators and Expressions in Python	4 Hours
5	Algorithmic Approach 1: Sequential	4 Hours
6	Algorithmic Approach 2: Selection (if, elif, if.. else, nested if else)	4 Hours
7	Algorithmic Approach 3: Iteration (while and for)	6 Hours
8	Strings and its Operations	6 Hours
9	Regular Expressions	6 Hours
10	List and its operations	6 Hours
11	Dictionaries: operations	6 Hours
12	Tuples and its operations	6 Hours
13	Set and its operations	6 Hours
14	Functions, Recursions	6 Hours
15	Sorting Techniques (Bubble/Selection/Insertion)	6 Hours
16	Searching Techniques : Sequential Search and Binary Search	6 Hours
17	Files and its Operations	6 Hours
	Total hours:	**90 hours**

Text Book(s)

1.	John V. Guttag., 2016. Introduction to computation and programming using python: with applications to understanding data. PHI Publisher.			
Reference Books				
1.	Charles Severance.2016.Python for everybody: exploring data in Python 3, Charles Severance.			
2.	Charles Dierbach.2013.Introduction to computer science using python: a computational problem-solving focus. Wiley Publishers.			
Mode of Evaluation: **PAT / CAT / FAT**				
Recommended by Board of Studies		04-04-2014		
Approved by Academic Council		No. 38	Date	23-10-2015

CSE1002	Problem Solving And Object Oriented Programming	L	T	P	J	C
		0	0	6	0	3
Pre-requisite	**Nil**	**Syllabus version**				
		1.0				

Course Objectives:

1. To emphasize the benefits of object oriented concepts.
2. To enable students to solve the real time applications using object oriented programming features
3. To improve the skills of a logical thinking and to solve the problems using any processing elements

Expected Course Outcome:

1. Demonstrate the basics of procedural programming and to represent the real world entities as programming constructs.
2. Enumerate object oriented concepts and translate real-world applications into graphical representations.
3. Demonstrate the usage of classes and objects of the real world entities in applications.
4. Discriminate the reusability and multiple interfaces with same functionality based features to solve complex computing problems.
5. Illustrate possible error-handling constructs for unanticipated states/inputs and to use generic programming constructs to accommodate different datatypes.
6. Validate the program against file inputs towards solving the problem.

List of Challenging Experiments (Indicative)

1.	**Postman Problem** A postman needs to walk down every street in his area in order to deliver the mail. Assume that the distances between the streets along the roads are given. The postman starts at the post office and returns back to the post office after delivering all the mails. Implement an algorithm to help the post man to walk minimum distance for the purpose.	10 hours
2.	**Budget Allocation for Marketing Campaign** A mobile manufacturing company has got several marketing options such as Radio advertisement campaign, TV non peak hours campaign, City top paper network, Viral marketing campaign, Web advertising. From their previous experience, they have got a statistics about paybacks for each marketing option. Given the marketing budget (rupees in crores) for the current year and details of paybacks for each option, implement an algorithm to determine the amount that shall spent on each marketing option so that the company attains the maximum profit.	15 hours
3.	**Missionaries and Cannibals** Three missionaries and three cannibals are on one side of a river, along with a	10 hours

	boat that can hold one or two people. Implement an algorithm to find a way to get everyone to the other side of the river, without ever leaving a group of missionaries in one place outnumbered by the cannibals in that place.	
4.	**Register Allocation Problem** A register is a component of a computer processor that can hold any type of data and can be accessed faster. As registers are faster to access, it is desirable to use them to the maximum so that the code execution is faster. For each code submitted to the processor, a register interference graph (RIG) is constructed. In a RIG, a node represents a temporary variable and an edge is added between two nodes (variables) t1 and t2 if they are live simultaneously at some point in the program. During register allocation, two temporaries can be allocated to the same register if there is no edge connecting them. Given a RIG representing the dependencies between variables in a code, implement an algorithm to determine the number of registers required to store the variables and speed up the code execution	15 hours
5.	**Selective Job Scheduling Problem** A server is a machine that waits for requests from other machines and responds to them. The purpose of a server is to share hardware and software resources among clients. All the clients submit the jobs to the server for execution and the server may get multiple requests at a time. In such a situation, the server schedule the jobs submitted to it based on some criteria and logic. Each job contains two values namely time and memory required for execution. Assume that there are two servers that schedules jobs based on time and memory. The servers are named as Time Schedule Server and memory Schedule Server respectively. Design a OOP model and implement the time Schedule Server and memory Schedule Server. The Time Schedule Server arranges jobs based on time required for execution in ascending order whereas memory Schedule Server arranges jobs based on memory required for execution in ascending order	15 hours
6.	**Fragment Assembly in DNA Sequencing** DNA, or deoxyribonucleic acid, is the hereditary material in humans and almost all other organisms. The information in DNA is stored as a code made up of four chemical bases: adenine (A), guanine (G), cytosine (C), and thymine (T). In DNA sequencing, each DNA is sheared into millions of small fragments (reads) which assemble to form a single genomic sequence (superstring). Each read is a small string. In such a fragment assembly, given a set of reads, the objective is to determine the shortest superstring that contains all the reads. For example, given a set of strings, 000, 001, 010, 011, 100, 101, 110, 111 the shortest superstring is 0001110100. Given a set of reads, implement an algorithm to find the shortest superstring that contains all the given reads.	15 hours
7.	**House Wiring** An electrician is wiring a house which has many rooms. Each room has many power points in different locations. Given a set of power points and the distances between them, implement an algorithm to find the minimum cable required.	10 hours
	Total Laboratory Hours	**90 hours**

Text Book(s)				
1.	Stanley B Lippman, Josee Lajoie, Barbara E, Moo, C++ primer, Fifth edition, Addison-Wesley, 2012.			
2	Ali Bahrami, Object oriented Systems development, Tata McGraw - Hill Education, 1999.			
3	Brian W. Kernighan, Dennis M. Ritchie , The C programming Language, 2nd edition, Prentice Hall Inc., 1988.			
Reference Books				
1.	Bjarne stroustrup, The C++ programming Language, Addison Wesley, 4th edition, 2013			
2.	Harvey M. Deitel and Paul J. Deitel, C++ How to Program, 7th edition, Prentice Hall, 2010			
3.	Maureen Sprankle and Jim Hubbard, Problem solving and Programming concepts, 9th edition, Pearson Eduction, 2014.			
Mode of assessment: **PAT / CAT / FAT**				
Recommended by Board of Studies		29-10-2015		
Approved by Academic Council		No. 39	Date	17-12-2015

ENG1901	Technical English - I	L	T	P	J	C
		0	0	4	0	2
Pre-requisite	Foundation English-II	Syllabus Version				
		1				

Course Objectives:

1. To enhance students' knowledge of grammar and vocabulary to read and write error-free language in real life situations.
2. To make the students' practice the most common areas of written and spoken communications skills.
3. To improve students' communicative competency through listening and speaking activities in the classroom.

Expected Course Outcome:

1. Develop a better understanding of advanced grammar rules and write grammatically correct sentences.
2. Acquire wide vocabulary and learn strategies for error-free communication.
3. Comprehend language and improve speaking skills in academic and social contexts.
4. Improve listening skills so as to understand complex business communication in a variety of global English accents through proper pronunciation.
5. Interpret texts, diagrams and improve both reading and writing skills which would help them in their academic as well as professional career.

Module:1	Advanced Grammar	4 hours

Articles, Tenses, Voice and Prepositions

Activity: Worksheets on Impersonal Passive Voice, Exercises from the prescribed text

Module:2	Vocabulary Building I	4 hours

Idioms and Phrases, Homonyms, Homophones and Homographs

Activity: Jigsaw Puzzles; Vocabulary Activities through Web tools

Module:3	Listening for Specific Purposes	4 hours

Gist, monologues, short conversations, announcements, briefings and discussions

Activity: Gap filling; Interpretations

Module:4	Speaking for Expression	6 hours

Introducing oneself and others, Making Requests & responses, Inviting and Accepting/Declining Invitations

Activity: Brief introductions; Role-Play; Skit.

Module:5	Reading for Information	4 hours

Reading Short Passages, News Articles, Technical Papers and Short Stories

Activity: Reading specific news paper articles; blogs

Module:6	Writing Strategies	4 hours

Joining the sentences, word order, sequencing the ideas, introduction and conclusion Activity: Short Paragraphs; Describing familiar events; story writing		
Module:7	**Vocabulary Building II**	**4 hours**
Enrich the domain specific vocabulary by describing Objects, Charts, Food, Sports and Employment. Activity: Describing Objects, Charts, Food, Sports and Employment		
Module:8	**Listening for Daily Life**	**4 hours**
Listening for statistical information, Short extracts, Radio broadcasts and TV interviews Activity: Taking notes and Summarizing		
Module:9	**Expressing Ideas and Opinions**	**6 hours**
Telephonic conversations, Interpretation of Visuals and describing products and processes. Activity: Role-Play (Telephonic); Describing Products and Processes		
Module: 10	**Comprehensive Reading**	**4 hours**
Reading Comprehension, Making inferences, Reading Graphics, Note-making, and Critical Reading. Activity: Sentence Completion; Cloze Tests		
Module: 11	**Narration**	**4 hours**
Writing narrative short story, Personal milestones, official letters and E-mails. Activity: Writing an E-mail; Improving vocabulary and writing skills.		
Module:12	**Pronunciation**	**4 hours**
Speech Sounds, Word Stress, Intonation, Various accents Activity: Practicing Pronunciation through web tools; Listening to various accents of English		
Module:13	**Editing**	**4 hours**
Simple, Complex & Compound Sentences, Direct & Indirect Speech, Correction of Errors, Punctuations. Activity: Practicing Grammar		
Module:14	**Short Story Analysis**	**4 hours**
"The Boundary" by Jhumpa Lahiri Activity: Reading and analyzing the theme of the short story.		
	Total Lecture hours	**60 hours**

Text Book / Workbook	
1.	Wren, P.C.; Martin, H.; Prasada Rao, N.D.V. (1973–2010). *High School English Grammar & Composition*. New Delhi: Sultan Chand Publishers.
2	Kumar, Sanjay,; Pushp Latha. (2018) English Language and Communication Skills for Engineers, India: Oxford University Press.

Reference Books	
1.	Guptha S C, (2012) *Practical English Grammar & Composition*, 1st Edition, India: Arihant Publishers
2.	Steven Brown, (2011) Dorolyn Smith**,** *Active Listening **3***, 3rd Edition, UK: Cambridge University Press.

3.	Liz Hamp-Lyons, Ben Heasley, (2010) *Study Writing*, 2nd Edition, UK: Cambridge University Pres.
4.	Kenneth Anderson, Joan Maclean, (2013) Tony Lynch, *Study Speaking*, 2nd Edition, UK: Cambridge, University Press.
5.	Eric H. Glendinning, Beverly Holmstrom, (2012) *Study Reading*, 2nd Edition, UK: Cambridge University Press.
6.	Michael Swan, (2017) *Practical English Usage* (Practical English Usage), 4th edition, UK: Oxford University Press.
7.	Michael McCarthy, Felicity O'Dell, (2015) *English Vocabulary in Use Advanced* (South Asian Edition), UK: Cambridge University Press.
8.	Michael Swan, Catherine Walter, (2012) *Oxford English Grammar Course Advanced*, Feb, 4th Edition, UK: Oxford University Press.
9.	Watkins, Peter. (2018) *Teaching and Developing Reading Skills: Cambridge Handbooks for Language teachers*, UK: Cambridge University Press.
10.	(*The Boundary by Jhumpa Lahiri)* URL: https://www.newyorker.com/magazine/2018/01/29/the-boundary?intcid=inline_amp

Mode of evaluation: Quizzes, Presentation, Discussion, Role play, Assignments and FAT

List of Challenging Experiments (Indicative)		
1.	Self-Introduction	**12 hours**
2.	Sequencing Ideas and Writing a Paragraph	**12 hours**
3.	Reading and Analyzing Technical Articles	**8 hours**
4.	Listening for Specificity in Interviews (Content Specific)	**12 hours**
5.	Identifying Errors in a Sentence or Paragraph	**8 hours**
6.	Writing an E-mail by narrating life events	**8 hours**
	Total Laboratory Hours	**60 hours**

Mode of evaluation: Quizzes, Presentation, Discussion, Role play, Assignments and FAT

Recommended by Board of Studies	08.06.2019	
Approved by Academic Council	55	Date: 13-06-2019

ENG1902	Technical English - II	L	T	P	J	C
		0	0	4	0	2
Pre-requisite	71% to 90% EPT score	**Syllabus Version**				
		1				

Course Objectives:

1. To acquire proficiency levels in LSRW skills on par with the requirements for placement interviews of high-end companies / competitive exams.
2. To evaluate complex arguments and to articulate their own positions on a range of technical and general topics.
3. To speak in grammatical and acceptable English with minimal MTI, as well as develop a vast and active vocabulary.

Expected Course Outcome:

1. Communicate proficiently in high-end interviews and exam situations and all social situations
2. Comprehend academic articles and draw inferences
3. Evaluate different perspectives on a topic
4. Write clearly and convincingly in academic as well as general contexts
5. Synthesize complex concepts and present them in speech and writing

Module:1	**Listening for Clear Pronunciation**	**4 hours**

Ice-breaking, Introduction to vowels, consonants, diphthongs.

Listening to formal conversations in British and American accents (BBC and CNN) as well as other 'native' accents

Activity: Factual and interpretive exercises; note-making in a variety of global English accents

Module:2	**Introducing Oneself**	**4 hours**

Speaking: Individual Presentations

Activity: Self-Introductions, Extempore speech

Module:3	**Effective Writing**	**6 hours**

Writing: Business letters and Emails, Minutes and Memos

Structure/ template of common business letters and emails: inquiry/ complaint/ placing an order; Formats of Minutes and Memos

Activity: Students write a business letter and Minutes/ Memo

Module:4	**Comprehensive Reading**	**4 hours**

Reading: Reading Comprehension Passages, Sentence Completion (Technical and General Interest), Vocabulary and Word Analogy

Activities: Cloze tests, Logical reasoning, Advanced grammar exercises

Module:5	**Listening to Narratives**	**4 hours**

Listening: Listening to audio files of short stories, News, TV Clips/ Documentaries, Motivational Speeches in UK/ US/ global English accents.

Activity: Note-making and Interpretive exercises

Module:6	**Academic Writing and Editing**	**6 hours**

Writing: Editing/ Proofreading symbols

Citation Formats

Structure of an Abstract and Research Paper

Activity: Writing Abstracts and research paper; Work with Editing/ Proofreading exercise

Module:7	**Team Communication**	**4 hours**

Speaking: Group Discussions and Debates on complex/ contemporary topics Discussion evaluation parameters, using logic in debates Activity: Group Discussions on general topics		
Module:8	**Career-oriented Writing**	**4 hours**
Writing: Resumes and Job Application Letters, SOP Activity: Writing resumes and SOPs		
Module:9	**Reading for Pleasure**	**4 hours**
Reading: Reading short stories Activity: Classroom discussion and note-making, critical appreciation of the short story		
Module: 10	**Creative Writing**	**4 hours**
Writing: Imaginative, narrative and descriptive prose Activity: Writing about personal experiences, unforgettable incidents, travelogues		
Module: 11	**Academic Listening**	**4 hours**
Listening: Listening in academic contexts Activity: Listening to lectures, Academic Discussions, Debates, Review Presentations, Research Talks, Project Review Meetings		
Module:12	**Reading Nature-based Narratives**	**4 hours**
Narratives on Climate Change, Nature and Environment Activity: Classroom discussions, student presentations		
Module:13	**Technical Proposals**	**4 hours**
Writing: Technical Proposals Activities: Writing a technical proposal		
Module:14	**Presentation Skills**	**4 hours**
Persuasive and Content-Specific Presentations Activity: Technical Presentations		
	Total Lecture hours:	**60 hours**

Text Book / Workbook	
1.	Oxenden, Clive and Christina Latham-Koenig. *New English File: Advanced Students Book*. Paperback. Oxford University Press, UK, 2017.
2	Rizvi, Ashraf. *Effective Technical Communication*. McGraw-Hill India, 2017.
Reference Books	
1.	Oxenden, Clive and Christina Latham-Koenig, *New English File: Advanced: Teacher's Book with Test and Assessment*. CD-ROM: Six-level General English Course for Adults. Paperback. Oxford University Press, UK, 2013.
2.	Balasubramanian, T. *English Phonetics for the Indian Students: A Workbook*. Laxmi Publications, 2016.
3.	Philip Seargeant and Bill Greenwell, *From Language to Creative Writing*. Bloomsbury Academic, 2013.
4.	Krishnaswamy, N. *Eco-English*. Bloomsbury India, 2015.
5.	Manto, Saadat Hasan. *Selected Short Stories*. Trans. Aatish Taseer. Random House India, 2012.
6.	Ghosh, Amitav. *The Hungry Tide*. Harper Collins, 2016.
7.	Ghosh, Amitav. *The Great Derangement: Climate Change and the Unthinkable*. Penguin Books, 2016.
8.	*The MLA Handbook for Writers of Research Papers,* 8th ed. 2016.
	Online Sources: https://americanliterature.com/short-short-stories. (75 *short* short stories) http://www.eco-ction.org/dt/thinking.html (Leopold, Aldo."Thinking like a Mountain") https://www.esl-lab.com/; http://www.bbc.co.uk/learningenglish/;

	https://www.bbc.com/news; https://learningenglish.voanews.com/a/using-voa-learning-english-to-improve-listening-skills/3815547.html

Mode of evaluation: Quizzes, Presentation, Discussion, Role play, Assignments and FAT

	List of Challenging Experiments (Indicative)	
1.	Self-Introduction using SWOT	**12 hours**
2.	Writing minutes of meetings	**10 hours**
3.	Writing an abstract	**10 hours**
4.	Listening to motivational speeches and interpretation	**10 hours**
5.	Cloze Test	**6 hours**
6.	Writing a proposal	**12 hours**
	Total Laboratory Hours	**60 hours**

Mode of evaluation: Quizzes, Presentation, Discussion, Role play, Assignments and FAT

Recommended by Board of Studies	08.06.2019	
Approved by Academic Council	55	Date: 13-06-2019

ENG1903	Advanced Technical English	L	T	P	J	C
		0	0	2	4	2
Pre-requisite	Greater than 90 % EPT score	**Syllabus Version**				
		1				

Course Objectives:

1. To review literature in any form or any technical article
2. To infer content in social media and respond accordingly
3. To communicate with people across the globe overcoming trans-cultural barriers and negotiate successfully

Expected Course Outcome:

1. Analyze critically and write good reviews
2. Articulate research papers, project proposals and reports
3. Communicate effectively in a trans-cultural environment
4. Negotiate and lead teams towards success
5. Present ideas in an effective manner using web tools

Module:1	Negotiation and Decision Making Skills through Literary Analysis	5 hours

Concepts of Negotiation and Decision Making Skills

Activity: Analysis of excerpts from Shakespeare's "The Merchant of Venice" (court scene) and discussion on negotiation skills.

Critical evaluation of excerpts from Shakespeare's "Hamlet"(Monologue by Hamlet) and discussion on decision making skills

Module:2	Writing reviews and abstracts through movie interpretations	5 hours

Review writing and abstract writing with competency

Activity: Watching Charles Dickens "Great Expectations" and writing a movie review

Watching William F. Nolan's "Logan's Run" and analyzing it in tune with the present scenario of depletion of resources and writing an abstract

Module:3	Technical Writing	4 hours

Stimulate effective linguistics for writing: content and style

Activity: ProofreadingStatement of Purpose

Module:4	Trans-Cultural Communication	4 hours

Nuances of Trans-cultural communication

Activity:Group discussion and case studies on trans-cultural communication.

Debate on trans-cultural communication.

Module:5	Report Writing and Content Writing	4 hours

Enhancing reportage on relevant audio-visuals

Activity: Watch a documentary on social issues and draft a report

Identify a video on any social issue and interpret

Module:6	Drafting project proposals and article writing	4 hours

Dynamics of drafting project proposals and research articles

Activity:Writing a project proposal.

Writing a research article.

Module:7	Technical Presentations	4 hours

Build smart presentation skills and strategies Activity: Technical presentations using PPT and Web tools		
	Total Lecture hours	**30 hours**
Text Book / Workbook		
1.	Raman, Meenakshi & Sangeeta Sharma. *Technical Communication: Principles and Practice*, 3rd edition, Oxford University Press, 2015.	
Reference Books		
1	Basu B.N. *Technical Writing*, 2011 Kindle edition	
2	Arathoon, Anita. *Shakespeare's The Merchant of Venice* (Text with Paraphrase), Evergreen Publishers, 2015.	
3	Kumar, Sanjay and Pushp Lata. *English Language and Communication Skills for Engineers,* Oxford University Press, India, 2018.	
4	Frantisek, Burda. *On Transcultural Communication*, 2015, LAP Lambert Academic Publishing, UK.	
5	Geever, C. Jane. *The Foundation Center's Guide to Proposal Writing*, 5th Edition, 2007, Reprint 2012 The Foundation Center, USA.	
6	Young, Milena. *Hacking Your Statement of Purpose: A Concise Guide to Writing Your SOP*, 2014 Kindle Edition.	
7	Ray, Ratri, *William Shakespeare's Hamlet*, The Atlantic Publishers, 2011.	
8	C Muralikrishna & Sunitha Mishra, *Communication Skills for Engineers,* 2nd edition, NY: Pearson, 2011.	
Mode of Evaluation: Quizzes, Presentation, Discussion, Role Play, Assignments		
List of Challenging Experiments (Indicative)		
1.	Enacting a court scene - Speaking	**6 hours**
2.	Watching a movie and writing a review	**4 hours**
3.	Trans-cultural – case studies	**2 hours**
4.	Drafting a report on any social issue	**6 hours**
5.	Technical Presentation using web tools	**6 hours**
6.	Writing a research paper	**6 hours**
J- Component Sample Projects		
1.	Short Films	
2.	Field Visits and Reporting	
3.	Case studies	
4.	Writing blogs	
5.	Vlogging	
	Total Hours (J-Component)	**60 hours**
Mode of evaluation: Quizzes, Presentation, Discussion, Role play, Assignments and FAT		
Recommended by Board of Studies	08.06.2019	
Approved by Academic Council	55	Date: 13-06-2019

HUM1021	Ethics And Values	L	T	P	J	C
		2	0	0	0	2
Pre-requisite	**Nil**	**Syllabus version**				
		1.2				

Course Objectives:

1. To understand and appreciate the ethical issues faced by an individual in profession, society and polity
2. To understand the negative health impacts of certain unhealthy behaviors
3. To appreciate the need and importance of physical, emotional health and social health

Expected Course Outcome:

Students will be able to:

1. Follow sound morals and ethical values scrupulously to prove as good citizens
2. Understand various social problems and learn to act ethically
3. Understand the concept of addiction and how it will affect the physical and mental health
4. Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects
5. Identify the main typologies, characteristics, activities, actors and forms of cybercrime

Module: 1	**Being good and responsible**	**5 hours**

Gandhian values such as truth and non-violence – comparative analysis on leaders of past and present – society's interests versus self-interests–Personal Social Responsibility: Helping the needy, charity and serving the society.

Module: 2	**Social Issues 1**	**4 hours**

Harassment – types - Prevention of harassment, violence and terrorism

Module: 3	**Social Issues 2**	**4 hours**

Corruption: ethical values, causes, impact, laws, prevention – electoral malpractices white collar crimes – tax evasions – unfair trade practices

Module: 4	**Addiction and Health**	**3 hours**

Peer pressure - Alcoholism: ethical values, causes, impact, laws, prevention – Ill effects of smoking – Prevention of Suicides

Sexual Health: Prevention and impact of pre-marital pregnancy and Sexually Transmitted Diseases

Module: 5	**Drug Abuse**	**4 hours**

Abuse of different types of legal and illegal drugs: ethical values, causes, impact, laws and prevention

Module: 6	**Personal and Professional Ethics**	**3 hours**

Dishonesty - Stealing - Malpractices in Examinations – Plagiarism

Module: 7	**Abuse of technologies**	**4 hours**

Hacking and other cyber crimes, addiction to mobile phone usage, video games and social

networking websites				
Module: 8	**Contemporary Issues**			**3 hours**
Total Lecture hours				**30 hours**
Reference Books				
1.	Dhaliwal, K.K (2016), "Gandhian Philosophy of Ethics: A Study of Relationship between his Presupposition and Precepts, Writers Choice, New Delhi, India			
2.	Vittal, N (2012), "Ending Corruption? - How to Clean up India?", Penguin Publishers, UK			
3.	Pagliaro, L.A. and Pagliaro, A.M (2012), "Handbook of Child and Adolescent Drug and Substance Abuse: Pharmacological , Developmental and Clinical Considerations", Wiley Publishers, U.S.A			
4.	Pandey, P. K (2012), "Sexual Harassment and Law in India", Lambert Publishers, Germany			
Mode of Evaluation: CAT, Assignment, Quiz, FAT and Seminar				
Recommended by Board of Studies	26.07.2017			
Approved by Academic Council	46th ACM	**Date**	24.08.2017	

ITE1901	Technical Answers for Real World Problems (TARP)	L	T	P	J	C
		1	0	0	4	2

Pre-requisite	PHY1999 and 115 Credits Earned	Syllabus version
		1.0

Course Objectives:

1. To help students to identify the need for developing newer technologies for industrial / societal needs
2. To train students to propose and implement relevant technology for the development of the prototypes / products
3. To make the students learn to the use the methodologies available for analysing the developed prototypes / products

Expected Course Outcome:

At the end of the course, the student will be able to

1. Identify real life problems related to society
2. Apply appropriate technology(ies) to address the identified problems using engineering principles and arrive at innovative solutions

Module:1 **15 hours**

1. Identification of real life problems
2. Field visits can be arranged by the faculty concerned
3. 6 – 10 students can form a team (within the same / different discipline)
4. Minimum of eight hours on self-managed team activity
5. Appropriate scientific methodologies to be utilized to solve the identified issue
6. Solution should be in the form of fabrication/coding/modeling/product design/process design/relevant scientific methodology(ies)
7. Consolidated report to be submitted for assessment
8. Participation, involvement and contribution in group discussions during the contact hours will be used as the modalities for the continuous assessment of the theory component
9. Project outcome to be evaluated in terms of technical, economical, social, environmental, political and demographic feasibility
10. Contribution of each group member to be assessed
11. The project component to have three reviews with the weightage of 20:30:50

Mode of Evaluation: (No FAT) Continuous Assessment the project done – Mark weightage of 20:30:50 – project report to be submitted, presentation and project reviews

Recommended by Board of Studies	28-02-2016		
Approved by Academic Council	No.37	Date	16-06-2015

ITE1902	Industrial Internship	L	T	P	J	C
		0	0	0	0	1
Pre-requisite	Completion of minimum of Two semesters					

Course Objectives:

The course is designed so as to expose the students to industry environment and to take up on-site assignment as trainees or interns.

Expected Course Outcome:

At the end of this internship the student should be able to:

1. Have an exposure to industrial practices and to work in teams
2. Communicate effectively
3. Understand the impact of engineering solutions in a global, economic, environmental and societal context
4. Develop the ability to engage in research and to involve in life-long learning
5. Comprehend contemporary issues
6. Engage in establishing his/her digital footprint

Contents	**4**	**Weeks**
Four weeks of work at industry site. Supervised by an expert at the industry.		

Mode of Evaluation: Internship Report, Presentation and Project Review

Recommended by Board of Studies	28-02-2016		
Approved by Academic Council	No. 37	Date	16-06-2015

ITE1903	Comprehensive Examination	L	T	P	J	C
		0	0	0	0	1
Pre-requisite		**Syllabus version**				
		1.00				

Digital Logic and Microprocessor

Simplification of Boolean functions using K-Map – Combinational logic: Adder, subtractor, encoder, decoder, multiplexer, de-multiplexer – Sequential Logic: Flip flops- 8086 Microprocessor: instructions – peripherals: 8255, 8254, 8257.

Computer Architecture and Organization

Instructions - Instruction types- Instruction Formats - Addressing Modes- Pipelining- Data Representation - Memory Hierarchy- Cache memory-Virtual Memory- I/O Fundamentals- I/O Techniques - Direct Memory Access - Interrupts-RAID architecture

Programming, Data Structures and Algorithms

Programming in C; Algorithm Analysis – Iterative and Recursive Algorithms; ADT - Stack and its Applications - Queue and its Applications; Data Structures – Arrays and Linked Lists; Algorithms - Sorting – Searching; Trees – BST, AVL; Graphs – BFS , DFS , Dijkstra's Shortest Path Algorithm.

Theory of Computation

Deterministic Finite Automata, Non deterministic Finite Automata, Regular Expressions, Context Free Grammar, Push down Automata and Context Free Languages, Turing Machines.

Web Technologies

Web Architecture- JavaScript – objects String, date, Array, Regular Expressions, DHTML-HTML DOM Events; Web Server – HTTP- Request/Response model-RESTful methods- State Management – Cookies , Sessions – AJAX.

Operating Systems

Processes, Threads, Inter-process communication, CPU scheduling, Concurrency and synchronization, Deadlocks, Memory management and Virtual memory & File systems.

Database Management System

DBMS, Schema, catalog, metadata, data independence, pre-compiler; Users-naïve, sophisticated, casual ;ER Model- Entity, attributes, structural constraints; Relational Model-Constraints, Relational Algebra operations; SQL- DDL, DML, TCL, DCL commands, basic queries and Top N queries; Normalization-properties, 1NF, 2NF, 3NF, BCNF; Indexing-different types, Hash Vs B-tree Index; Transaction-problems, Concurrency Control-techniques, Recovery-methods.

Data Communication and Computer Networks

Circuit Switching, Packet Switching, Frame Relay, Cell Switching, ATM , OSI Reference model,

TCP\IP, Network topologies, LAN Technologies, Error detection and correction techniques, Internet protocols , IPv4/IPv6, Routing algorithms, TCP and UDP, Sockets, Congestion control, Application Layer Protocols, Network Security: Basics of public and private key cryptosystems-Digital Signatures and Hash codes, Transport layer security, VPN, Firewalls.			
Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016

ITE1904	Capstone Project	L	T	P	J	C
		0	0	0	0	12
Pre-requisite	As per the academic regulations	Syllabus version				
		1.0				

Course Objectives:

To provide sufficient hands-on learning experience related to the design, development and analysis of suitable product / process so as to enhance the technical skill sets in the chosen field.

Expected Course Outcome:

At the end of the course the student will be able to

1. Formulate specific problem statements for ill-defined real life problems with reasonable assumptions and constraints.
2. Perform literature search and / or patent search in the area of interest.
3. Conduct experiments / Design and Analysis / solution iterations and document the results.
4. Perform error analysis / benchmarking / costing
5. Synthesise the results and arrive at scientific conclusions / products / solution
6. Document the results in the form of technical report / presentation

Contents

1. Capstone Project may be a theoretical analysis, modeling & simulation, experimentation & analysis, prototype design, fabrication of new equipment, correlation and analysis of data, software development, applied research and any other related activities.
2. Project can be for one or two semesters based on the completion of required number of credits as per the academic regulations.
3. Can be individual work or a group project, with a maximum of 3 students.
4. In case of group projects, the individual project report of each student should specify the individual's contribution to the group project.
5. Carried out inside or outside the university, in any relevant industry or research institution.
6. Publications in the peer reviewed journals / International Conferences will be an added advantage

Mode of Evaluation: Periodic reviews, Presentation, Final oral viva, Poster submission

Recommended by Board of Studies	10.06.2015		
Approved by Academic Council	37th AC	Date	16.06.2015

MAT1011	Calculus for Engineers	L	T	P	J	C
		3	0	2	0	4
Pre-requisite	10+2 Mathematics or MAT1001	Syllabus Version				
		1.0				

Course Objectives :

1. To provide the requisite and relevant background necessary to understand the other important engineering mathematics courses offered for Engineers and Scientists.
2. To introduce important topics of applied mathematics, namely Single and Multivariable Calculus and Vector Calculus etc.
3. To impart the knowledge of Laplace transform, an important transform technique for Engineers which requires knowledge of integration

Expected Course Outcomes:

At the end of this course the students should be able to

1. Apply single variable differentiation and integration to solve applied problems in engineering and find the maxima and minima of functions
2. Understand basic concepts of Laplace Transforms and solve problems with periodic functions, step functions, impulse functions and convolution
3. Evaluate partial derivatives, limits, total differentials, Jacobians, Taylor series and optimization problems involving several variables with or without constraints
4. Evaluate multiple integrals in Cartesian, Polar, Cylindrical and Spherical coordinates.
5. Understand gradient, directional derivatives, divergence, curl and Greens', Stokes, Gauss theorems
6. Demonstrate MATLAB code for challenging problems in engineering

Module:1	Application of Single Variable Calculus	9 hours

Differentiation- Extrema on an Interval-Rolle's Theorem and the Mean Value Theorem-Increasing and Decreasing functions and First derivative test-Second derivative test-Maxima and Minima-Concavity. Integration-Average function value - Area between curves - Volumes of solids of revolution - Beta and Gamma functions–interrelation

Module:2	Laplace transforms	7 hours

Definition of Laplace transform-Properties-Laplace transform of periodic functions-Laplace transform of unit step function, Impulse function-Inverse Laplace transform-Convolution.

Module:3	Multivariable Calculus	4 hours

Functions of two variables-limits and continuity-partial derivatives –total differential-Jacobian and its properties.

Module:4	Application of Multivariable Calculus	5 hours

Taylor's expansion for two variables–maxima and minima–constrained maxima and minima-Lagrange's multiplier method.

Module:5	Multiple integrals	8 hours
Evaluation of double integrals–change of order of integration–change of variables between Cartesian and polar co-ordinates - Evaluation of triple integrals-change of variables between Cartesian and cylindrical and spherical co-ordinates- evaluation of multiple integrals using gamma and beta functions.		
Module:6	**Vector Differentiation**	**5 hours**
Scalar and vector valued functions – gradient, tangent plane–directional derivative-divergence and curl–scalar and vector potentials–Statement of vector identities-Simple problems		
Module:7	**Vector Integration**	**5 hours**
line, surface and volume integrals - Statement of Green's, Stoke's and Gauss divergence theorems -verification and evaluation of vector integrals using them.		
Module:8	**Contemporary Issues:**	**2 hours**
Industry Expert Lecture		
	Total Lecture hours:	**45 hours**

Text Book(s)

[1] Thomas' Calculus, George B.Thomas, D.Weir and J. Hass, 13th edition, Pearson, 2014.
[2] Advanced Engineering Mathematics, Erwin Kreyszig, 10th Edition, Wiley India, 2015.

Reference Books

1. Higher Engineering Mathematics, B.S. Grewal, 43rd Edition ,Khanna Publishers, 2015
2. Higher Engineering Mathematics, John Bird, 6th Edition, Elsevier Limited, 2017.
3. Calculus: Early Transcendentals, James Stewart, 8th edition, Cengage Learning, 2017.
4. Engineering Mathematics, K.A.Stroud and Dexter J. Booth, 7th Edition, Palgrave Macmillan (2013)

Mode of Evaluation

Digital Assignments, Quiz, Continuous Assessments, Final Assessment Test

List of Challenging Experiments (Indicative)		
1.	Introduction to MATLAB through matrices, and general Syntax	3 hours
2	Plotting and visualizing curves and surfaces in MATLAB – Symbolic computations using MATLAB	3 hours
3.	Evaluating Extremum of a single variable function	3 hours
4.	Understanding integration as Area under the curve	3 hours
5.	Evaluation of Volume by Integrals (Solids of Revolution)	3 hours
6.	Evaluating maxima and minima of functions of several variables	3 hours
7.	Applying Lagrange multiplier optimization method	2 hours
8.	Evaluating Volume under surfaces	2 hours
9.	Evaluating triple integrals	2 hours
10.	Evaluating gradient, curl and divergence	2 hours
11.	Evaluating line integrals in vectors	2 hours
12.	Applying Green's theorem to real world problems	2 hours
	Total Laboratory Hours	**30 hours**

Mode of Assessment:

Weekly assessment, Final Assessment Test

Recommended by Board of Studies	12-06-2015		
Approved by Academic Council	No. 37	Date	16-06-2015

MAT2001	Statistics for Engineers	L	T	P	J	C
		3	0	2	0	4

Prerequisites	MAT1011 – Calculus for Engineers	Syllabus Version: 1.1

Course Objectives :

1. To provide students with a framework that will help them choose the appropriate descriptive methods in various data analysis situations.
2. To analyse distributions and relationship of real-time data.
3. To apply estimation and testing methods to make inference and modelling techniques for decision making.

Expected Course Outcome:

At the end of the course the student should be able to:

1. Compute and interpret descriptive statistics using numerical and graphical techniques.
2. Understand the basic concepts of random variables and find an appropriate distribution for analysing data specific to an experiment.
3. Apply statistical methods like correlation, regression analysis in analysing, interpreting experimental data.
4. Make appropriate decisions using statistical inference that is the central to experimental research.
5. Use statistical methodology and tools in reliability engineering problems.
6. demonstrate R programming for statistical data

Module: 1	Introduction to Statistics	6 hours

Introduction to statistics and data analysis-Measures of central tendency –Measures of variability-[Moments-Skewness-Kurtosis (Concepts only)].

Module: 2	Random variables	8 hours

Introduction -random variables-Probability mass Function, distribution and density functions - joint Probability distribution and joint density functions- Marginal, conditional distribution and density functions- Mathematical expectation, and its properties Covariance , moment generating function – characteristic function.

Module: 3	Correlation and regression	4 hours

Correlation and Regression – Rank Correlation- Partial and Multiple correlation- Multiple regression.

Module: 4	Probability Distributions	7 hours

Binomial and Poisson distributions – Normal distribution – Gamma distribution – Exponential distribution – Weibull distribution.

Module: 5	Hypothesis Testing I	4 hours

Testing of hypothesis – Introduction-Types of errors, critical region, procedure of testing hypothesis-Large sample tests- Z test for Single Proportion, Difference of Proportion, mean and difference of means.

Module: 6	Hypothesis Testing II	9 hours
Small sample tests- Student's t-test, F-test- chi-square test- goodness of fit - independence of attributes- Design of Experiments - Analysis of variance – one and two way classifications - CRD-RBD- LSD.		
Module: 7	**Reliability**	**5 hours**
Basic concepts- Hazard function-Reliabilities of series and parallel systems- System Reliability - Maintainability-Preventive and repair maintenance- Availability.		
Module: 8	**Contemporary Issues**	**2 hours**
	Total Lecture hours	**45 hours**

Text book(s)

- Probability and Statistics for engineers and scientists, R.E.Walpole, R.H.Myers, S.L.Mayers and K.Ye, 9th Edition, Pearson Education (2012).
- Applied Statistics and Probability for Engineers, Douglas C. Montgomery, George C. Runger, 6th Edition, John Wiley & Sons (2016).

Reference books

- Reliability Engineering, E.Balagurusamy, Tata McGraw Hill, Tenth reprint 2017.
- Probability and Statistics, J.L.Devore, 8th Edition, Brooks/Cole, Cengage Learning (2012).
- Probability and Statistics for Engineers, R.A.Johnson, Miller Freund's, 8th edition, Prentice Hall India (2011).
- Probability, Statistics and Reliability for Engineers and Scientists, Bilal M. Ayyub and Richard H. McCuen, 3rd Edition, CRC press (2011).

Mode of Evaluation

Digital Assignments, Continuous Assessment Tests, Quiz, Final Assessment Test.

List of Experiments (Indicative)		
•	Introduction: Understanding Data types; importing/exporting data.	3 hours
•	Computing Summary Statistics /plotting and visualizing data using Tabulation and Graphical Representations.	3 hours
•	Applying correlation and simple linear regression model to real dataset; computing and interpreting the coefficient of determination.	3hours
•	Applying multiple linear regression model to real dataset; computing and interpreting the multiple coefficient of determination.	3 hours
•	Fitting the following probability distributions: Binomial distribution	3 hours
•	Normal distribution, Poisson distribution	3 hours
•	Testing of hypothesis for One sample mean and proportion from real-time problems.	3 hours
•	Testing of hypothesis for Two sample means and proportion from real-time problems	3 hours
•	Applying the t test for independent and dependent samples	2 hours
•	Applying Chi-square test for goodness of fit test and Contingency test to real dataset	2 hours

•	Performing ANOVA for real dataset for Completely randomized design, Randomized Block design ,Latin square Design	2 hours
	Total laboratory hours	**30 hours**

Mode of Evaluation			
Weekly Assessment, Final Assessment Test			
Recommended by Board of Studies	25-02-2017		
Approved by Academic Council	47	Date:	05-10-2017

MGT1022	Lean Start-up Management	L	T	P	J	C
		1	0	0	4	2

Pre-requisite	None	Syllabus version
		1.0

Course Objectives:

1. Learn the difference between traditional methods and Lean Start-up
2. Explore Lean Start-up concepts, principles, and terminology
3. Learn how "start-up" applies to both public products and internal company products
4. Explore the Lean Start-up Model and the power of Visioning

Expected Course Outcome:

1. Understand developing business models and growth drivers
2. Use the business model canvas to map out key components of enterprise
3. Analyze market size, cost structure, revenue streams, and value chain
4. Understand build-measure-learn principles
5. Foreseeing and quantifying business and financial risks

Module:1	Creativity and Design Thinking	2 hours

Creativity and Design Thinking (identify the vertical for business opportunity, understand your customers, accurately assess market opportunity)

Module:2	Minimum Viable Product	3 hours

Minimum Viable Product (Value Proposition, Customer Segments, Build-measure-learn process)

Module:3	Business Model Development	3 hours

Business Model Development(Channels and Partners, Revenue Model and streams, Key Resources, Activities and Costs, Customer Relationships and Customer Development Processes, Business model canvas –the lean model- templates)

Module:4	Business Plan and Access to Funding	3 hours

Business Plan and Access to Funding(visioning your venture, taking the product/ service to market, Market plan including Digital & Viral Marketing, start-up finance - Costs/Profits & Losses/cash flow, Angel/VC,/Bank Loans and Key elements of raising money)

Module:5	Legal and Regulatories	2 hours

Legal, Regulatory, CSR, Standards, Taxes

Module:6	Contemporary issues	2 hours

	Total Lecture hours:	**15hours**	

Text Books	
1.	The Startup Owner's Manual: The Step-By-Step Guide for Building a Great Company, Steve Blank, K & S Ranch; 1st edition (March 1, 2012).
2.	The Four Steps to the Epiphany, Steve Blank, K&S Ranch; 2nd edition (July 17, 2013)
3.	The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Eric Ries, Crown Business; (13 September 2011)
Reference Books	
1.	Holding a Cat by the Tail, Steve Blank, K&S Ranch Publishing LLC (August 14, 2014)
2.	Product Design and Development, Karal T Ulrich, SD Eppinger, McGraw Hill
3.	Zero to One: Notes on Startups, or How to Build the Future, Peter Thiel, Crown Business; (16 September 2014)
4.	Lean Analytics: Use Data to Build a Better Startup Faster (Lean Series), Alistair Croll & Benjamin Yoskovitz, O'Reilly Media; 1st Edition (March 21, 2013)
5.	Inspired: How To Create Products Customers Love, Marty Cagan, SVPG Press; 1st edition (June 18, 2008)
Mode of evaluation: Internal Assessment Assignments; Field Trips, Case Studies; e-learning; Learning through research, TED Talks & FAT	

Recommended by Board of Studies	15.12.2015		
Approved by Academic Council	39th ACM	Date	17.12.2015

PHY1701	Engineering Physics	L	T	P	J	C
		3	0	2	0	4

Pre-requisite	Physics of 12th standard or equivalent	Syllabus version
		1.0

Course Objectives:

To enable the students to understand the basics of the latest advancements in Physics viz., Quantum Mechanics, Nanotechnology, Lasers, Electro Magnetic Theory and Fiber Optics.

Expected Course Outcome:

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

1. To understand the dual nature of radiation and matter.
2. To apply Schrodinger's equations to solve finite and infinite potential problems.
3. To apply quantum ideas at the nanoscale.
4. To apply quantum ideas for understanding the operation and working principle of optoelectronic devices.
5. To analyze the Maxwell's equations in differential and integral form.
6. To classify the optical fiber for different Engineering applications.
7. To apply concept of Lorentz Transformation for engineering applications.
8. To demonstrate the quantum mechanical ideas – Lab

Module: 1	Introduction to Modern Physics	6 hours

Planck's concept (hypothesis), Compton Effect, Particle properties of wave: Matter Waves, Davisson Germer Experiment, Heisenberg Uncertainty Principle, Wave function, and Schrodinger equation (time dependent & independent).

Module: 2	Applications of Quantum Physics	5 hours

Particle in a 1-D box (Eigen Value and Eigen Function), 3-D Analysis (Qualitative), Tunneling Effect (Qualitative) (AB 205), Scanning Tunneling Microscope (STM).

Module: 3	Nanophysics	5 hours

Introduction to Nano-materials, Moore's law, Properties of Nano-materials, Quantum confinement, Quantum well, wire & dot, Carbon Nano-tubes (CNT), Applications of nanotechnology in industry.

Module: 4	Laser Principles and Engineering Application	6 hours

Laser Characteristics, Spatial and Temporal Coherence, Einstein Coefficient & its significance, Population inversion, Two, three & four level systems, Pumping schemes, Threshold gain coefficient, Components of laser, Nd-YAG, He-Ne, CO2 and Dye laser and their engineering applications.

Module: 5	Electromagnetic Theory and its application	6 hours

Physics of Divergence, Gradient and Curl, Qualitative understanding of surface and volume integral, Maxwell Equations (Qualitative), Wave Equation (Derivation), EM Waves, Phase velocity, Group velocity, Group index , Wave guide (Qualitative)

Module: 6	Propagation of EM waves in Optical fibers and Optoelectronic Devices	6 hours

Light propagation through fibers, Acceptance angle, Numerical Aperture, Types of fibers - step index, graded index, single mode & multimode, Attenuation, Dispersion-intermodal and intramodal.

Sources-LED & Laser Diode, Detectors-Photodetectors- PN & PIN - Applications of fiber optics in communication- Endoscopy.		
Module: 7	Special Theory of Relativity	**9 hours**
Frame of reference, Galilean relativity, Postulate of special theory of relativity, Simultaneity, length contraction and time dilation.		
Module: 8	**Contemporary issues**	**2 hours**
	Total Lecture hours	**45 hours**

Text Book (s)	
1.	Arthur Beiser et al., Concepts of Modern Physics, 2013, Sixth Edition, Tata McGraw Hill. William Silfvast,
2.	Laser Fundamentals, 2008, Cambridge University Press
3.	D. J. Griffith, Introduction to Electrodynamics, 2014, 4th Edition, Pearson
4.	Djafar K. Mynbaev and Lowell L.Scheiner, Fiber Optic Communication Technology, 2011, Pearson
Reference Books	
1.	Raymond A. Serway, Clement J. Mosses, Curt A. Moyer Modern Physics, 2010, 3rd Indian Edition Cengage learning.
2.	John R. Taylor, Chris D. Zafiratos and Michael A. Dubson, Modern Physics for Scientists and Engineers, 2011, PHI Learning Private Ltd.
3.	Kenneth Krane Modern Physics, 2010, Wiley Indian Edition.
4.	Nityanand Choudhary and RichaVerma, Laser Systems and Applications, 2011, PHI Learning Private Ltd.
5.	S. Nagabhushana and B. Sathyanarayana, Lasers and Optical Instrumentation, 2010, I.K. International Publishing House Pvt. Ltd.
6.	R. Shevgaonkar, Electromagnetic Waves, 2005, 1st Edition, Tata McGraw Hill
7.	Principles of Electromagnetics, Matthew N.O. Sadiku, 2010, Fourth Edition, Oxford
8.	Ajoy Ghatak and K. Thyagarajan, Introduction to Fiber Optics, 2010, Cambridge University Press
Mode of Evaluation: Quizzes , Digital Assignments, CAT-I and II and FAT	

List of Challenging Experiments (Indicative)		
1.	Determination of Planck's constant using electrolumine scence process	2 hrs
2.	Electron diffraction	2 hrs
3.	Determination of wave length of laser source (He-Ne laser and diodelasers of Different wave lengths) using diffraction technique	2 hrs
4.	Determination of size offine particle using laser diffraction	2 hrs
5.	Determination of the track width (periodicity) in a written CD	2 hrs
6.	Optical Fiber communication (source+optical fiber+detector)	2 hrs
7.	Analysis of crystallite size and strain in a nano-crystalline film using X-ray diffraction	2 hrs
8.	Numerical solutions of Schrödinger equation (e.g. particle in a box problem) (can be given as an assignment)	2 hrs
9.	Laser coherence length measurement	2 hrs
10.	Proof for transverse nature of E.M. waves	2 hrs

11.	Quantum confinement and Heisenberg's uncertainty principle	2 hrs
12.	Determination of angle of prism and refractive index for various colour – Spectrometer	2 hrs
13.	Determination of divergence of a laser beam	2 hrs
14.	Determination of crystalline size for nanomaterial (Computer simulation)	2 hrs
15.	Demonstration of phase velocity and group velocity (Computer simulation)	2 hrs
Total Laboratory Hours		**30 hours**

Mode of assessment: CAT / FAT			
Recommended by Board of Studies	04.06.2019		
Approved by Academic Council	46th ACM	**Date**	24.08.2017

PHY1901	Introduction To Innovative Projects	L	T	P	J	C
		1	0	0	0	1

Pre-requisite	Nil	Syllabus version
		1.0

Course Objectives:

This course is offered to the students in the 1st Year of B. Tech. in order to orient them towards independent, systemic thinking and be innovative.

1. To make students confident enough to handle the day to day issues.
2. To develop the "Thinking Skill" of the students, especially Creative Thinking Skills
3. To train the students to be innovative in all their activities
4. To prepare a project report on a socially relevant theme as a solution to the existing issues

Expected Course Outcome:

1. To understand the various types of thinking skills.
2. To enhance the innovative and creative ideas.
3. To find out a suitable solution for socially relevant issues-J component

Module: 1A	Self Confidence	1 hour

Understanding self – Johari Window – SWOT Analysis – Self Esteem – Being a contributor – Case Study

Project : Exploring self, understanding surrounding, thinking about how s(he) can be acontributor Forthe society, Creating a big picture of being an innovator–writing a 1000 words imaginary Autobiography of self–Topic "Mr. X–the great innovator of 2015" and upload. (**non-contact hours)**

Module: 1B	Thinking Skill	1 hour

Thinking and Behaviour–Types of thinking–Concrete– Abstract, Convergent, Divergent, Creative, Analytical, Sequential and Holistic thinking–Chunking Triangle–Context Grid – Examples – Case Study.

Project: Meeting atleast 50 people belonging to various strata of life and talk to them / make field visits to identify a min. of 100 society related issues, problems for which they need solutions and categories them and upload along with details of people met and lessons learnt. **(4 non-contact hours)**

Module: 1C	Lateral ThinkingSkill	1 hour

Blooms Taxonomy–HOTS–Out of the box thinking–de Bono lateral thinking model–Examples

Project : Last weeks-incomplete portion to be done and uploaded

Module: 2A	Creativity	1 hour

Creativity Models–Walla–Barrons–Koberg & Begnall–Examples

Project: Selecting 5 out of 100 issues identified for future work. Criteria based approach for prioritisation, use of statistical tools & upload. **(4 non-contact**

hours)		
Module: 2B	**Brain storming**	**1 hour**
25 brainstorming techniques and examples **Project:** Brainstorm and come out with as many solutions as possible for the top 5 issues identified & upload. **(4 non-contact hours)**		
Module: 3	**Mind Mapping**	**1 hour**
Mind Mapping techniques and guidelines. Drawing a mind map **Project:** Using Mind Maps get another set of solutions for the next 5 issues (issue 6–10). **(4 non-contact hours)**		
Module: 4A	**Systems thinking**	**1 hour**
Systems Thinking essentials–examples–Counter Intuitive condemns **Project:** Select 1 issue / problem for which the possible solutions are available with you. Apply Systems Thinking process and pick up one solution [explanation should be given why the other possible solutions have been left out].Goback to the customer and assess the acceptability and upload. **(4 non-contact hours)**		
Module: 4B	**Design Thinking**	**1 hour**
Design thinking process–Human element of design thinking– case study **Project:** Apply design thinking to the selected solution; apply the engineering & scientific tinge to it. Participate in "design week" celebration sup load the weeks learning out come.		
Module: 5A	**Innovation**	**1 hour**
Difference between Creativity and Innovation–Examples of innovation–Being innovative. **Project:** A literature searches on proto typing of your solution finalized. Prepare a proto type model or processand upload. **(4 non-contact hours)**		
Module: 5B	**Blocks for Innovation**	**1 hour**
Identify Blocks for creativity and innovation – overcoming obstacles – Case Study **Project:** Project presentation on problem identification, solution, innovations-expected results–Interim review with PPT presentation. **(4 non-contact hours)**		
Module: 5C	**Innovation Process**	**1 hour**
Steps for Innovation–right climate for innovation **Project:** Refining the project, based on the review report and uploading the text. **(4 non-contact hours)**		
Module: 6A	**Innovation in India**	**1 hour**
Stories of 10 Indian innovations **Project:** Making the project better with add ons. **(4 non- contact hours)**		
Module: 6B	**JUGAAD Innovation**	**1 hour**
Frugal and flexible approach to innovation-doing more with less Indian Examples **Project:** Fine tuning the innovation project with JUGAAD principles and uploading (Credit for JUGAAD implementation). **(4 non-contact hours)**		
Module: 7A	**Innovation Project Proposal Presentation**	**1 hour**
Project proposal contents, economicinput, ROI–Template **Project:** Presentation of the innovative project proposal and upload. **(4 non- contact hours)**		

Module: 8A	**Contemporary issue in Innovation**	**1 hour**
Contemporary issue in Innovation **Project:** Final project Presentation, Vivavoce Exam		**(4 non-contact hours)**
Total Lecture hours		**15 hours**
Text Book(s)		
1.	How to have Creative Ideas, Edward debone,Vermil on publication, UK, 2007	
2.	The Art of Innovation, Tom Kelley & Jonathan Littman, Profile Books Ltd., UK, 2008	
Reference Books		
1.	Creating Confidence, Meribeth Bonct, Kogan Page India Ltd., New Delhi, 2000	
2.	Lateral Thinking Skills, Paul Sloane, Keogan Page India Ltd, New Delhi, 2008	
3.	Indian Innovators, Akhat Agrawal, Jaico Books, Mumbai, 2015	
4.	JUGAAD Innovation, Navi Radjou, Jaideep Prabhu, Simone Ahuja Random house India, Noida, 2012.	
Mode of Evaluation: CAT / Assignment / Quiz / FAT / Project / Seminar Three reviews with weightage of 25 : 25 : 50 along with reports		
Recommended by Board of Studies	15.12.2015	
Approved by Academic Council	39th ACM	**Date** 17.12.2015

ESP1001	Español Fundamental	L	T	P	J	C
		2	0	0	0	2
Pre-requisite	Nil	Syllabus version				
		1.0				

Course Objectives:

The course gives students the necessary background to:

1. Demonstrate Proficiency in reading, writing, and speaking in basic Spanish. Learning vocabulary related to profession, education centres, day today activities, food, culture, sports and hobby, family set up, workplace, market and classroom activities is essential.
2. Demonstrate the ability to describe things and will be able to translate into English and vice versa.
3. Describe in simple terms (both in written and oral form) aspects of their background, immediate environment and matters in areas of immediate need.

Expected Course Outcome:

The students will be able to

1. Remember greetings, giving personal details and Identify genders by using correct articles
2. Apply the correct use of SER, ESTAR and TENER verb for describing people, place and things
3. Create opinion about time and weather conditions by knowing months, days and seasons in Spanish
4. Create opinion about people and places by using regular verbs
5. Apply reflexive verbs for writing about daily routine and create small paragraphs about hometown, best friend and family

Module: 1	Abecedario, Saludos y Datos personales: Origen, Nacionalidad, Profesión	**3 hours**
Competencia Gramática: Vocales y Consonantes. Artículos definidos e indefinidos (Numero y Genero). Competencia Escrita: Saludos y Datos personales		
Module: 2	Edad y posesión. Números (1-20)	**3 hours**
Competencia Gramática: Pronombres personales. Adjetivos. Los verbos SER y TENER. Competencia Escrita: Escribe sobre mismo/a y los compañeros de la clase		
Module: 3	Vocabulario de Mi habitación. Colores. Descripción de lugares y cosas	**5 hours**
Competencia Gramática: Adjetivos posesivos. El uso del verbo ESTAR. Diferencia entre SER y ESTAR. Competencia Escrita: Mi habitación		
Module: 4	Mi familia. Números (21-100). Direcciones.Expresar la hora. Los meses del año.	**5hours**
Competencia Gramática: Frases preposicionales. Uso del HAY. La diferencia entre MUY y MUCHO. Uso del verbo GUSTAR Competencia Escrita: Mi familia. Dar opiniones sobre tiempo		
Module: 5	Expresar fechas y el tiempo. Dar opiniones sobre personas y lugares.	**5 hours**
Competencia Gramática: Los verbos regulares (-AR, -ER, -IR) en el presente. Adjetivos demostrativos. Competencia Escrita: Mi mejor amigo/a. Expresar fechas. Traducción ingles a español y Español a Ingles.		
Module: 6	Describir el diario. Las actividades cotidianas.	**3 hours**
Competencia Gramática: Los Verbos y pronombres reflexivos. Los verbos pronominales con e/ie, o/ue, e/i, u/ue.		

Competencia Escrita: El horario. Traducción ingles a español y Español a Ingles.		
Module: 7	Dar opiniones sobre comidas y bebidas. Decir lo que está haciendo. Describir mi ciudad y Ubicar los sitios en la ciudad.	**4 hours**
Competencia Gramática: Los verbos irregulares. Estar + gerundio. Poder + Infinitivo. Competencia Escrita: Conversación en un restaurante. Traducción ingles a español y Español a Ingles.Mi ciudad natal. Mi Universidad. La clase.Mi fiesta favorita.		
Module: 8	**Guest Lectures / Native Speakers**	**2 hours**
	Total Lecture hours	**30 hours**

Text Book(s)	
1.	Text Book: "Aula Internacional 1", Jaime Corpas, Eva Garcia, Agustin Garmendia, Carmen Soriano Goyal Publication; reprinted Edition, (2010)
Reference Books	
1.	"¡Acción Gramática!" Phil Turk and Mike Zollo, Hodder Murray, London 2006. "Practice makes perfect: Spanish Vocabulary", Dorothy Richmond, McGraw Hill Contemporary, USA,2012.
2.	"Practice makes perfect: Basic Spanish", Dorothy Richmond, McGraw Hill Contemporary, USA 2009.
3.	"Pasaporte A1 Foundation", Matilde Cerrolaza Aragón, Óscar Cerrolaza Gili, Begoña Llovet Barquero, Edelsa Grupo, España, 2010.

Recommended by Board of Studies	22.02.2016		
Approved by Academic Council	41st ACM	**Date**	17.06.2016

ESP2001	Español Intermedio	L	T	P	J	C
		2	0	2	0	3
Pre-requisite		Syllabus version				
		1.0				

Course Objectives:

The course gives students the necessary background to:

1. Enable students to read, listen and communicate in Spanish in their day to day life.
2. Enable students to describe situations by using present, past and future tenses in Spanish.
3. Enable to develop the comprehension skill in Spanish language.

Expected Course Outcome:

The students will be able to

1. Create sentences in near future and future tenses and correctly using the prepositions like POR and PARA
2. Create sentences in preterito perfecto and correctly use the direct and indirect object pronouns
3. Create sentences related to likes and dislikes and also give commands in formal and informal way
4. Create sentences in past tense by using imperfect and idefinido forms and describe past events
5. Create conversations in Spanish at places like restaurants, hotels, Shops and Railway stations
6. Understand about different Spanish speaking countries and its culture and traditions.

Module: 1	Números (101 – 1 millón). Expresar los planes futuros. Los númerosordinales.	7 hours

Competencia Gramática: Futuros cercanos (Ir+a+Infinitivo). Futuros (Verbos regulares e irregulares).Uso del POR y PARA.
Competencia Escrita: Traducción ingles a español y español a Ingles.
Comprensión - Los textos y Videos

Module: 2	Las ropas, colores y tamaños. Costar, valer, descuentos y rebajas	8 hours

Competencia Gramática: Pronombres objetivos directos e indirectos. El verbo Gustar y Disgustar.
Competencia Escrita: Traducción ingles a español y español a Ingles. Comprensión - Los textos y Videos

Module: 3	Escribir un Correo electrónico formal e informal.	7 hours

Competencia Gramática: Imperativos formales e informales. Pretérito perfecto.
Competencia Escrita: Traducción ingles a español y español a Ingles.
Comprensión - Los textos y Videos

Module: 4	Currículo Vitae. Presentarse en una entrevista informal.	6 hours

Competencia Gramática: Pretérito imperfecto. Pretérito indefinido.
Competencia Escrita: Traducción ingles a español y español a Ingles.
Comprensión - Los textos y Videos

Module: 5	Introducción personal, Expresar los planes futuros.	5 hours

Comprensión oral: Introducción personal, Expresar los planes futuros. ¿Qué vas a hacer en las próximas vacaciones?
Comprensión auditiva: Las preguntas sobre un cuento auditivo. Relacionar el audio con las imágenes. Las preguntas basadas en canciones.
Medio de transporte: Comprar y Reservar billetes.

Module: 6	Diálogos entre dos	5 hours

Comprensión oral: Diálogos entre dos (cliente y tendero de ropas, pasajero y empleado, en un restaurante, Reservación de habitación en un hotel). Presentación en una entrevista.
Comprensión auditiva: Las preguntas basadas en canciones. Las preguntas basadas en diálogos.

Module: 7	Presentación de los países hispánicos.	5 hours

Comprensión oral: Dialogo entre un médico y paciente. Presentación de los países hispánicos.

Describir su infancia. Describir vacaciones últimas o las actividades de último fin de semana. Comprensión auditiva: Rellenar los blancos del cuento en pasado. Las preguntas basadas en el cuento. Las preguntas basadas en un anuncio				
Module: 8	**Guest Lectures / Native Speakers**			**2 hours**
	Total Lecture hours			**45 hours**
Text Book(s)				
1.	"Aula Internacional 1", Jaime Corpas, Eva Garcia, Agustin Garmendia, Carmen Soriano Goyal Publication; reprinted Edition, Delhi (2010)			
Reference Books				
1.	"¡Acción Gramática!" Phil Turk and Mike Zollo, Hodder Murray, London 2006.			
2.	"Practice makes perfect: Spanish Vocabulary", Dorothy Richmond, McGraw Hill Contemporary, USA,2012.			
3.	"Practice makes perfect: Basic Spanish", Dorothy Richmond, McGraw Hill Contemporary, USA 2009.			
4.	"Pasaporte A1 Foundation", Matilde Cerrolaza Aragón, Óscar Cerrolaza Gili, Begoña Llovet Barquero, Edelsa Grupo, España, 2010.			
	Authors, book title, year of publication, edition number, press, place			
Recommended by Board of Studies	22-02-2016			
Approved by Academic Council	41st ACM	**Date**	17-06-2016	

FRE1001	Français Quotidien	L	T	P	J	C
		2	0	0	0	2
Pre-requisite	NIL	Syllabus version				
		1.0				

Course Objectives:

The course gives students the necessary background to:

1. Learn the basics of French language and to communicate effectively in French in their day to day life.
2. Achieve functional proficiency in listening, speaking, reading and writing
3. Recognize culture-specific perspectives and values embedded in French language.

Expected Course Outcome:

The students will be able to :

1. Identify in French language the daily life communicative situations via personal pronouns, emphatic pronouns, salutations, negations and interrogations.
2. Communicate effectively in French language via regular / irregular verbs.
3. Demonstrate comprehension of the spoken / written language in translating simple sentences.
4. Understand and demonstrate the comprehension of some particular new range of unseen written materials
5. Demonstrate a clear understanding of the French culture through the language studied

Module: 1	Expressions simples	3 hours

Les Salutations, Les nombres (1-100), Les jours de la semaine, Les mois de l'année, Les Pronoms Sujets, Les Pronoms Toniques, La conjugaison des verbes irréguliers- avoir / être / aller / venir / faire etc.

Savoir-faire pour:Saluer, Se présenter, Présenter quelqu'un, Etablir des contacts

Module: 2	La conjugaison des verbes réguliers	3 hours

La conjugaison des verbes réguliers, La conjugaison des verbes pronominaux, La Négation, L'interrogation avec 'Est-ce que ou sans Est-ce que'.

Savoir-faire pour:

Chercher un(e) correspondant(e), Demander des nouvelles d'une personne.

Module: 3	La Nationalité du Pays, L'article (défini/ indéfini), Les prépositions	6 hours

La Nationalité du Pays, L'article (défini/ indéfini), Les prépositions (à/en/au/aux/sur/dans/avec etc.), L'article contracté, Les heures en français, L'adjectif (La Couleur, L'adjectif possessif, L'adjectif démonstratif/ L'adjectif interrogatif (quel/quelles/quelle/quelles), L'accord des adjectifs avec le nom, L'interrogation avec Comment/ Combien / Où etc.

Savoir-faire pour:

Poser des questions, Dire la date et les heures en français,

Module: 4	La traduction simple	4 hours

La traduction simple :(français-anglais / anglais –français),

Savoir-faire pour :

Faire des achats, Comprendre un texte court, Demander et indiquer le chemin.

Module: 5	L'article Partitif, Mettez les phrases aux pluriels	5 hours

L'article Partitif, Mettez les phrases aux pluriels, Faites une phrase avec les mots donnés, Trouvez les questions.

Savoir-faire pour :

Répondez aux questions générales en français, Exprimez les phrases données au Masculin ou au Féminin, Associez les phrases.

Module: 6	Décrivez :	3 hours

Décrivez: La Famille / La Maison / L'université / Les Loisirs / La Vie quotidienne etc.

Module: 7	Dialogue	**4 hours**
Dialogue: 1. Décrire une personne. 2. Des conversations à la cafeteria. 3. Des conversations avec les membres de la famille 4. Des dialogues entre les amis.		
Module: 8	**Guest lecures**	**2 hours**
Guest lectures / Natives speakers		
Total Lecture hours		**30 hours**

Text Book(s)	
1.	Fréquence jeunes-1, Méthode de français, G. Capelle et N.Gidon, Hachette, Paris, 2010.
2.	Fréquence jeunes-1, Cahier d'exercices, G. Capelle et N.Gidon, Hachette, Paris, 2010.
Reference Books	
1.	CONNEXIONS 1, Méthode de français, Régine Mérieux, Yves Loiseau,Les Éditions Didier, 2010.
2.	CONNEXIONS 1, Le cahier d'exercices, Régine Mérieux, Yves Loiseau, Les Éditions Didier, 2010
3.	ALTER EGO 1, Méthode de français, Annie Berthet, Catherine Hugo, Véronique M. Kizirian, Béatrix Sampsonis, Monique Waendendries, Hachette livre Paris 2011
4.	ALTER EGO 1, Le cahier d'activités, Annie Berthet, Catherine Hugo, Béatrix Sampsonis, Monique Waendendries, Hachette livre, Paris 2011

Mode of Evaluation: CAT / Assignment / Quiz / Seminar / FAT			
Recommended by Board of Studies	26.02.2016		
Approved by Academic Council	41st ACM	**Date**	17.06.2016

FRE2001	Français Progressif	L	T	P	J	C
		2	0	2	0	3
Pre-requisite	Français Quotidien	Syllabus version				
		1.0				

Course Objectives:

The course gives students the necessary background to:

1. Understand isolated sentences and frequently used expressions in relation to immediate priority areas (personal or family information, shopping, close environment, work).
2. Communicate in simple and routine tasks requiring only a simple and direct exchange of information on familiar and habitual topics.
3. Enable students to describe with simply means his training, his immediate environment and evoke familiar and habitual subjects, evoke subjects that correspond to immediate needs.

Expected Course Outcome:

The students will be able to :

1. Understand expressions in French.
2. Create senteces by using frequent lexicon related to himself, his family, his close environment (family, shopping, work, school, etc).
3. Understand simple, clear messages on internet, authentic documents.
4. Analyse predictable information in common documents, such as advertisements, flyers, menus, schedules, simple personal letters.
5. Create simple and routine tasks.
6. Create simple and direct exchange of information on familiar activities and topics.

Module: 1	Expressions simples	8 hours

La vie quotidiennes - Le verbe pronominal - Le passé composé avec l'auxiliaire - avoir et être- le passé récent : venir de + infinitif - Le comparatif - Le superlatif - Les mots interrogatifs (les trois formes)

Savoir-faire pour : Faire des achats, faire des commandes dans un restaurant, poser des questions.

Module: 2	Les activitiés quotidiennes	6 hours

La vie privée et publique (Les achats, Les voyages, les transports-La nourriture, etc.) - Les lieux de la ville - Les mots du savoir-vivre - Les pronoms indéfinis - Les pronoms démonstratifs - Les pronoms compléments objets directs/ indirects - La formation du future simple et future proche

Savoir-faire pour : Réserver les billets pour le voyage, réserver les chambres dans un hôtel, S'informer sur les lieux de la ville, indiquer la direction à un étranger.

Module: 3	Les activités de loisirs	7 hours

Les loisirs (sports/spectacles/activités) - Les moments de la journée, de l'année- La fête indienne et française – Les goûts - L'impératif - La négation de l'impératif-La place du pronom à l'impératif avec un verbe pronominal.

Savoir-faire pour : Parler de ses goûts, raconter les vacances, formuler des phrases plus compliquées, Raconter les souvenirs de l'enfance, parler sur la tradition de son pays natal.

Module: 4	La Francophonie	7 hours

L'espace francophone - Première approche de la société française – La consommation alimentaire – caractériser un objet – décrire une tenue - Le pronom relatif (qui/que/dont/où)

Savoir-faire pour :

Articles de la presse-Portrait d'une personne-Cartes et messages d'invitation, d'acceptation ou de refus -Article de presse - rédaction d'un événement.

Module: 5	La culture française	5 hours

Parler de ses activités quotidiennes - les fêtes en France – Parler de sa famille – réserver un billet à l'agence - la gastronomie française

Module: 6	La description	5 hours
Décrire physiquement une personne – les vacances – les achats – réserver une chambre dans un hôtel – les plus grands français - raconter des évènements passés		
Module: 7	**S'exprimer**	**5 hours**
Parler du climat - parcours francophone – placer une commande au restaurant –- la mode - parler de son projet d'avenir.		
Module: 8	**Guest lecures**	**2 hours**
Guest lectures / Natives speakers		
Total Lecture hours		**45 hours**

Text Book(s)	
1.	Alter Ego 1, Méthode de français, Annie Berthet, Hachette, Paris 2010.
2.	Alter Ego 1, Cahier d'exercices, Annie Berthet, Hachette, Paris 2010.
Reference Books	
1.	CONNEXIONS 1, Méthode de français, Régine Mérieux, Yves Loiseau,Les Éditions Didier, 2010.
2.	CONNEXIONS 1, Le cahier d'exercices, Régine Mérieux, Yves Loiseau, Les Éditions Didier, 2010
3.	Fréquence jeunes-1, Méthode de français, G. Capelle et N.Gidon, Hachette, Paris, 2010.

Mode of Evaluation: CAT / Assignment / Quiz / Project / Seminar / FAT			
Recommended by Board of Studies	26.02.2016		
Approved by Academic Council	41st ACM	**Date**	17.06.2016

GER1001	Grundstufe Deutsch	L	T	P	J	C
		2	0	0	0	2
Pre-requisite	Nil	Syllabus version				
		1.0				

Course Objectives:

The course gives students the necessary background to:

1. Demonstrate Proficiency in reading, writing, and speaking in basic German. Learning vocabulary related to profession, education centres, day-to-day activities, food, culture, sports and hobby, family set up, workplace, market and classroom activities are essential.
2. Make the students industry oriented and make them adapt in the German culture.

Expected Course Outcome:

The students will be able to

1. Remember greeting people, introducing oneself and understanding basic expressions in German.
2. Understand basic grammar skills to use these in a meaning way.
3. Remember beginner's level vocabulary
4. Create sentences in German on a variety of topics with significant precision and in detail.
5. Apply good comprehension of written discourse in areas of special interests.

Module: 1		3 hours

Begrüssung, Landeskunde, Alphabet, Personalpronomen, Verben- heissen, kommen, wohnen, lernen, Zahlen (1-100), W-Fragen, Aussagesätze, Nomen- Singular und Plural, der Artikel -Bestimmter- Unbestimmter Artikel)

Lernziel :

Sich vorstellen, Grundlegendes Verständnis von Deutsch, Deutschland in Europa

Module: 2		3 hours

Konjugation der Verben (regelmässig /unregelmässig),das Jahr- Monate, Jahreszeiten und die Woche, Hobbys, Berufe, Artikel, Zahlen (Hundert bis eine Million), Ja-/Nein- Frage, Imperativ mit ,,Sie'' Lernziel:

Sätze schreiben, über Hobbys, Berufe erzählen, usw

Module: 3		5 hours

Possessivpronomen, Negation, Kasus (Bestimmter- Unbestimmter Artikel) Trennbareverben, Modalverben, Uhrzeit, Präpositionen, Lebensmittel, Getränkeund Essen, Farben, Tiere

Lernziel :

Sätze mit Modalverben, Verwendung von Artikel, Adjektiv beim Verb

Module: 4		5 hours

Übersetzung: (Deutsch – Englisch / Englisch – Deutsch)

Lernziel :

Die Übung von Grammatik und Wortschatz

Module: 5		5 hours

Leserverständnis. Mindmap machen, Korrespondenz- Briefe und Email

Lernziel:

Übung der Sprache, Wortschatzbildung

Module: 6		3 hours

Aufsätze : Die Familie, Bundesländer in Deutschland, Ein Fest in Deutschland,

Lernziel :

Aktiver, selbständiger Gebrauch der Sprache			
Module: 7			**4 hours**
Dialoge: a) Gespräche mit einem/einer Freund /Freundin. b) Gespräche beim Einkaufen ; in einem Supermarkt ; in einer Buchhandlung ; c) in einem Hotel - an der Rezeption ; ein Termin beim Arzt. d) Ein Telefongespräch ; Einladung–Abendessen			
Module: 8			**2 hours**
Guest Lectures / Native Speakers Einleitung in die deustche Kultur und Politik			
Total Lecture hours			**30 hours**
Text Book(s)			
1.	Netzwerk Deutsch als Fremdsprache A1, Stefanie Dengler, Paul Rusch, Helen Schmtiz, Tanja Sieber, Klett-Langenscheidt Verlag, München : 2013		
Reference Books			
1.	Lagune, Hartmut Aufderstrasse, Jutta Müller, Thomas Storz, 2012.		
2.	Deutsche Sprachlehre für Ausländer, Heinz Griesbach, Dora Schulz, 2013		
3.	Studio d A1, Hermann Funk, Christina Kuhn, CorneslenVerlag, Berlin: 2010		
4.	Tangram Aktuell-I, Maria-Rosa, SchoenherrTil, Max Hueber Verlag, Muenchen: 2012		
	www.goethe.de wirtschaftsdeutsch.de hueber.de klett-sprachen.de www.deutschtraning.org		
Mode of Evaluation: CAT / Assignment / Quiz / Seminar / FAT			
Recommended by Board of Studies	04.03.2016		
Approved by Academic Council	41st ACM	**Date**	17.06.2016

GER2001	Mittelstufe Deutsch	L	T	P	J	C
		2	0	2	0	3
Pre-requisite	Grundstufe Deutsch	Syllabus version				
		1.0				

Course Objectives:

The course gives students the necessary background to:

1. Improve the communication skills in German language
2. Improve the listening and understanding capability of German FM Radio, and TV Programmes, Films
3. Build the confidence of the usage of German language and better understanding of the culture

Expected Course Outcome:

The students will be able to

1. Create proficiency in advanced grammar and rules
2. Understand the texts including scientific subjects.
3. Create the ability of listening and speaking in real time situations.
4. Create the vocabulary in different context-based situations.
5. Create written communication in profession life, like replying or sending E-mails and letters in a company.
6. Create communication related to simple and routine tasks.

Module: 1	Proficiency in Advanced Grammar	8 hours
Grammatik : Tempus- Perfekt, Präteritum, Plusquamperfekt, Futur-I, Futur-II, Wiederholung der Grundstufen grammatik **Lernziel:** Sätzeschreiben in verschiedenen Zeiten.		
Module: 2	**Understanding of Technical Texts**	**6 hours**
Grammatik : Passiv, Personalpronomen (Nominativ, Akkusativ, Dativ) **Lernziel:** Passiv, Formen des Personalpronomens		
Module: 3	**Understanding of Scientific texts**	**7 hours**
Adjektivdeklination, Nebensatz, Präpositionen mit Akkusativ und Dativ, Infinitiv Sätze **Lernziel:** Verbindung zwischen Adjektiv beim Nomen		
Module: 4	**Communicating in Real Time Situations**	**7 hours**
Übersetzung:Technische Terminologie, wissenschaftliche, literarische Texte aus dem Deutschen ins Englische und umgekehrt, **Lernziel :** Übung von Grammatik und Wortschatz		
Module: 5	**Acquisition of the Vocabulary of the advanced Level**	**5 hours**
Hörverständnis durch Audioübung :Familie, Leben in Deutschland, Am Bahnhof, Videos : Politik, Historie, Tagesablauf in einer anderen Stadt, **Lernziel** : Übung der Sprache		
Module: 6	**Ability to Communicate in Professional Life**	**5 hours**
Hörverständnis durch Audioübung: Überberühmte Persönlichkeiten, Feste in Deutschland, Videos:Wetter, An der Universität,ein Zimmer buchen, Studentenleben,Städteund Landeskunde **Lernziel**: Hörverständnis, Landeskunde		
Module: 7	**Ability to Communicate in Task-based Situations**	**5 hours**
Hörverständnis durch Audioübung: FM Radio aus Deutschland Videos: Fernseher aus Deutschland **Lernziel**: LSRW Fähigkeiten		
Module: 8	**Invited Talk:Contemporary issues**	**2 hours**
Total Lecture hours		**45 hours**

Text Book(s)

1.	Text Book: 1. TangramAktuell II, Rosa Maria Dallapizza, Beate Blüggel, Max Hueber Verlag, München : 2010		
Reference Books			
1.	Themen Aktuell, Heiko Bock, Mueller Jutta, Max Hueber Verla, Muenchen : 2010		
2.	Deutsch Sprachlehre fuer Auslaender, Schulz Griesbach, Max Hueber Verlag, Muenchen : 2012		
3.	Lagune, Deutsch als Fremdsprache, Jutta Müller, Storz Thomas, Hueber Verlag, Ismaning : 2013		
4.	Studio d A1, Hermann Funk, Christina Kuhn, Max HuerberVerlag, München : 2011		
Mode of Evaluation: CAT / Assignment / Quiz / Seminar / FAT			
Recommended by Board of Studies	04.03.2016		
Approved by Academic Council	41st ACM	**Date**	17.06.2016

JAP1001	Japanese For Beginners	L	T	P	J	C
		2	0	0	0	2
Pre-requisite	Nil	Syllabus version				
		1.0				

Course Objectives:

The course gives students the necessary background to:

1. Develop four basic skills related to reading, listening, speaking and writing Japanese language.
2. Instill in learners an interest in Japanese language by teaching them culture and general etiquettes.
3. Recognize, read and write Hiragana and Katakana.

Expected Course Outcomes:

Students will be able to:

1. Remember Japanese alphabets and greet in Japanese.
2. Understand pronouns, verbs form, adjectives and conjunctions in Japanese.
3. Remember time and dates related vocabularies and express them in Japanese.
4. Create simple questions and its answers in Japanese.
5. Understand the Japanese culture and etiquettes.

Module: 1	Introduction to Japanese syllables and Greetings	4 hours

Introduction of Japanese language, alphabets; Hiragana, katakana, and Kanji Pronunciation, vowels and consonants.

Hiragana – writing and reading; Vocabulary: 50 Nouns and 20 pronouns, Greetings.

Module: 2	Demonstrative Pronouns	4 hours

Grammar: N1 wa N2 desu, Japanese Numerals, Demonstrative pronoun - Kore, Sore, Are and Dore

(This, That, Over there, which) Kono, sono, Ano and Dono (this, that, over there, which) Kochira, Sochira, Achira and

Dochira. this way...) Koko, Soko, Asoko and Doko (Here, There…. location)

Module: 3	Verbs and Sentence formation	4 hours

Classification of verbs Be verb desu Present and Present negative Basic structure of sentence (Subject+ Object+

Verb) Katakana-reading and writing

Module: 4	Conjunction and Adjectives	4 hours

Conjunction-Ya…..nado Classification of Adjectives 'I' and 'na'-ending Set phrase – Onegaishimasu – Sumimasen,

wakarimasen Particle –Wa, Particle-Ni 'Ga imasu' and 'Ga arimasu' for Existence of living things and non-living things Particle- Ka, Ni, Ga

Module: 5	Vocabulary and its Meaning	4 hours

Days/ Months /Year/Week (Current, Previous, Next, Next to Next) ; Nation, People and Language Relationship of family (look and learn); Simple kanji recognition

Module: 6	Forming questions and giving answers	4 hours

Classification of Question words (Dare, Nani, Itsu, Doyatte, dooshite, Ikutsu, Ikura); Classification of Te forms, Polite form of verbs

Module: 7	Expressing time, position and directions	4 hours

Classification of question words (Doko, Dore, Dono, Dochira); Time expressions (Jikan), Number of hours, Number of months, calendar of a month; Visit the departmental store, railway stations, Hospital (Byoki), office and University

Module: 8	**Guest Lecture by Experts**			**2 hours**
Total Lecture hours				**30 hours**
Text Book(s):				
1.	The Japan Foundation (2017), Marugoto Japanese Language and Culture Starter A1 Coursebook For Communicative Language Competences, New Delhi: Goyal Publishers (9788183078047)			
2.	Banno, Eri et al (2011), Genki: An Integrated Course in Elementary Japanese I [Second Edition], Japan: The Japan Times.			
Reference Book(s):				
1.	Japanese for Busy people (2011) video CD, AJALT, Japan.			
2.	Carol and Nobuo Akiyama (2010), The Fast and Fun Way, New Delhi: Barron's Publication			
Mode of Evaluation: CAT , Quiz and Digital Assignments				
Recommended by Board of Studies		24.10.2018		
Approved by Academic Council		53rd ACM	**Date**	13.12.2018

STS1001	Introduction to Soft skills	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	None	Syllabus version				
		2.0				

Course Objectives:

1. To enhance the ability to plan better and work as a team effectively
2. To boost the learning ability and to acquire analytical and research skills
3. To educate the habits required to achieve success

Expected Course Outcome:

1. Enabling students to know themselves and interact better with self and environment

Module:1	Lessons on excellence	10 hours

Ethics and integrity

Importance of ethics in life, Intuitionism vs Consequentialism, Non-consequentialism, Virtue ethics vs situation ethics, Integrity - listen to conscience, Stand up for what is right

Change management

Who moved my cheese?, Tolerance of change and uncertainty, Joining the bandwagon, Adapting change for growth - overcoming inhibition

How to pick up skills faster?

Knowledge vs skill, Skill introspection, Skill acquisition, "10,000 hours rule" and the converse

Habit formation

Know your habits, How habits work? - The scientific approach, How habits work? - The psychological approach, Habits and professional success, "The Habit Loop", Domino effect, Unlearning a bad habit

Analytic and research skills.

Focused and targeted information seeking, How to make Google work for you, Data assimilation

Module:2	Team skills	11 hours

Goal setting

SMART goals, Action plans, Obstacles -Failure management

Motivation

Rewards and other motivational factors, Maslow's hierarchy of needs, Internal and external motivation

Facilitation

Planning and sequencing, Challenge by choice, Full Value Contract (FVC), Experiential learning cycle, Facilitating the Debrief

Introspection

Identify your USP, Recognize your strengths and weakness, Nurture strengths, Fixing weakness, Overcoming your complex, Confidence building

Trust and collaboration

Virtual Team building, Flexibility, Delegating, Shouldering responsibilities

Module:3	**Emotional Intelligence**	**12 hours**

Transactional Analysis

Introduction**,** Contracting, Ego states**,** Life positions

Brain storming

Individual Brainstorming, Group Brainstorming, Stepladder Technique, Brain writing, Crawford's Slip writing approach, Reverse brainstorming, Star bursting, Charlette procedure, Round robin brainstorming

Psychometric Analysis

Skill Test, Personality Test

Rebus Puzzles/Problem Solving

More than one answer, Unique ways

Module:4	**Adaptability**	**12 hours**

Theatrix

Motion Picture, Drama, Role Play, Different kinds of expressions

Creative expression

Writing, Graphic Arts, Music, Art and Dance

Flexibility of thought

The 5'P' framework (Profiling, prioritizing, problem analysis, problem solving, planning)

Adapt to changes(tolerance of change and uncertainty)

Adaptability Curve , Survivor syndrome

	Total Lecture hours:	**45 hours**	

Text Book(s)

1.	Chip Heath, How to Change Things When Change Is Hard (Hardcover**)**,2010,First Edition,Crown Business.
2.	Karen Kindrachuk, Introspection**,** 2010, 1st Edition.
3.	Karen Hough, The Improvisation Edge: Secrets to Building Trust and Radical Collaboration at Work, 2011, Berrett-Koehler Publishers

Reference Books

1.	Gideon Mellenbergh, A Conceptual Introduction to Psychometrics: Development, Analysis and Application of Psychological and Educational Tests,2011, Boom Eleven International.
2.	Phil Lapworth, An Introduction to Transactional Analysis, 2011, Sage Publications (CA)

Mode of Evaluation: FAT, Assignments, Projects, Case studies, Role plays,3 Assessments with Term End FAT (Computer Based Test)

Recommended by Board of Studies	09/06/2017		
Approved by Academic Council	No. 45th AC	Date	15/06/2017

STS1002	Introduction to Business Communication	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	**None**	**Syllabus version**				
		2.0				

Course Objectives:

1. To provide an overview of Prerequisites to Business Communication
2. To enhance the problem solving skills and improve the basic mathematical skills
3. To organize the thoughts and develop effective writing skills

Expected Course Outcome:

1. Enabling students enhance knowledge of relevant topics and evaluate the information

Module:1	Study skills	10 hours

Memory techniques

Relation between memory and brain, Story line technique, Learning by mistake, Image-name association, Sharing knowledge, Visualization

Concept map

Mind Map, Algorithm Mapping, Top down and Bottom Up Approach

Time management skills

Prioritization - Time Busters, Procrastination, Scheduling, Multitasking, Monitoring

6. Working under pressure and adhering to deadlines

Module:2	Emotional Intelligence (Self Esteem)	6 hours

Empathy

Affective Empathy and Cognitive Empathy

Sympathy

Level of sympathy (Spatial proximity, Social Proximity, Compassion fatigue)

Module:3	Business Etiquette	9 hours

Social and Cultural Etiquette

Value, Manners, Customs, Language, Tradition

Writing Company Blogs

Building a blog, Developing brand message, FAQs', Assessing Competition

Internal Communications

Open and objective Communication, Two way dialogue, Understanding the audience

Planning

Identifying, Gathering Information, Analysis, Determining, Selecting plan, Progress check, Types of planning

Writing press release and meeting notes

Write a short, catchy headline, Get to the Point –summarize your subject in the first paragraph, Body – Make it relevant to your audience

Module:4	Quantitative Ability	4 hours

Numeracy concepts
Fractions, Decimals, Bodmas, Simplifications, HCF, LCM, Tests of divisibility
Beginning to Think without Ink
Problems solving using techniques such as: Percentage, Proportionality, Support of answer choices, Substitution of convenient values, Bottom-up approach etc.
Math Magic
Puzzles and brain teasers involving mathematical concepts
Speed Calculations
Square roots, Cube roots, Squaring numbers, Vedic maths techniques

Module:5	**Reasoning Ability**	**3 hours**

Interpreting Diagramming and sequencing information
Picture analogy, Odd picture, Picture sequence, Picture formation, Mirror image and water image
Logical Links
Logic based questions-based on numbers and alphabets

Module:6	**Verbal Ability**	**3 hours**

Strengthening Grammar Fundamentals
Parts of speech, Tenses, Verbs(Gerunds and infinitives)
Reinforcements of Grammar concepts
Subject Verb Agreement, Active and Passive Voice, Reported Speech

Module:7	**Communication and Attitude**	**10 hours**

Writing
Writing formal & informal letters, How to write a blog & knowing the format, Effective ways of writing a blog, How to write an articles & knowing the format, Effective ways of writing an articles, Designing a brochures
Speaking skills
How to present a JAM, Public speaking
Self managing
Concepts of self management and self motivation, Greet and Know, Choice of words, Giving feedback, Taking criticism

	Total Lecture hours:	**45 hours**	

Text Book(s)

1.	FACE, Aptipedia, Aptitude Encyclopedia, 2016, First Edition, Wiley Publications, Delhi.
2.	ETHNUS, Aptimithra, 2013, First Edition, McGraw-Hill Education Pvt. Ltd.

Reference Books

1.	Alan Bond and Nancy Schuman, 300+ Successful Business Letters for All Occasions, 2010, ThirdEdition, Barron's Educational Series, New York.
2.	Josh Kaufman, The First 20 Hours: How to Learn Anything ... Fast , 2014, First Edition, Penguin Books, USA.

Mode of Evaluation: FAT, Assignments, Projects, Case studies, Role plays,3 Assessments with Term End FAT (Computer Based Test)

Recommended by Board of Studies	09/06/2017		
Approved by Academic Council	No. 45th AC	Date	15/06/2017

STS1101	Fundamentals of Aptitude	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	**None**	**Syllabus version**				
		1.0				

Course Objectives:

1. To enhance the logical reasoning skills of the students and improve the problem-solving abilities
2. To strengthen the ability to solve quantitative aptitude problems
3. To enrich the verbal ability of the students

Expected Course Outcome:

1. Students will be introduced to basic concepts of Quantitative Aptitude, Logical reasoning and Verbal ability
2. Students will be able to read and demonstrate good comprehension of text in areas of the student's interest
3. Students will be able to demonstrate the ability to resolve problems that occur in their field.

Module:1	**Lessons on excellence**	**2hours**

Skill introspection, Skill acquisition, consistent practice

Module:2	**Logical Reasoning**	**16 hours**

Thinking Skill

- Problem Solving
- Critical Thinking
- Lateral Thinking

Taught through thought-provoking word and rebus puzzles, and word-link builder questions

Coding & decoding, Series, Analogy, Odd man out and Visual reasoning

- Coding and Decoding
- Series
- Analogy
- Odd Man Out
- Visual Reasoning

Sudoku puzzles

Solving introductory to moderate level sudoku puzzles to boost logical thinking and comfort with numbers

Attention to detail

Picture and word driven Qs to develop attention to detail as a skill

Module:3	**Quantitative Aptitude**	**14 hours**

Speed Maths

- Addition and Subtraction of bigger numbers
- Square and square roots

- Cubes and cube roots
- Vedic maths techniques
- Multiplication Shortcuts
- Multiplication of 3 and higher digit numbers
- Simplifications
- Comparing fractions
- Shortcuts to find HCF and LCM
- Divisibility tests shortcuts

Algebra and functions

Module:4	**Recruitment Essentials**	**5hours**

Looking at an engineering career through the prism of an effective resume

- Importance of a resume - the footprint of a person's career achievements
- How a resume looks like?
- An effective resume vs. a poor resume: what skills you must build starting today and how?

Impression Management

Getting it right for the interview:

- Grooming, dressing
- Body Language and other non-verbal signs
- Displaying the right behaviour

Module:5	**Verbal Ability**	**8hours**

Essential grammar for placements:

- Nouns and Pronouns
- Verbs
- Subject-Verb Agreement
- Pronoun-Antecedent Agreement
- Punctuations

Verbal Reasoning

	Total Lecture hours:	**45 hours**

Mode of Evaluation: FAT, Assignments, 3 Assessments with Term End FAT (Computer Based Test)

Text Book(s):

1. FACE, Aptipedia Aptitude Encyclopedia, 2016, 1st Edition, Wiley Publications, Delhi.
2. ETHNUS, Aptimithra, 2013, 1st Edition, McGraw-Hill Education Pvt.Ltd.
3. **SMART, PlaceMentor, 2018, 1st Edition, Oxford University Press.**
4. R S Aggarwal, Quantitative Aptitude For Competitive Examinations, 2017, 3rd Edition, S. Chand Publishing, Delhi.

Reference Book(s):

Arun Sharma, Quantitative Aptitude, 2016, 7th Edition, McGraw Hill Education Pvt. Ltd.

STS1102	Arithmetic Problem Solving	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	**None**	**Syllabus version**				
		1.0				

Course Objectives:

1. To enhance the logical reasoning skills of the students and improve the problem-solving abilities
2. To strengthen the ability to solve quantitative aptitude problems
3. To enrich the verbal ability of the students for academic purpose

Expected course outcome:

1. Students will be able to show more confidence in solving problems of Quantitative Aptitude
2. Students will be able to show more confidence in solving problems of Logical Reasoning
3. Students will be able to show more confidence in understanding the questions of Verbal Ability

Module:1	Logical Reasoning	11 hours

Word group categorization questions

Puzzle type class involving students grouping words into right group orders of logical sense

Cryptarithmetic

Data arrangements and Blood relations

- Linear Arrangement
- Circular Arrangement
- Multi-dimensional Arrangement
- Blood Relations

Module:2	Quantitative Aptitude	18 hours

Ratio and Proportion

- Ratio
- Proportion
- Variation
- Simple equations
- Problems on Ages
- Mixtures and alligations

Percentages, Simple and Compound Interest

- Percentages as Fractions and Decimals
- Percentage Increase / Decrease
- Simple Interest

- Compound Interest
- Relation Between Simple and Compound Interest

Number System

- Number system
- Power cycle
- Remainder cycle
- Factors, Multiples
- HCF and LCM

Module:3	**Verbal Ability**	**16hours**

Essential grammar for placements

- Prepositions
- Adjectives and Adverbs
- Tenses
- Forms and Speech and Voice
- Idioms and Phrasal Verbs
- Collocations, Gerund and Infinitives

Reading Comprehension for placements

- Types of questions
- Comprehension strategies
- Practice exercises

Articles, Prepositions and Interrogatives

- Definite and Indefinite Articles
- Omission of Articles
- Prepositions
- Compound Prepositions and Prepositional Phrases
- Interrogatives

Vocabulary for placements

- Exposure to solving questions of
- Synonyms
- Antonyms
- Analogy
- Confusing words
- Spelling correctness

	Total Lecture hours:	**45 hours**

Mode of Evaluation: FAT, Assignments, 3 Assessments with Term End FAT (Computer Based Test)

Text Book(s):

1. FACE, Aptipedia Aptitude Encyclopedia, 2016, 1st Edition, Wiley Publications, Delhi.

2. ETHNUS, Aptimithra, 2013, 1st Edition, McGraw-Hill Education Pvt.Ltd.
3. **SMART, PlaceMentor, 2018, 1st Edition, Oxford University Press.**
4. R S Aggarwal, Quantitative Aptitude For Competitive Examinations, 2017, 3rd Edition, S. Chand Publishing, Delhi.

Reference Book(s):

Arun Sharma, Quantitative Aptitude, 2016, 7th Edition, McGraw Hill Education Pvt. Ltd.

STS1201	Introduction to Problem Solving	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	**None**	**Syllabus version**				
		1.0				

Course Objectives:

1. To enhance the logical reasoning skills of the students and improve the problem-solving abilities
2. To strengthen the ability to solve quantitative aptitude problems
3. To enrich the verbal ability of the students for academic purpose

Expected Course Outcome:

1. Students will be introduced to basic concepts of Quantitative Aptitude, Logical reasoning and Verbal ability
2. Students will be able to read and demonstrate good comprehension of text in areas of the student's interest
3. Students will be able to demonstrate the ability to resolve problems that occur in their field.

Module:1	**Lessons on excellence**	**2hours**

Skill introspection, Skill acquisition, consistent practice

Module:2	**Logical Reasoning**	**18 hours**

Thinking Skill

- Problem Solving
- Critical Thinking
- Lateral Thinking

Taught through thought-provoking word and rebus puzzles, and word-link builder questions

Coding & decoding, Series, Analogy, Odd man out and Visual reasoning

- Coding and Decoding
- Series
- Analogy
- Odd Man Out
- Visual Reasoning

Sudoku puzzles

Solving introductory to moderate level sudoku puzzles to boost logical thinking and comfort with numbers

Attention to detail

Picture and word driven Qs to develop attention to detail as a skill

Module:3	**Quantitative Aptitude**	**14 hours**

Speed Maths

- Addition and Subtraction of bigger numbers
- Square and square roots
- Cubes and cube roots
- Vedic maths techniques
- Multiplication Shortcuts
- Multiplication of 3 and higher digit numbers
- Simplifications
- Comparing fractions
- Shortcuts to find HCF and LCM
- Divisibility tests shortcuts

Algebra and functions

Module:4	**Recruitment Essentials**	**5hours**

Looking at an engineering career through the prism of an effective resume

- Importance of a resume - the footprint of a person's career achievements
- How a resume looks like?
- An effective resume vs. a poor resume: what skills you must build starting today and how?

Impression Management

Getting it right for the interview:

- Grooming, dressing
- Body Language and other non-verbal signs
- Displaying the right behaviour

Module:5	**Verbal Ability**	**6hours**

Grammar challenge

A practice paper with sentence based and passage-based questions on grammar discussed. Topics covered in questions are Nouns and Pronouns, Verbs, Subject-Verb Agreement, Pronoun-Antecedent Agreement, Punctuations

Verbal reasoning

	Total Lecture hours:	**45 hours**

Mode of Evaluation: FAT, Assignments, 3 Assessments with Term End FAT (Computer Based Test)

Text Book(s):

1. FACE, Aptipedia Aptitude Encyclopedia, 2016, 1st Edition, Wiley Publications, Delhi.
2. ETHNUS, Aptimithra, 2013, 1st Edition, McGraw-Hill Education Pvt.Ltd.
3. **SMART, PlaceMentor, 2018, 1st Edition, Oxford University Press.**
4. R S Aggarwal, Quantitative Aptitude For Competitive Examinations, 2017, 3rd Edition, S. Chand Publishing, Delhi.

Reference Book(s):

Arun Sharma, Quantitative Aptitude, 2016, 7th Edition, McGraw Hill Education Pvt. Ltd.

STS1202	Introduction to Quantitative, Logical and Verbal Ability	L	T	P	J	C
		3	0	0	0	1

Pre-requisite	None	Syllabus version
Cleared the cut-off in end-of-sem 1 assessment		1.0

Course Objectives:

1. To enhance the logical reasoning skills of the students and improve the problem-solving abilities
2. To strengthen the ability to solve quantitative aptitude problems
3. To enrich the verbal ability of the students for academic purpose

Expected Course Outcome:

1. Students will be able to show more confidence in solving problems of Quantitative Aptitude
2. Students will be able to show more confidence in solving problems of Logical Reasoning
3. Students will be able to show more confidence in understanding the questions of Verbal Ability

Module:1	Logical Reasoning	12 hours

Word group categorization questions

Puzzle type class involving students grouping words into right group orders of logical sense

Cryptarithmetic

Data arrangements and Blood relations

- Linear Arrangement
- Circular Arrangement
- Multi-dimensional Arrangement
- Blood Relations

Module:2	Quantitative Aptitude	20 hours

Ratio and Proportion

- Ratio
- Proportion
- Variation
- Simple equations
- Problems on Ages
- Mixtures and alligations: Problems involving multiple iterations of mixtures

Percentages, Simple and Compound Interest

- Percentages as Fractions and Decimals
- Percentage Increase / Decrease
- Simple Interest

- Compound Interest
- Relation Between Simple and Compound Interest

Number System

- Number system
- Power cycle
- Remainder cycle
- Factors, Multiples
- HCF and LCM

Module:3	**Verbal Ability**	**13 hours**

Reading Comprehension – Advanced

Grammar - application and discussion

A practice paper with sentence based and passage-based questions on grammar discussed. Topics covered in questions are Prepositions, Adjectives and Adverbs, Tenses, Forms and Speech and Voice, Idioms and Phrasal Verbs, Collocations, Gerund and Infinitives

Articles, Prepositions and Interrogatives

- Definite and Indefinite Articles
- Omission of Articles
- Prepositions
- Compound Prepositions and Prepositional Phrases
- Interrogatives

Vocabulary – Advanced

Exposure to challenging placement questions on vocabulary

	Total Lecture hours:	**45 hours**

Mode of Evaluation: FAT, Assignments, 3 Assessments with Term End FAT (Computer Based Test)

Text Book(s):

1. FACE, Aptipedia Aptitude Encyclopedia, 2016, 1st Edition, Wiley Publications, Delhi.
2. ETHNUS, Aptimithra, 2013, 1st Edition, McGraw-Hill Education Pvt.Ltd.
3. **SMART, PlaceMentor, 2018, 1st Edition, Oxford University Press.**
4. R S Aggarwal, Quantitative Aptitude For Competitive Examinations, 2017, 3rd Edition, S. Chand Publishing, Delhi.

Reference Book(s):

Arun Sharma, Quantitative Aptitude, 2016, 7th Edition, McGraw Hill Education Pvt. Ltd.

STS2001	Reasoning Skill Enhancement	L	T	P	J	C
		3	0	0	0	1

Pre-requisite	None	Syllabus version
		2.0

Course Objectives:

1. To strengthen the social network by the effective use of social media and social interactions.
2. To identify own true potential and build a very good personal branding
3. To enhance the Analytical and reasoning skills.

Expected Course Outcome:

1. Understanding the various strategies of conflict resolution among peers and supervisors and respond appropriately

Module:1	Social Interaction and Social Media	6 hours

Effective use of social media

Types of social media, Moderating personal information, Social media for job/profession, Communicating diplomatically

Networking on social media

Maximizing network with social media, How to advertise on social media

Event management

Event management methods, Effective techniques for better event management

Influencing

How to win friends and influence people, Building relationships, Persistence and resilience, Tools for talking when stakes are high

Conflict resolution

Definition and strategies ,Styles of conflict resolution

Module:2	Non Verbal Communication	6 hours

Proximecs

Types of proximecs**,** Rapport building

Reports and Data Transcoding

Types of reports

Negotiation Skill

Effective negotiation strategies

Conflict Resolution

Types of conflicts

Module:3	Interpersonal Skill	8 hours

Social Interaction

Interpersonal Communication,Peer Communication, Bonding,Types of social interaction

Responsibility

Types of responsibilities**,** Moral and personal responsibilities

Networking

Competition, Collaboration, Content sharing

Personal Branding
Image Building, Grooming, Using social media for branding
Delegation and compliance
Assignment and responsibility, Grant of authority, Creation of accountability

Module:4	**Quantitative Ability**	**10 hours**

Number properties
Number of factors, Factorials, Remainder Theorem, Unit digit position, Tens digit position
Averages
Averages, Weighted Average
Progressions
Arithmetic Progression, Geometric Progression, Harmonic Progression
Percentages
Increase & Decrease or successive increase
Ratios
Types of ratios and proportions

Module:5	**Reasoning Ability**	**8 hours**

Analytical Reasoning
Data Arrangement(Linear and circular & Cross Variable Relationship), Blood Relations, Ordering/ranking/grouping, Puzzletest, Selection Decision table

Module:6	**Verbal Ability**	**7 hours**

Vocabulary Building
Synonyms & Antonyms, One word substitutes, Word Pairs, Spellings, Idioms, Sentence completion, Analogies

	Total Lecture hours:	**45 hours**	

Text Book(s)

1.	FACE, Aptipedia Aptitude Encyclopedia, 2016, First Edition, Wiley Publications, Delhi.
2.	ETHNUS, Aptimithra, 2013, First Edition, McGraw-Hill Education Pvt.Ltd.
3.	Mark G. Frank, David Matsumoto, Hyi Sung Hwang, Nonverbal Communication: Science and Applications, 2012, 1st Edition, Sage Publications, New York.

Reference Books

1.	Arun Sharma, Quantitative aptitude, 2016, 7th edition, Mcgraw Hill Education Pvt. Ltd.
2.	Kerry Patterson, Joseph Grenny, Ron McMillan, Al Switzler, Crucial Conversations: Tools for Talking When Stakes are High, 2001,1st edition McGraw Hill Contemporary, Bangalore.
3.	Dale Carnegie, How to Win Friends and Influence People, Latest Edition,2016. Gallery Books, New York.

Mode of evaluation: FAT, Assignments, Projects, Case studies, Role plays,3 Assessments with Term End FAT (Computer Based Test)

Recommended by Board of Studies	09/06/2017		
Approved by Academic Council	No. 45th AC	Date	15/06/2017

STS2002	Introduction to Etiquette	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	**None**	**Syllabus version**				
		2.0				

Course Objectives:

1. To analyze social psychological phenomena in terms of impression management.
2. To control or influence other people's perceptions.
3. To enhance the problem solving skills

Expected Course Outcome:

1. Creating in the students an understanding of decision making models and generating alternatives using appropriate expressions.

Module:1	**Impression Management**	**8 hours**

Types and techniques

Importance of impression management, Types of impression management, Techniques and case studies, Making a good first impression in an interview (TEDOS technique), How to recover from a bad impressions/experience, Making a good first impression online

Non-verbal communication and body language

Dressing, Appearance and Grooming, Facial expression and Gestures, Body language (Kinesics), Keywords to be used, Voice elements (tone, pitch and pace)

Module:2	**Thinking Skill**	**4 hours**

Introduction to problem solving process

Steps to solve the problem,Simplex process

Introduction to decision making and decision making process

Steps involved from identification to implementation**,** Decision making model

Module:3	**Beyond Structure**	**4 hours**

Art of questioning

How to frame questions, Blooms questioning pyramid, Purpose of questions

Etiquette

Business, Telephone etiquette, Cafeteria etiquette, Elevator etiquette, Email etiquette, Social media etiquette

Module:4	**Quantitative Ability**	**9 hours**

Profit and Loss

Cost Price & Selling Price, Margins & Markup

Interest Calculations

Simple Interest, Compound Interest, Recurring

Mixtures and solutions Ratio & Averages, Proportions **Time and Work** Pipes & Cisterns, Man Day concept, Division Wages **Time Speed and Distance** Average speed, Relative speed, Boats and streams. **Proportions & Variations**		
Module:5	**Reasoning Ability**	**11 hours**
Logical Reasoning Sequence and series, Coding and decoding, Directions **Visual Reasoning** Abstract Reasoning, Input Type Diagrammatic Reasoning, Spatial reasoning, Cubes **Data Analysis And Interpretation** DI-Tables/Charts/Text		
Module:6	**Verbal Ability**	**9 hours**
Grammar Spot the Errors, Sentence Correction, Gap Filling Exercise, Sentence Improvisations, Misc. Grammar Exercise		

	Total Lecture hours:	**45 hours**	

Text Book(s)	
1.	Micheal Kallet,Think Smarter: Critical Thinking to Improve Problem-Solving and Decision-Making Skills, April 7, 2014, 1st Edition, Wiley, New Jersey.
2.	MK Sehgal, Business Communication, 2008, 1st Edition, Excel Books, India.
3.	FACE, Aptipedia Aptitude Encyclopedia, 2016, First Edition, Wiley Publications, Delhi.
4.	ETHNUS, Aptimithra, 2013, First edition, McGraw-Hill Education Pvt. Ltd, Banglore.
Reference Books	
1.	Andrew J. DuBrin, Impression Management in the Workplace: Research, Theory and Practice, 2010, 1stedition, Routledge.
2.	Arun Sharma, Manorama Sharma, Quantitative aptitude, 2016, 7th edition, McGraw Hill Education Pvt. Ltd, Banglore.
3.	M. Neil Browne, Stuart M. Keeley, Asking the right questions, 2014, 11th Edition, Pearson, London.

Mode of Evaluation: FAT, Assignments, Projects, Case studies, Role plays,3 Assessments with Term End FAT (Computer Based Test)			
Recommended by Board of Studies	09/06/2017		
Approved by Academic Council	No. 45th AC	Date	15/06/2017

STS2101	Getting Started to Skill Enhancement	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	**None**	**Syllabus version**				
		1.0				

Course Objectives:

1. To develop the students' logical thinking skills and apply it in the real-life scenarios
2. To learn the strategies of solving quantitative ability problems
3. To enrich the verbal ability of the students

Expected Course Outcome:

1. Students will be able to demonstrate critical thinking skills, such as problem solving related to their subject matters
2. Students will be able to demonstrate competency in verbal, quantitative and reasoning aptitude
3. Students will be able to perform good written communication skills

Module:1	**Logical Reasoning**	**11 hours**

Clocks, calendars, Direction sense and Cubes

- Clocks
- Calendars
- Direction Sense
- Cubes

Data interpretation and Data sufficiency

- Data Interpretation – Tables
- Data Interpretation - Pie Chart
- Data Interpretation - Bar Graph
- Data Sufficiency

Module:2	**Quantitative Aptitude**	**18 hours**

Time and work

- Work with different efficiencies
- Pipes and cisterns
- Work equivalence
- Division of wages

Time, Speed and Distance

- Basics of time, speed and distance
- Relative speed
- Problems based on trains
- Problems based on boats and streams
- Problems based on races

Profit and loss, Partnerships and averages

- Basic terminologies in profit and loss
- Partnership

- Averages
- Weighted average

Module:3	Verbal Ability	13hours

Sentence Correction

- Subject-Verb Agreement
- Modifiers
- Parallelism
- Pronoun-Antecedent Agreement
- Verb Time Sequences
- Comparisons
- Prepositions
- Determiners

Sentence Completion and Para-jumbles

- Pro-active thinking
- Reactive thinking (signpost words, root words, prefix suffix, sentence structure clues)
- Fixed jumbles
- Anchored jumbles

Module:4	Writing skills for placements	3 hours

Essay writing

- Idea generation for topics
- Best practices
- Practice and feedback

	Total Lecture hours:	45 hours

Mode of Evaluation: FAT, Assignments, 3 Assessments with Term End FAT (Computer Based Test)

Text Book(s):

5. FACE, Aptipedia Aptitude Encyclopedia, 2016, 1st Edition, Wiley Publications, Delhi.
6. ETHNUS, Aptimithra, 2013, 1st Edition, McGraw-Hill Education Pvt.Ltd.
7. **SMART, PlaceMentor, 2018, 1st Edition, Oxford University Press.**
8. R S Aggarwal, Quantitative Aptitude For Competitive Examinations, 2017, 3rd Edition, S. Chand Publishing, Delhi.

Reference Book(s):

Arun Sharma, Quantitative Aptitude, 2016, 7th Edition, McGraw Hill Education Pvt. Ltd.

STS2102	Enhancing Problem Solving Skills	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	**None**	**Syllabus version**				
		1.0				

Course Objectives:

1. To develop the students' logical thinking skills and apply it in the real-life scenarios
2. To learn the strategies of solving quantitative ability problems
3. To enrich the verbal ability of the students
4. To strengthen the basic programming skills for placements

Expected Course Outcome:

1. The students will be able to interact confidently and use decision making models effectively
2. The students will be able to deliver impactful presentations
3. The students will be able to be proficient in solving quantitative aptitude and verbal ability questions effortlessly

Module:1 Logical Reasoning — **5 hours**

Logical connectives, Syllogism and Venn diagrams

- Logical Connectives
- Syllogisms
- Venn Diagrams – Interpretation

Venn Diagrams – Solving

Module:2 Quantitative Aptitude — **11 hours**

Logarithms, Progressions, Geometry and Quadratic equations

- Logarithm
- Arithmetic Progression
- Geometric Progression
- Geometry
- Mensuration
- Coded inequalities
- Quadratic Equations

Permutation,Combination and Probability

- Fundamental Counting Principle
- Permutation and Combination
- Computation of Permutation
- Circular Permutations
- Computation of Combination Probability

Module:3 Verbal Ability — **4 hours**

Critical Reasoning

- Argument – Identifying the Different Parts (Premise, assumption, conclusion)
- Strengthening statement
- Weakening statement
- Mimic the pattern

Module:4	Recruitment Essentials	7 hours

Cracking interviews - demonstration through a few mocks

Sample mock interviews to demonstrate how to crack the:

- HR interview
- MR interview
- Technical interview

Cracking other kinds of interviews

- Skype/ Telephonic interviews
- Panel interviews
- Stress interviews

Resume building – workshop

A workshop to make students write an accurate resume

Module:5	Problem solving and Algorithmic skills	18 hours

- Logical methods to solve problem statements in Programming
- Basic algorithms introduced

	Total Lecture hours:	45 hours

Mode of Evaluation: FAT, Assignments, Mock interviews, 3 Assessments with Term End FAT (Computer Based Test)

Text Book(s):

- FACE, Aptipedia Aptitude Encyclopedia, 2016, 1st Edition, Wiley Publications, Delhi.
- ETHNUS, Aptimithra, 2013, 1st Edition, McGraw-Hill Education Pvt.Ltd.
- SMART, PlaceMentor, 2018, 1st Edition, Oxford University Press.
- R S Aggarwal, Quantitative Aptitude For Competitive Examinations, 2017, 3rd Edition, S. Chand Publishing, Delhi.

Reference Book(s):

Arun Sharma, Quantitative Aptitude, 2016, 7th Edition, McGraw Hill Education Pvt. Ltd.

STS2201	Numerical Ability and Cognitive Intelligence	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	None	Syllabus version				
		1.0				

Course Objectives:

1. To develop the students' logical thinking skills and apply it in the real-life scenarios
2. To learn the strategies of solving quantitative ability problems
3. To enrich the verbal ability of the students

Expected Course Outcome:

1. Students will be able to demonstrate critical thinking skills, such as problem solving related to their subject matters
2. Students will be able to demonstrate competency in verbal, quantitative and reasoning aptitude
3. Students will be able to perform good written communication skills

Module:1	Logical Reasoning	10 hours

Clocks, calendars, Direction sense and Cubes

- Clocks
- Calendars
- Direction Sense
- Cubes

Practice on advanced problems

Data interpretation and Data sufficiency - Advanced

- Advanced Data Interpretation and Data Sufficiency questions of CAT level
- Multiple chart problems
- Caselet problems

Module:2	Quantitative Aptitude	19 hours

Time and work – Advanced

- Work with different efficiencies
- Pipes and cisterns: Multiple pipe problems
- Work equivalence
- Division of wages
- Advanced application problems with complexity in calculating total work

Time, Speed and Distance - Advanced

- Relative speed
- Advanced Problems based on trains
- Advanced Problems based on boats and streams
- Advanced Problems based on races

Profit and loss, Partnerships and averages - Advanced

- Partnership

- Averages
- Weighted average

Advanced problems discussed

Number system - Advanced

Advanced application problems on Numbers involving HCF, LCM, divisibility tests, remainder and power cycles.

Module:3	Verbal Ability	13 hours

Sentence Correction - Advanced

- Subject-Verb Agreement
- Modifiers
- Parallelism
- Pronoun-Antecedent Agreement
- Verb Time Sequences
- Comparisons
- Prepositions
- Determiners

Quick introduction to 8 types of errors followed by exposure to GMAT level questions

Sentence Completion and Para-jumbles - Advanced

- Pro-active thinking
- Reactive thinking (signpost words, root words, prefix suffix, sentence structure clues)
- Fixed jumbles
- Anchored jumbles

Practice on advanced GRE/ GMAT level questions

Reading Comprehension – Advanced

Exposure to difficult foreign subject-based RCs of the level of GRE/ GMAT

Module:4	Writing skills for placements	3 hours

Essay writing

- Idea generation for topics
- Best practices
- Practice and feedback

	Total Lecture hours:	45 hours

Mode of Evaluation: FAT, Assignments, 3 Assessments with Term End FAT (Computer Based Test)

Text Book(s):

- FACE, Aptipedia Aptitude Encyclopedia, 2016, 1st Edition, Wiley Publications, Delhi.
- ETHNUS, Aptimithra, 2013, 1st Edition, McGraw-Hill Education Pvt.Ltd.
- **SMART, PlaceMentor, 2018, 1st Edition, Oxford University Press.**
- R S Aggarwal, Quantitative Aptitude For Competitive Examinations, 2017, 3rd Edition, S. Chand Publishing, Delhi.

Reference Book(s):

Arun Sharma, Quantitative Aptitude, 2016, 7th Edition, McGraw Hill Education Pvt. Ltd.

STS2202	Advanced Aptitude and Reasoning Skills	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	**None**	**Syllabus version**				
		1.0				

Course Objectives:

1. To develop the students' logical thinking skills and apply it in the real-life scenarios
2. To learn the strategies of solving quantitative ability problems
3. To enrich the verbal ability of the students
4. To strengthen the basic programming skills for placements

Expected Course Outcome:

1. The students will be able to interact confidently and use decision making models effectively
2. The students will be able to deliver impactful presentations
3. The students will be able to be proficient in solving quantitative aptitude and verbal ability questions effortlessly

Module:1	Logical Reasoning	4 hours

Logical Reasoning puzzles - Advanced

Advanced puzzles:

- Sudoku
- Mind-bender style word statement puzzles
- Anagrams
- Rebus puzzles

Logical connectives, Syllogism and Venn diagrams

1. Logical Connectives
2. Advanced Syllogisms - 4, 5, 6 and other multiple statement problems
3. Challenging Venn Diagram questions: Set theory

Module:2	Quantitative Aptitude	10 hours

Logarithms, Progressions, Geometry and Quadratic equations - Advanced

1. Logarithm
2. Arithmetic Progression
3. Geometric Progression
4. Geometry
5. Mensuration
6. Coded inequalities
7. Quadratic Equations

Concepts followed by advanced questions of CAT level

Permutation, Combination and Probability - Advanced

- Fundamental Counting Principle
- Permutation and Combination
- Computation of Permutation - Advanced problems
- Circular Permutations
- Computation of Combination - Advanced problems
- Advanced probability

Module:3	Verbal Ability	5 hours

Image interpretation

1. Image interpretation: Methods
2. Exposure to image interpretation questions through brainstorming and practice

Critical Reasoning - Advanced

1. Concepts of Critical Reasoning
2. Exposure to advanced questions of GMAT level

Module:4	Recruitment Essentials	8 hours

Mock interviews

Cracking other kinds of interviews

Skype/ Telephonic interviews

Panel interviews

Stress interviews

Guesstimation

1. Best methods to approach guesstimation questions
2. Practice with impromptu interview on guesstimation questions

Case studies/ situational interview

1. Scientific strategies to answer case study and situational interview questions
2. Best ways to present cases
3. Practice on presenting cases and answering situational interviews asked in recruitment rounds

Module:5	Problem solving and Algorithmic skills	18 hours

1. Logical methods to solve problem statements in Programming
2. Basic algorithms introduced

	Total Lecture hours:	45 hours

Mode of Evaluation: FAT, Assignments, Mock interviews, 3 Assessments with Term End FAT (Computer Based Test)

Text Book(s):

1. FACE, Aptipedia Aptitude Encyclopedia, 2016, 1st Edition, Wiley Publications, Delhi.
2. ETHNUS, Aptimithra, 2013, 1st Edition, McGraw-Hill Education Pvt.Ltd.
3. **SMART, PlaceMentor, 2018, 1st Edition, Oxford University Press.**
4. R S Aggarwal, Quantitative Aptitude For Competitive Examinations, 2017, 3rd Edition, S. Chand Publishing, Delhi.

Reference Book(s):

Arun Sharma, Quantitative Aptitude, 2016, 7th Edition, McGraw Hill Education Pvt. Ltd.

STS3001	Preparedness for External Opportunities	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	**None**	**Syllabus version**				
		2.0				

Course Objectives:

1. To effectively tackle the interview process, and leave a positive impression with your prospective employer by reinforcing your strength, experience and appropriateness for the job.
2. To check if candidates have the adequate writing skills that are needed in an organization.
3. To enhance the problem solving skills.

Expected Course Outcome:

1. Enabling students acquire skills for preparing for interviews, presentations and higher education

Module:1	Interview Skills	3 hours

Types of interview

Structured and unstructured interview orientation, Closed questions and hypothetical questions, Interviewers' perspective, Questions to ask/not ask during an interview

Techniques to face remote interviews

Video interview, Recorded feedback , Phone interview preparation

Mock Interview

Tips to customize preparation for personal interview, Practice rounds

Module:2	Resume Skills	2 hours

Resume Template

Structure of a standard resume**,** Content, color, font

Use of power verbs

Introduction to Power verbs and Write up

Types of resume

Quiz on types of resume

Customizing resume

Frequent mistakes in customizing resume, Layout - Understanding different company's requirement, Digitizing career portfolio

Module:3	Presentation Skills	6 hours

Preparing presentation

10 tips to prepare PowerPoint presentation**,** Outlining the content, Passing the Elevator Test

Organizing materials

Blue sky thinking, Introduction , body and conclusion, Use of Font, Use of Color, Strategic presentation

Maintaining and preparing visual aids

Importance and types of visual aids, Animation to captivate your audience, Design of posters

Dealing with questions

Setting out the ground rules, Dealing with interruptions, Staying in control of the questions, Handling difficult questions

Module:4	Quantative Ability	14 hours

Permutation-Combinations

Counting, Grouping, Linear Arrangement, Circular Arrangements

Probability

Conditional Probability, Independent and Dependent Events

Geometry and Mensuration

Properties of Polygon, 2D & 3D Figures, Area & Volumes

Trigonometry

Heights and distances, Simple trigonometric functions

Logarithms

Introduction, Basic rules

Functions

Introduction, Basic rules

Quadratic Equations

Understanding Quadratic Equations, Rules & probabilities of Quadratic Equations

Set Theory

Basic concepts of Venn Diagram

Module:5	Reasoning Ability	7 hours

Logical reasoning

Syllogisms, Binary logic, Sequential output tracing, Crypto arithmetic

Data Analysis and Interpretation

Data Sufficiency

Data interpretation-Advanced Interpretation tables, pie charts & bar chats

Module:6	Verbal Ability	8 hours

Comprehension and Logic

Reading comprehension

Para Jumbles

Critical Reasoning :

Premise and Conclusion, Assumption & Inference, Strengthening & Weakening an Argument

Module:7	Writing Skills	5 hours

Note making

What is note making, Different ways of note making

Report writing

What is report writing, How to write a report, Writing a report & work sheet

Product description

Designing a product, Understanding it's features, Writing a product description

Research paper Research and its importance, Writing sample research paper			
	Total Lecture hours:	**45 hours**	

Text Book(s)	
1.	Michael Farra, Quick Resume & Cover letter Book, 2011, 1st Edition, JIST Editors, Saint Paul.
2.	Daniel Flage, An Introduction to Critical Thinking, 2002, 1st Edition, Pearson, London.
Reference Books	
1.	FACE, Aptipedia Aptitude Encyclopedia, 2016, 1st Edition, Wiley Publications, Delhi.
2.	ETHNUS, Aptimithra, 2013, 1st Edition, McGraw-Hill Education Pvt. Ltd.

Mode of Evaluation: FAT, Assignments, Projects, Case studies, Role plays,3 Assessments with Term End FAT (Computer Based Test)			
Recommended by Board of Studies	09/06/2017		
Approved by Academic Council	No. 45th AC	Date	15/06/2017

STS3004	Data Structures and Algorithms	L	T	P	J	C
		3	0	0	0	1

Pre-requisite	None	Syllabus version
		1.0

Course Objectives:

1. To assess how the choice of data structures and algorithm design methods impacts the performance of programs.
2. To develop logics which will help them to create programs, applications in C.
3. To learn how to design a graphical user interface (GUI) with Java Swing.

Expected Course Outcome:

1. Clear knowledge about problem solving skills in DS & Algorithms concepts

Module:1	Data Structures	10 hours

Introduction to data structures, Array,Linked List, Stack, Queue, Trees.

Module:2	Algorithms	15 hours

Introduction to Algorithms, Searching Algorithms, Sorting Algorithms, Greedy Algorithm, Divide and Conquer, Analysis of Algorithm.

Module:3	C Programming	10 hours

Introduction to C, Execution and Structure of a C Program, Data Types and Operators, Control Statements, Looping, Arrays, Structure, Pointers, Memory Management in C, Functions

Module:4	C++ Programming	5 hours

Introduction to C++, Need for OOP, Class & Objects, Create C++ & Java class and show the similarityEncapsulation, Access Specifiers, Relationship, Polymorphism, Exception Handling, Abstract Classes.

Module:5	JAVA	5 hours

Introduction to Java, Data Types and Operators, Control Statements, Looping, Arrays, Need for OOP, Class & Objects, Create C++ & Java class and show the similarityEncapsulation, Access Specifiers, Relationship, Polymorphism, Exception Handling, Abstract Classes, Interfaces.

	Total Lecture hours:	45 hours	

Reference Books

1. Data Structures and Algorithms: https://ece.uwaterloo.ca/~dwharder/aads/Lecture_materials/: University of waterloo
2. C Programming: C Programming Absolute Beginner's Guide (3rd Edition) by Greg Perry, Dean Miller
3. Java: Thinking in Java, 4th Edition

Mode of Evaluation: FAT, Assignments, Projects, 3 Assessments with Term End FAT (Computer Based Test)

Recommended by Board of Studies	09/06/2017		
Approved by Academic Council	No. 45th AC	Date	15/06/2017

STS3005	Code Mithra	L	T	P	J	C
		3	0	0	0	1

Pre-requisite	None	Syllabus version
		1.0

Course Objectives:

1. To develop logics which will help them to create programs, applications in C.
2. To learn how to design a graphical user interface (GUI) with Java Swing.
3. To present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively.

Expected Course Outcome:

1. Enabling students to write coding in C,C++,Java and DBMS concepts

Module:1	C Programming	15 hours

Introduction to C, Execution and Structure of a C Program, Data Types and Operators, Control Statements, Looping, Arrays, Structure, Pointers, Memory Management in C, Functions.

Module:2	C++ Programming	15 hours

Introduction to C++, Need for OOP, Class & Objects, Create C++ & Java class and show the similarityEncapsulation, Access Specifiers, Relationship, Polymorphism, Exception Handling, Abstract Classes, Interfaces.

Module:3	JAVA	10 hours

Introduction to Java, Data Types and Operators, Control Statements, Looping, Arrays, Need for OOP, Class & Objects, Create C++ & Java class and show the similarityEncapsulation, Access Specifiers, Relationship, Polymorphism, Exception Handling, Abstract Classes, Interfaces.

Module:4	Database	5 hours

Introduction to database, DDL, Data Manipulation, SELECT, Joins.

	Total Lecture hours:	45 hours

Reference Books

1. Data Structures and Algorithms: https://ece.uwaterloo.ca/~dwharder/aads/Lecture_materials/
2. C Programming: C Programming Absolute Beginner's Guide (3rd Edition) by Greg Perry, Dean Miller
3. Java: Thinking in Java, 4th Edition
4. **Websites: www.eguru.ooo**

Mode of Evaluation: FAT, Assignments, Projects 3 Assessments with Term End FAT (Computer Based Test)

Recommended by Board of Studies	09/06/2017		
Approved by Academic Council	No.45th AC	Date	15/06/2017

STS3006	Preparedness for External Opportunities	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	**None**	**Syllabus version**				
		1.0				

Course Objectives:

1. To enhance the problem solving skills.
2. To check if candidates have the adequate writing skills that are needed in an organization.
3. To reason, model, and draw conclusions or make decisions with mathematical, statistical, and quantitative information.

Expected Course Outcome:

1. Students will be able to solve mathematical, reasoning and verbal questionnaires

Module:1	**Quantitative Ability**	**12 hours**

Time and Work, Time Speed and Distance, Number System, Equations, Percentages, Profit and Loss, Permutation and Combination, Probability, Geometry and Mensuration, Averages, Progression, Allegations and Mixtures, Ages

Module:2	**Reasoning Ability**	**12 hours**

Data Arrangement - Linear, Circular and Cross Variable Relationship**,** Data Sufficiency, Data Interpretation-Advanced Interpretation Tables**,** Coding and Decoding, Abstract Reasoning, Input Type Diagrammatic Reasoning, Spatial Reasoning, Cubes, Clocks and Calendar

Module:3	**Verbal Ability**	**21 hours**

Vocabulary Building

Synonyms & Antonyms, One word substitutes, Word Pairs, Spellings, Idioms, Sentence completion, Analogies, Cloze Test.

Comprehension and Logic

Reading comprehension

Para Jumbles

Critical Reasoning

Premise and Conclusion, Assumption & Inference, Strengthening & Weakening an Argument.

Sentence Correction

Modifiers, parallelism, Verb time sequences, Comparison, Determiners.

Building personal lexicon

Benefits of becoming a logophile, Etymology – Root words, Prefix and suffix.

Grammar

Spot the Errors, Sentence Correction, Gap Filling Exercise.

Text Book(s)

1.	FACE, Aptipedia Aptitude Encyclopedia, 2016, 1st Edition, Wiley Publications, Delhi.		
2.	ETHNUS, Aptimithra, 2013, 1st Edition, McGraw-Hill Education Pvt.Ltd.		
3.	R S Aggarwal, Quantitative Aptitude For Competitive Examinations, 2017, 3rd Edition, S. Chand Publishing, Delhi.		
Reference Books			
1.	Arun Sharma, Quantitative Aptitude, 2016, 7th Edition, McGraw Hill Education Pvt. Ltd.		
Mode of evaluation: Assignments, Projects, Case studies, FAT (Computer Based Test)			
Recommended by Board of Studies	09/06/2017		
Approved by Academic Council	No.45th AC	Date	15/06/2017

STS3007	Preparedness for Career Opportunities	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	**None**	**Syllabus version**				
		1.0				

Course Objectives:

1. To enrich the logical thinking ability for better analysis and decision making
2. To hone the competence in solving problems and reasoning skills
3. To build a good vocabulary and use it in effective communication

Expected Course Outcome:

1. Students will be able to solve mathematical, reasoning and verbal questionnaires

Module:1	**Quantitative Ability**	**15 hours**

Time and Work, Time Speed and Distance, Number System, Equations, Percentages, Profit and Loss, Permutation and Combination, Probability, Geometry and Mensuration, Averages, Progression, Allegations and Mixtures, Ages

Module:2	**Reasoning Ability**	**12 hours**

Data Arrangement - Linear, Circular and Cross Variable Relationship**,** Data Sufficiency, Data Interpretation-Advanced Interpretation Tables**,** Coding and Decoding, Abstract Reasoning, Input Type Diagrammatic Reasoning, Spatial Reasoning, Cubes, Clocks and Calendar

Module:3	**Verbal Ability**	**18 hours**

Vocabulary Building

Synonyms & Antonyms, One word substitutes, Word Pairs, Spellings, Idioms, Sentence completion, Analogies, Cloze Test.

Comprehension and Logic

Reading comprehension

Para Jumbles

Critical Reasoning :

Premise and Conclusion, Assumption & Inference, Strengthening & Weakening an Argument.

Sentence Correction

Modifiers, parallelism, Verb time sequences, Comparison, Determiners.

Building personal lexicon

Benefits of becoming a logophile, Etymology – Root words, Prefix and suffix.

Text Book(s)

1. FACE, Aptipedia Aptitude Encyclopedia, 2016, 1st Edition, Wiley Publications, Delhi.
2. ETHNUS, Aptimithra, 2013, 1st Edition, McGraw-Hill Education Pvt.Ltd.
3. R S Aggarwal, Quantitative Aptitude For Competitive Examinations, 2017, 3rd Edition, S.

	Chand Publishing, Delhi.			
Reference Books				
1.	Arun Sharma, Quantitative Aptitude, 2016, 7th Edition, McGraw Hill Education Pvt. Ltd.			
Mode of evaluation: Assignments, Projects, Case studies, FAT (Computer Based Test)				
Recommended by Board of Studies		09/06/2017		
Approved by Academic Council		No.45th	Date	15/06/2017

STS3101	Introduction to Programming Skills	L	T	P	J	C
		3	0	0	0	1

Pre-requisite	None	Syllabus version
		1.0

Course Objectives:

1. Ability to translate vast data into abstract concepts and to understand JAVA concepts
2. To have a clear understanding of subject related concepts
3. To develop computational ability in Java programming language

Expected Course Outcome:

1. Clear Knowledge about problem solving skills in JAVA concepts
2. Students will be able to write codes in Java

Module:1	Object and Class, Data types	8 hours

Types of programming
Disadvantages of functional programming
Class & Objects
Attributes
Methods
Objects
Solving MCQs based on Objects and Classes
Solving tricky questions based on encapsulation
Solving frequently asked object-based questions
Data types
Data
Why data type
Variables
Available data types
Numeric – int, float, double
Character – char, string
Solving MCQs based on type casting, data types
Solving debugging based MCQs

Module:2	Basic I / O, Decision Making, Loop Control	8 hours

Printing
Getting input from user during run time
Command line arguments
Solving programming questions based on CLA
Solving MCQs questions based on CLA

Need for control statement
if..else
if..else if..else

Nested if..else
Switch case
Common mistakes with control statements (like using = instead of ==)
Solving frequently asked questions on decision making

Types of looping statements
Entry Controlled
For
While
Exit Controlled
do while
break and continue
Demo on looping
Common mistakes with looping statements (like using; at the end of the loop)
Solving pattern programming problems, series problems
Solving predict the output questions

Module:3	**String, Date, Array**	**10 hours**

String handling, date handling
Solving problems based on arrays like searching, sorting, rearranging, iteration)
Multi-dimensional arrays
Solving pattern problems using 2D arrays
Real time application based on 2D arrays

Module:4	**Inheritance, Aggregation & Associations**	**12 hours**

Need
Is A – Inheritance
Types of inheritance supported
Diagrammatic representation
Demo on inheritance
Has A – Aggregation
Diagrammatic representation
Demo on aggregation
Uses A - Association
Diagrammatic representation
Demo on association
Assignment on relationships
Solving MCQs based on relationships between classes

Module:5	**Modifiers, Interface & Abstract classes (Java specific), Packages**	**7 hours**

Types of access specifiers
Demo on access specifiers
Assignment on access modifiers
Instance Members
Solving MCQs based on modifiers
Abstract Classes
Need
Abstract Classes
Abstract Methods
Interfaces

Assignment on abstract classes and interface Need for packages Access specifiers & packages Import classes from other packages		
	Total Lecture hours:	**45 hours**
Reference Books		
1.	Java The Complete Reference, 2014, 9th Edition by By Herbert Schildt, McGraw-Hill Education Pvt Ltd	
2.	Introduction to Programming with Java: A Problem-Solving Approach by John Dean	
Mode of Evaluation: FAT, Assignments, 3 Assessments with Term End FAT (Computer Based Test)		

STS3104	Enhancing Programming Ability	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	**None**	**Syllabus version**				
		1.0				

Course Objectives:

1. Ability to translate vast data into abstract concepts and to understand JAVA concepts
2. To have a clear understanding of subject related concepts
3. To develop computational ability in Java programming language

Expected Course Outcome:

1. Clear Knowledge about problem solving skills in JAVA concepts
2. Students will be able to write codes in Java

Module:1	**Collections**	**12 hours**

ArrayList, LinkedList, List Interface, HashSet, Map Interface, HashMap, Set
Programming questions based on collections
Real world problems based on data structure

Module:2	**Threads, Exceptions, LinkedList, Arrays**	**6 hours**

Need of threads
Creating threads
Wait
Sleep
Thread execution

Need for exception handling
try, catch, throw, throws
Creating own exception (Java, Python)
Handling own exceptions

Solving programming questions based on linked list and arrays

Module:3	**Stack and Queue, Trees**	**7 hours**

Solving programming questions based on stacks and queues
How to implement a stack using queue?
How to implement a queue using stack?

Solving programming questions based on trees, binary trees, binary search trees

Module:4	**JDBC Connectivity, JDBC Data**	**10 hours**

JDBC Overview
Database Setup
Install the MySQL Database

Create New Database User in MySQL Workbench Selecting data from tables Inserting Data into the Database Updating Data in the Database Deleting Data from the Database Creating Prepared Statements		
Module:5	**Networking with Java**	**10 hours**
Working with URLs Sending HTTP Requests Processing JSON data using Java Processing XML data using Java		
	Total Lecture hours:	**45 hours**

Reference Books	
1.	Java The Complete Reference, 2014, 9th Edition by By Herbert Schildt, McGraw-Hill Education Pvt Ltd
2.	Introduction to Programming with Java: A Problem-Solving Approach by John Dean

Mode of Evaluation: FAT, Assignments, 3 Assessments with Term End FAT (Computer Based Test)

STS3105	Computational Thinking	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	**None**	**Syllabus version**				
		1.0				

Course Objectives:

1. Ability to translate vast data into abstract concepts and to understand JAVA concepts
2. To have a clear understanding of subject related concepts
3. To develop computational ability in Java programming language

Expected Course Outcome:

1. Clear Knowledge about problem solving skills in JAVA concepts
2. Students will be able to write codes in Java

Module:1	**Date, Array**	**10 hours**

date handling
Solving problems based on arrays like searching, sorting, rearranging, iteration)
Multi-dimensional arrays
Solving pattern problems using 2D arrays
Real time application based on 2D arrays

Module:2	**Inheritance, Aggregation & Associations**	**15 hours**

Need
Is A – Inheritance
Types of inheritance supported
Diagrammatic representation
Demo on inheritance
Has A – Aggregation
Diagrammatic representation
Demo on aggregation
Uses A - Association
Diagrammatic representation
Demo on association
Assignment on relationships
Solving MCQs based on relationships between classes

Module:3	**Modifiers, Interface & Abstract classes (Java specific)**	**10 hours**

Types of access specifiers
Demo on access specifiers
Assignment on access modifiers
Instance Members
Solving MCQs based on modifiers

Abstract Classes Need Abstract Classes Abstract Methods Interfaces Assignment on abstract classes and interface		
Module:4	**Packages**	**5 hours**
Need for packages Access specifiers & packages Import classes from other packages		
Module:5	**Exceptions**	**5 hours**
Need for exception handling try, catch, throw, throws Creating own exception (Java, Python) Handling own exceptions		
	Total Lecture hours:	**45 hours**

Reference Books	
1.	Java The Complete Reference, 2014, 9th Edition by By Herbert Schildt, McGraw-Hill Education Pvt Ltd
2.	Introduction to Programming with Java: A Problem-Solving Approach by John Dean

Mode of Evaluation: FAT, Assignments, 3 Assessments with Term End FAT (Computer Based Test)

STS3201	Programming Skills for Employment	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	None	Syllabus version				
		1.0				

Course Objectives:

1. Ability to translate vast data into abstract concepts and to understand JAVA concepts
2. To have a clear understanding of subject related concepts
3. To develop computational ability in Java programming language

Expected Course Outcome:

1. Clear Knowledge about problem solving skills in JAVA concepts
2. Students will be able to write codes in Java

Module:1	Object and Class, Data types, Basic I / O	8 hours

Types of programming
Disadvantages of functional programming
Class & Objects
Attributes
Methods
Objects
Solving MCQs based on Objects and Classes
Solving tricky questions based on encapsulation
Solving frequently asked object based questions
Data types
Data
Why data type
Variables
Available data types
Numeric – int, float, double
Character – char, string
Solving MCQs based on type casting, data types
Solving debugging based MCQs
Printing
Getting input from user during run time
Command line arguments
Solving programming questions based on CLA
Solving MCQs questions based on CLA

Module:2	Decision Making, Loop Control, String, Date, Array	10 hours

Need for control statement
if..else

if..else if..else
Nested if..else
Switch case
Common mistakes with control statements (like using = instead of ==)
Solving frequently asked questions on decision making
Types of looping statements
Entry Controlled
For
While
Exit Controlled
do while
break and continue
Demo on looping
Common mistakes with looping statements (like using ; at the end of the loop)
Solving pattern programming problems, series problems
Solving predict the output questions
String handling, date handling
Solving problems based on arrays like searching, sorting, rearranging, iteration)
Multi-dimensional arrays
Solving pattern problems using 2D arrays
Real time application based on 2D arrays

Module:3	**Inheritance, Aggregation & Associations**	**10 hours**

Need
Is A – Inheritance
Types of inheritance supported
Diagrammatic representation
Demo on inheritance
Has A – Aggregation
Diagrammatic representation
Demo on aggregation
Uses A - Association
Diagrammatic representation
Demo on association
Assignment on relationships
Solving MCQs based on relationships between classes

Module:4	**Modifiers, Interface & Abstract classes (Java specific), Packages**	**7 hours**

Types of access specifiers
Demo on access specifiers
Assignment on access modifiers
Instance Members
Solving MCQs based on modifiers
Abstract Classes
Need
Abstract Classes
Abstract Methods

Interfaces Assignment on abstract classes and interface Need for packages Access specifiers & packages Import classes from other packages		
Module:5	**Collections**	**10 hours**
ArrayList, LinkedList, List Interface, HashSet, Map Interface, HashMap, Set Programming questions based on collections Real world problems based on data structure		
	Total Lecture hours:	**45 hours**
Reference Books		
1.	Java The Complete Reference, 2014, 9th Edition by By Herbert Schildt, McGraw-Hill Education Pvt Ltd	
2.	Introduction to Programming with Java: A Problem-Solving Approach by John Dean	
Mode of Evaluation: FAT, Assignments, 3 Assessments with Term End FAT (Computer Based Test)		

STS3204	JAVA Programming and Software Engineering Fundaments	L	T	P	J	C
		3	0	0	0	1

Pre-requisite	None	Syllabus version
		1.0

Course Objectives:

1. Ability to translate vast data into abstract concepts and to understand JAVA concepts
2. To have a clear understanding of subject related concepts
3. To develop computational ability in Java programming language

Expected Course Outcome:

1. Clear Knowledge about problem solving skills in JAVA concepts
2. Students will be able to write codes in Java

Module:1	Threads, Exceptions, LinkedList, Arrays, Stack and Queue	8 hours

Need of threads
Creating threads
Wait
Sleep
Thread execution

Need for exception handling
try, catch, throw, throws
Creating own exception (Java, Python)
Handling own exceptions

Solving programming questions based on linked list and arrays

Solving programming questions based on stacks and queues
How to implement a stack using queue?
How to implement a queue using stack?

Module:2	Trees, JDBC Connectivity	7 hours

Solving programming questions based on trees, binary trees, binary search trees
JDBC Overview
Database Setup
Install the MySQL Database
Create New Database User in MySQL Workbench

Module:3	JDBC Data	6 hours

Selecting data from tables
Inserting Data into the Database

Updating Data in the Database Deleting Data from the Database Creating Prepared Statements		
Module:4	**Networking with Java**	**12 hours**
Working with URLs Sending HTTP Requests Processing JSON data using Java Processing XML data using Java		
Module:5	**Advanced programming**	**12 hours**
File Operations CSV Operations Encoder & Decoders Encryption & Decryption Hashes Loggers		
	Total Lecture hours:	**45 hours**

Reference Books	
1.	Java The Complete Reference, 2014, 9th Edition by By Herbert Schildt, McGraw-Hill Education Pvt Ltd
2.	Introduction to Programming with Java: A Problem-Solving Approach by John Dean

Mode of Evaluation: FAT, Assignments, 3 Assessments with Term End FAT (Computer Based Test)

STS3205	Advanced JAVA Programming	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	None	Syllabus version				
		1.0				

Course Objectives:

1. Ability to translate vast data into abstract concepts and to understand JAVA concepts
2. To have a clear understanding of subject related concepts
3. To develop computational ability in Java programming language

Expected Course Outcome:

1. Clear Knowledge about problem solving skills in JAVA concepts
2. Students will be able to write codes in Java

Module:1	Associations, Modifiers	9 hours

Uses A - Association
Diagrammatic representation
Demo on association
Assignment on relationships
Solving MCQs based on relationships between classes

Types of access specifiers
Demo on access specifiers
Assignment on access modifiers
Instance Members
Solving MCQs based on modifiers

Module:2	Interface & Abstract classes (Java specific), Packages	10 hours

Abstract Classes
Need
Abstract Classes
Abstract Methods
Interfaces
Assignment on abstract classes and interface

Need for packages
Access specifiers & packages
Import classes from other packages

Module:3	Exceptions	7 hours

Need for exception handling
try, catch, throw, throws

Creating own exception (Java, Python) Handling own exceptions		
Module:4	**Collections**	**15 hours**
ArrayList, LinkedList, List Interface, HashSet, Map Interface, HashMap, Set Programming questions based on collections Real world problems based on data structure		
Module:5	**LinkedList, Arrays**	**4 hours**
Solving programming questions based on linked list and arrays		
	Total Lecture hours:	**45 hours**

Reference Books	
1.	Java The Complete Reference, 2014, 9th Edition by By Herbert Schildt, McGraw-Hill Education Pvt Ltd
2.	Introduction to Programming with Java: A Problem-Solving Approach by John Dean

Mode of Evaluation: FAT, Assignments, 3 Assessments with Term End FAT (Computer Based Test)

STS3301	JAVA for Beginners	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	**None**	**Syllabus version**				
		1.0				

Course Objectives:

1. Ability to translate vast data into abstract concepts and to understand JAVA concepts
2. To have a clear understanding of subject related concepts
3. To develop computational ability in Java programming language

Expected Course Outcome:

1. Clear Knowledge about problem solving skills in JAVA concepts
2. Students will be able to write codes in Java

Module:1	**Introduction to Programming**	**10 hours**

Introduction to Flow Charts
Pseudo code
Program Development Steps & Algorithms
Computer Operations & Data Types
Comparison Operators
Single Selection
Dual Selection
Three or More Choices
Nested Ifs
Boolean Operators
Loops

Module:2	**Object and Class**	**10 hours**

Types of programming
Disadvantages of functional programming
Class & Objects
Attributes
Methods
Objects
Solving MCQs based on Objects and Classes
Solving tricky questions based on encapsulation
Solving frequently asked object based questions

Module:3	**Data types, Basic I / O**	**10 hours**

Data types
Data
Why data type
Variables

Available data types Numeric – int, float, double Character – char, string Solving MCQs based on type casting, data types Solving debugging based MCQs Printing Getting input from user during run time Command line arguments Solving programming questions based on CLA Solving MCQs questions based on CLA		
Module:4	**Decision Making, Loop Control**	**10 hours**
Need for control statement if..else if..else if..else Nested if..else Switch case Common mistakes with control statements (like using = instead of ==) Solving frequently asked questions on decision making Types of looping statements Entry Controlled For While Exit Controlled do while break and continue Demo on looping Common mistakes with looping statements (like using ; at the end of the loop) Solving pattern programming problems, series problems Solving predict the output questions		
Module:5	**String**	**5 hours**
String handling		
	Total Lecture hours:	**45 hours**
Reference Books		
1.	Java The Complete Reference, 2014, 9th Edition by By Herbert Schildt, McGraw-HillEducation Pvt Ltd	
2.	Introduction to Programming with Java: A Problem-Solving Approachby John Dean	
Mode of Evaluation: FAT, Assignments, 3 Assessments with Term End FAT (Computer Based Test)		

STS3401	Foundation to Programming Skills	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	None	Syllabus version				
		1.0				

Course Objectives:

1. Ability to translate vast data into abstract concepts and to understand JAVA concepts
2. To have a clear understanding of subject related concepts
3. To develop computational ability in Java programming language

Expected Course Outcome:

1. Clear Knowledge about problem solving skills in JAVA concepts
2. Students will be able to write codes in Java

Module:1	Object and Class	8 hours

Types of programming
Disadvantages of functional programming
Class & Objects
Attributes
Methods
Objects
Solving MCQs based on Objects and Classes
Solving tricky questions based on encapsulation
Solving frequently asked object based questions

Module:2	Data types, Basic I / O	8 hours

Data types
Data
Why data type
Variables
Available data types
Numeric – int, float, double
Character – char, string
Solving MCQs based on type casting, data types
Solving debugging based MCQs

Printing
Getting input from user during run time
Command line arguments
Solving programming questions based on CLA
Solving MCQs questions based on CLA

Module:3	Decision Making, Loop Control	9 hours

Need for control statement if..else if..else if..else Nested if..else Switch case Common mistakes with control statements (like using = instead of ==) Solving frequently asked questions on decision making Types of looping statements Entry Controlled For While Exit Controlled do while break and continue Demo on looping Common mistakes with looping statements (like using ; at the end of the loop) Solving pattern programming problems, series problems Solving predict the output questions		
Module:4	**String, Date, Array**	**10 hours**
String handling, date handling Solving problems based on arrays like searching, sorting, rearranging, iteration) Multi-dimensional arrays Solving pattern problems using 2D arrays Real time application based on 2D arrays		
Module:5	**Inheritance, Aggregation**	**10 hours**
Need Is A – Inheritance Types of inheritance supported Diagrammatic representation Demo on inheritance Has A – Aggregation Diagrammatic representation Demo on aggregation Solving MCQs based on relationships between classes		
	Total Lecture hours:	**45 hours**

Reference Books

1.	Java The Complete Reference, 2014, 9th Edition by By Herbert Schildt, McGraw-Hill Education Pvt Ltd
2.	Introduction to Programming with Java: A Problem-Solving Approach by John Dean

Mode of Evaluation: FAT, Assignments, 3 Assessments with Term End FAT (Computer Based Test)

STS5002	Preparing for Industry	L	T	P	J	C
		3	0	0	0	1
Pre-requisite		**Syllabus version**				
		2.0				

Course Objectives:

1. To develop the students' logical thinking skills
2. To learn the strategies of solving quantitative ability problems
3. To enrich the verbal ability of the students
4. To enhance critical thinking and innovative skills

Expected Course Outcome:

1. Enabling students to simplify, evaluate, analyze and use functions and expressions to simulate real situations to be industry ready.

Module:1	**Interview skills – Types of interview and Techniques to face remote interviews and Mock Interview**	**3 hours**

Structured and unstructured interview orientation, Closed questions and hypothetical questions, Interviewers' perspective, Questions to ask/not ask during an interview, Video interview, Recorded feedback, Phone interview preparation, Tips to customize preparation for personal interview, Practice rounds

Module:2	**Resume skills – Resume Template and Use of power verbs and Types of resume and Customizing resume**	**2 hours**

Structure of a standard resume, Content, color, font, Introduction to Power verbs and Write up, Quiz on types of resume, Frequent mistakes in customizing resume, Layout - Understanding different company's requirement, Digitizing career portfolio

Module:3	**Emotional Intelligence - L1 – Transactional Analysis and Brain storming and Psychometric Analysis and Rebus Puzzles/Problem Solving**	**12 hours**

Introduction, Contracting, ego states, Life positions, Individual Brainstorming, Group Brainstorming, Stepladder Technique, Brain writing, Crawford's Slip writing approach, Reverse brainstorming, Star bursting, Charlette procedure, Round robin brainstorming, Skill Test, Personality Test, More than one answer, Unique ways

Module:4	**Quantitative Ability-L3 – Permutation-Combinations and Probability and Geometry and mensuration and Trigonometry and Logarithms and Functions and Quadratic Equations and Set Theory**	**14 hours**

Counting, Grouping, Linear Arrangement, Circular Arrangements, Conditional Probability, Independent and Dependent Events, Properties of Polygon, 2D & 3D Figures, Area & Volumes, Heights and distances, Simple trigonometric functions, Introduction to logarithms, Basic rules of

logarithms, Introduction to functions, Basic rules of functions, Understanding Quadratic Equations, Rules & probabilities of Quadratic Equations, Basic concepts of Venn Diagram		
Module:5	**Reasoning ability-L3 – Logical reasoning and Data Analysis and Interpretation**	**7 hours**
Syllogisms, Binary logic, Sequential output tracing, Crypto arithmetic, Data Sufficiency, Data interpretation-Advanced, Interpretation tables, pie charts & bar chats		
Module:6	**Verbal Ability-L3 – Comprehension and Logic**	**7 hours**
Reading comprehension, Para Jumbles, Critical Reasoning (a) Premise and Conclusion, (b) Assumption & Inference, (c) Strengthening & Weakening an Argument		
	Total Lecture hours:	**45 hours**

Reference Books

1.	Michael Farra and JIST Editors(2011) Quick Resume & Cover Letter Book: Write and Use an Effective Resume in Just One Day. Saint Paul, Minnesota.Jist Works
2.	Daniel Flage Ph.D(2003) The Art of Questioning: An Introduction to Critical Thinking. London. Pearson
3.	David Allen(2002) Getting Things done : The Art of Stress -Free productivity. New York City. Penguin Books.
4.	FACE(2016) Aptipedia Aptitude Encyclopedia.Delhi. Wiley publications
5.	ETHNUS(2013) Aptimithra. Bangalore. McGraw-Hill Education Pvt. Ltd.

Websites:

1. **www.chalkstreet.com**
2. **www.skillsyouneed.com**
3. **www.mindtools.com**
4. **www.thebalance.com**
5. **www.eguru.ooo**

Mode of Evaluation: FAT, Assignments, Projects, Case studies, Role plays,3 Assessments with Term End FAT (Computer Based Test)			
Recommended by Board of Studies	09/06/2017		
Approved by Academic Council	No. 45th AC	Date	15/06/2017

CSE1007	JAVA programming	L	T	P	J	C
		3	0	2	0	4
		Syllabus version				
		1.0				

Course Objectives:

1. To impart the core language features of Java and its Application Programming Interfaces (API).
2. To demonstrate the use of threads, exceptions, files and collection frameworks in Java.
3. To familiarize students with GUI based application development and database connectivity.

Expected Course Outcome:

1. Comprehend Java Virtual Machine architecture and Java Programming Fundamentals.
2. Design applications involving Object Oriented Programming concepts such as inheritance, association, aggregation, composition, polymorphism, abstract classes and interfaces.
3. Design and build multi-threaded Java Applications.
4. Build software using concepts such as files, collection frameworks and containers.
5. Design and implement Java Applications for real world problems involving Database
6. Connectivity.
7. Design Graphical User Interface using JavaFX.
8. Design, Develop and Deploy dynamic web applications using Servlets and Java Server Pages.

Module:1	Java Basics	5 hours

Java Basics: Java Design goal - Features of Java Language - JVM - Bytecode - Java source file structure basic programming constructs Arrays one dimensional and multi-dimensional enhanced for loop String package

Module:2	Object Oriented Programming	7 hours

Class Fundamentals - Object Object reference array of objects constructors methods over- loading this reference static block - nested class inner class garbage collection finalize() Wrapper classes Inheritance types - use of super - Polymorphism abstract class interfaces packages and sub packages.

Module:3	Robustness and Concurrency	8 hours

Exception Handling - Exceptions Errors - Types of Exception - Control Flow in Exceptions - Use of try, catch, finally, throw, throws in Exception Handling - user defined exceptions - Multithreading Thread creation sharing the workload among threads synchronization inter thread communication deadlock.

Module:4	Files, Streams and Collection framework	6 hours

Data structures: Java I/O streams Working with files Serialization and deserialization of objects Lambda expressions, Collection framework List, Map, Set Generics Annotations

Module:5	**GUI Programming and Database Connectivity**	**7 hours**
GUI programming using JavaFX, exploring events, controls and JavaFX menus Accessing databases using JDBC connectivity.		
Module:6	**Servlet**	**6 hours**
Introduction to servlet - Servlet life cycle - Developing and Deploying Servlets - Exploring Deployment Descriptor (web.xml) - Handling Request and Response - Session Tracking Management.		
Module:7	**JSP**	**4 hours**
JSP Tags and Expressions - JSP Expression Language (EL) - Using Custom Tag - JSP with Java Bean.		
Module:8	**Contemporary issues**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Herbert Schildt, The Complete Reference-Java, Tata McGraw-Hill Education, Tenth Edition, 2017.
2.	Paul J. Deitel, Harvey Deitel ,Java SE8 for Programmers (Deitel Developer Series) 3rd Edition, 2014
3.	Y. Daniel Liang, Introduction to Java programming-comprehensive version-Tenth Edition, Pearson ltd 2015

Reference Books

1. Paul Deitel Harvey Deitel ,Java, How to Program, Prentice Hall; 9th edition , 2011.
2. Cay Horstmann BIG JAVA, 4th edition, John Wiley Sons,2009
3. Nicholas S. Williams, Professional Java for Web Applications, Wrox Press, 2014.

List of Challenging Experiments (Indicative)		
1.	Write a program to demonstrate the use of multidimensional arrays and looping constructs.	2 hours
2	Write a program to demonstrate the application of String handling functions.	2 hours
3	Write a program to demonstrate the use of Inheritance.	2 hours
4	Write a program to demonstrate the application of user-defined packages and sub-packages.	2 hours
5	Write a program to demonstrate the use of Java Exception handling methods.	2 hours
6	Write a program to demonstrate the use of threads in Java.	2 hours
7	Demonstrate with a program the use of File handling methods in Java.	2 hours
8	Demonstrate the use of Java collection frameworks in reducing application development time.	2 hours
9	Build a GUI application using JavaFX	2 hours
10	Write a program to register students data using JDBC with MySQL Database.	2 hours
11	Write a program that uses Servlets to perform basic banking tasks.	2 hours
12	Write a web application using JSP and demonstrate the use of http request and	2 hours

	response methods.	
13	Write a JSP program for an order management system.	2 hours
14	Write a JSP program that using JDBC and MySQL database to store the user data.	2 hours
15	JSP with Java Bean	2 hours
	Total Laboratory Hours	30 hours
Mode of assessment: Project/Activity		
Recommended by Board of Studies	10-08-2018	
Approved by Academic Council	No. 52	14-09-2018

EEE1001	Basic Electrical and Electronics Engineering	L	T	P	J	C
		2	0	2	0	3

Pre-requisite	NIL	Syllabus version
		v. 1.0

Course Objectives:

1. To understand the various laws and theorems applied to solve electric circuits and networks
2. To provide the students with an overview of the most important concepts in Electrical and Electronics Engineering which is the basic need for every engineer

Expected Course Outcome:

1. Solve basic electrical circuit problems using various laws and theorems
2. Analyze AC power circuits and networks, its measurement and safety concerns
3. Classify and compare various types of electrical machines
4. Design and implement various digital circuits
5. Analyze the characteristics of semiconductor devices and comprehend the various modulation techniques in communication engineering
6. Design and conduct experiments to analyze and interpret data

Module:1	DC circuits	5 hours

Basic circuit elements and sources, Ohms law, Kirchhoff's laws, series and parallel connection of circuit elements, Node voltage analysis, Mesh current analysis, Thevenin's and Maximum power transfer theorem

Module:2	AC circuits	6 hours

Alternating voltages and currents, AC values, Single Phase RL, RC, RLC Series circuits, Power in AC circuits-Power Factor- Three Phase Systems – Star and Delta Connection- Three Phase Power Measurement – Electrical Safety –Fuses and Earthing, Residential wiring

Module:3	Electrical Machines	7 hours

Construction, Working Principle and applications ofDC Machines, Transformers, Single phase and Three-phase Induction motors, Special Machines-Stepper motor, Servo Motor and BLDC motor

Module:4	Digital Systems	5 hours

Basic logic circuit concepts, Representation of Numerical Data in Binary Form- Combinational logic circuits, Synthesis of logic circuits

Module:5	Semiconductor devices and Circuits	7 hours

Conduction in Semiconductor materials, PN junction diodes, Zener diodes, BJTs, MOSFETs, Rectifiers, Feedback Amplifiers using transistors.Communication Engineering: Modulation and Demodulation - Amplitude and Frequency Modulation

	Total Lecture hours:	**30 hours**	

Text Book(s)	
1.	1. John Bird, 'Electrical circuit theory and technology ', Newnes publications, 4th Edition, 2010.
Reference Books	
1.	Allan R. Hambley, 'Electrical Engineering -Principles & Applications' Pearson Education, First Impression, 6/e, 2013
2.	Simon Haykin, 'Communication Systems', John Wiley & Sons, 5 t h Edition, 2009.
3.	Charles K Alexander, Mathew N O Sadiku, 'Fundamentals of Electric Circuits', Tata McGraw Hill, 2012.
4.	Batarseh, 'Power Electronics Circuits', Wiley, 2003
5.	H. Hayt, J.E. Kemmerly and S. M. Durbin, 'Engineering Circuit Analysis', 6/e, Tata McGraw Hill, New Delhi, 2011.
7.	Fitzgerald, Higgabogan, Grabel, 'Basic Electrical Engineering', 5t h edn, McGraw Hill, 2009.
8.	S.L.Uppal, 'Electrical Wiring Estimating and Costing ', Khanna publishers, NewDelhi, 2008.
Mode of Evaluation: CAT / Assignment / Quiz / FAT / Project / Seminar	

List of Challenging Experiments (Indicative)		
1.	Thevenin's and Maximum Power Transfer Theorems – Impedance matching of source and load	2 hours
2.	Sinusoidal steady state Response of RLC circuits	2 hours
3.	Three phase power measurement for ac loads	2 hours
4.	Staircase wiring circuit layout for multi storey building	2 hours
5.	Fabricate and test a PCB layout for a rectifier circuit	2 hours
6.	Half and full adder circuits.	2 hours
7.	Full wave Rectifier circuits used in DC power supplies. Study the characteristics of the semiconductor device used	2 hours
8.	Regulated power supply using zener diode. Study the characteristics of the Zener diode used	2 hours
9.	Lamp dimmer circuit (Darlington pair circuit using transistors) used in cars. Study the characteristics of the transistor used	2 hours
10.	Characteristics of MOSFET	2 hours
	Total Laboratory Hours	20 hours

Mode of assessment: CAT / Assignment / Quiz / FAT / Project / Seminar			
Recommended by Board of Studies	**29/05/2015**		
Approved by Academic Council	**37th AC**	Date	**16/06/2015**

ITE1001	Digital Logic and Microprocessor	L	T	P	J	C
		3	0	2	0	4
Pre-requisite	**NIL**	**Syllabus version**				
		1.00				

Course Objectives:

1. To learn logic circuits and converters
2. To understand the components of a digital system
3. To understand the microprocessor architecture and assembler instruction formats

Expected Course Outcome:

1. Study, design and experiment the various digital logic design and architectures of microprocessors.
2. An ability to design and use the various combinational logic circuits.
3. Design and evaluate the various flip flops and counters for sequential logic circuits.
4. Analyze, design and implement the architecture of 8085.
5. Comprehend the design details of architecture of 8086 microprocessor.
6. Design and implement the various programming models of 8086 architecture.
7. Analyze and design the application of peripheral chips in various microcontroller architectures.

Module:1	**Introduction**	**4 hours**

Review of number systems - Logic gates: NAND, NOR gate as universal building blocks - Simplification of four-variable Boolean equations using Karnaugh maps

Module:2	**Combinational Logic circuits**	**5 hours**

Half adder, Full adder, Half subtractor, Full subtractor - 4-bit parallel adder and subtractor - 3-bit binary decoder – Decimal to BCD encoder – 8-to-1 multiplexer, 1-to-8 Demultiplexer

Module:3	**Sequential Logic Circuits**	**8 hours**

Flip-flops: SR flip-flop, Edge-triggered flip-flops (SR,D,JK and T), Master-slave JK flip-flop - 4-bit binary asynchronous and synchronous counter - Decade counter (asynchronous and synchronous) - Shift registers (SISO,SIPO,PISO,PIPO) - Ring counter – Memories (RAM, ROM, EPROM,FLASH)

Module:4	**The 8085 Microprocessor Architecture**	**4 hours**

Pin diagram - CPU architecture – Flags-Interrupts – Instruction Set-Addressing mode

Module:5	**The 8086 Microprocessor**	**8 hours**

Pin diagram, CPU architecture, addressing mode, Segmentation- Minimum mode maximum mode operations -Memory Interfacing-I/O interfacing

Module:6	**Programming model of 8086**	**7 hours**
Programming model of 8086, Addressing modes, Instruction Formats, Instruction set, Assembler directives and Assembly language Programming of 8086.		
Module:7	**Peripheral Chips**	**7 hours**
Block diagram – pin diagram**,** 8255 (PPI), 8254 (Timer), 8257 (DMA), 8259 (PIC), 8251 (USART)8279(Keyboard and Display Interfacing)		
Module:8	**Contemporary issues**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Ramesh Gaonkar, Microprocessor Architecture, Programming, and Applications with the 8085, Sixth Edition, Penram International Publishing, 2013.
2.	Morris Mano, Digital logic and Computer design, 4th Edition, Pearson, 2008.
Reference Books	
1.	Yu-Cheng Liu, Glenn A. Gibson, Microcomputer Systems: The 8086/8088 Family-Architecture Programming and Design, Second Edition, Pearson, 2015.
2.	R.K. Gaur, Digital Electronics and Microcomputers, Dhanpat Rai Publications, 2012.

List of Challenging Experiments (Indicative)

Digital Logic Design

1. Basic Logic Gates
2. Combinational Circuits
3. Adders and Subtractors
4. Code Convertors
5. Parallel Adder and Magnitude Comparator
6. Decoder and Encoder
7. Multiplexer and De-multiplexer
8. Sequential Circuits and Shift registers
9. Counters

Microprocessors

10. To write programs in Assembly Language using 8085 instruction set.
11. To write programs in Assembly Language using 8086 instruction set.
12. To perform interfacing of RAM chip
13. To perform interfacing of keyboard controller
14. To perform interfacing of DMA Controller
15. To perform interfacing of UART/USART

1.	Assume a large room has 3 doors and a switch near each door controls a light in the room. The light is turned on or off by changing the state of any one of the switches. More specifically the following should happen:

	1. The light is OFF when all 3 switches are open. 2. Closing any one switch will turn the light ON. 3. Then closing the second switch will have to TURN OFF the light. 4. If the light is OFF when the 2 switches are closed, then by closing the third switch the light will TURN ON.

2.	Design hardware that implements the following pseudo-code using the provided Comparator, Adder and Registers, along with as many multiplexers and de-multiplexers as needed. The comparator has two inputs In1 and In2, and three outputs, C1, C2, and C3. If In1 < In2, C1 = 1; if In1 = In2, C2=1; if In1 > In2, C3 =1 (for a given In1 and In2, only one of the comparator outputs can be 1). The Adder takes as inputs two numbers p and q, and produces an output Sum. There are 5 registers for storing the 5 variables, A, B, X, Y, and Z. • Hint: You do not need to use truth table or K-maps. Insert the muxes/demuxes as appropriate, and show the signal connections from the input registers A, B, X to the output registers Y and Z, through the muxes, comparator, adder, and demuxes. Be sure to show the equations for the select lines of the multiplexers/demultiplexers in terms of the comparator outputs, C1, C2, and C3.
	Pseudo-code:
	If A<B then
	Z= X+ A
	Else if A=B then
	Z= X+ B
	Else
	Y = A + B

3.	Design a simplified traffic-light controller that switches traffic lights on a crossing where a north-south (NS) street intersects an east-west (EW) street. The input to the controller is the WALK button pushed by pedestrians who want to cross the street. The outputs are two signals NS and EW that control the traffic lights in the Ns and EW directions. When NS or EW are 0, the red light is on, and when they are 1, the green light is on. When there are no pedestrians, NS=0, EW=1 for a minute, follow by NS=1 and EW=0 for 1 minutes, and so on, when WALK button is pushed, Ns and EW both become 0 for a minute when the present minute expires. After that the NS and EW signals continue alerting. For this traffic-light controller: a) Develop a state diagram. (Hint: can be done using 3 states) b) Draw the state transition table. c) Encode the states using minimum number of bits. d) Derive the logic schematic for a sequential circuit which implements the state transition table.
4.	Many game shows use a circuit to determine which of the contestants ring in first. Design a circuit to determine which of two contestants rings in first. It has two inputs S1 and S0 which are connected to the contestants' buttons. The circuit has two outputs Z1 and Z0 which are connected to LED's to indicate which contestant rang in first. There is also a reset button that is used by the game show host to asynchronously reset the flip-flops to the initial state before each question. If contestant 0 rings in first, the circuit turns on LED 0. Once LED 0 is on, the circuit leaves it on regardless of the inputs until the circuit is asynchronously reset by the game show host. If contestant 1 rings in first, the circuit turns on LED 1 and leaves it on until the circuit is reset. If there is a tie, both LED's are turned on. The circuit requires four states: reset, contestant 0 wins, contestant 1 wins, and tie. One way to map the states is to use state

	00 for reset, state 01 for contestant 0 wins, state 10 for contestant 1 wins, and state 11 for a tie. With this mapping, the outputs are equal to the current state, which simplifies the output equations.
5.	Design a simple circuit that could operate a car alarm. The circuit has one input Y which would be connected to the car's door switch to determine if the car door is open or shut. When the door is shut Y = 0, and when the door is open Y = 1. The circuit has one output Z which is used to operate a horn by shorting the wires that go to the horn switch in the steering wheel. When Z = 1, the switch is activated and the horn honks. The circuit would be asynchronously reset by the accessories power line that is high when the ignition is turned on or is in accessory-only mode, both of which require the key to the car.
6.	Design a 12 hour Digital clock which is usually set up to start at 12:00, and they count 12:01, 12:02, 12:03, 12:04, 12:05, 12:06, 12:07, 12:08, 12:09, 12:10, and eventually the clock gets to 12:58, 12:59, 1:00, and so on. The one's place of the minutes (the right-most digit) counts 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, and then repeats. The ten's place of the minutes (second digit from the right) counts 0, 1, 2, 3, 4, 5, and then repeats. The hour counter counts 12, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and repeats.
7.	Design a Microprocessor based combinational lock which has a combination of five digits. The five digits are entered from a keyboard and they are to be entered within a 10 seconds. If the right combination is entered the lock will open. If after 10 seconds either all five digits are not entered or a wrong combination is entered then the display will show an error message. Then the system will allow 5 seconds for the first digit to be entered the second time. If after this time the digit is not entered, the system will turn ON the alarm. If the second try fails, the alarm is also turned ON. Then to reset the system the power has to be turned OFF.(Scrambling Keypad)
8.	Design a microprocessor based Smart Pill Box Alarm System for Elderly people. The system will alert the user 3 times per day for taking up the pills. The user has to set the system into fixed slots: for example: Morning, Afternoon, Evening and Night. The system will deliver a display message such as “Take this Pill X “five minutes before the scheduled time. A real time clock is to be included in the system to display the current time and will show the alarm as per the time slots.
9.	Design an intelligent system for the following real time situation. Consider you are driving a car. You are having a limited display area, where you need to display the fuel status, temperature status, Speed limit, Gear Position based on the priority which suits the following context. “There is an obstacle at a distance of 100m and the same is sensed by a sensor. Based on the sensor input, the display has to be displayed to indicate the function to be performed by the driver.”
10.	An event sequence recorder has to be designed for a hospital in your city which will monitor a patient’s pulse rate, blood pressure, body temperature. The equipment accepts inputs from different sensors, and prints the sequence in which they operate. It scans the inputs every millisecond and prints in a compact, type of event (normal or abnormal) and time of occurrence. It also communicates these events over an RS232C link to a remote computer. A real-time clock is included. Design the processor unit using 8086.

11.	Elderly users often forget their daily routines. Hence you need to design a microprocessor based unit to help them remember their monthly expenses and bill payments. For example, their house rent, telephone bills, electricity bills, gas requirement, etc. An alarm has to be blown to remind them and when they reset it, it is understood that they have paid and the expense has to be calculated for the entire month and at the end of the month the total expense has to be intimated.
12.	Let say that you work in VIT. Each day there is a rush hour in lunch time - everyone wants to get in the food line first. Your school is at the top floor and only way to get to the lobby is to use a lift. So, you call the lift and wait... and wait. Your waiting time could be infinite because everyone in bottom floors are loading the lift, so it never reaches the top! And when it finally does, your lunch time is over. Design a system to overcome this infinite waiting time.

		Total Laboratory Hours	30 hours
Recommended by Board of Studies	04-12-2015		
Approved by Academic Council	No. 39	Date	12-12-2015

ITE1002	Web Technologies	L	T	P	J	C
		2	0	2	0	3
Pre-requisite	**CSE1001**	**Syllabus version**				
		1.10				

Course Objectives:

1. To understand the web architecture and web languages.
2. To program for web client and web server objects.
3. To understand web development environment and methodology

Expected Course Outcome:

1. Implement interactive and responsive web pages using HTML and CSS.
2. Use Java script language to transfer data and add interactive components to web pages.
3. Develop a sophisticated web application that appropriately employs the MVC architecture
4. Demonstrate a client server application using HTTP protocol and access web services for dynamic content using AJAX.
5. Exhibit the working of server-side scripts.
6. Understand the fundamental working of data using open source databases
7. Develop advanced web frameworks by combining multiple web technologies
8. Implement Client side and Server side programming.

Module:1	**Web Essentials**	**4 hours**

Evolution of Web – Web architecture – HTML –XHTML- CSS

Module:2	**Client-Side Scripting**	**5 hours**

Javascript Basics –Arrays- Functions - Javascript objects – HTML DOM - DOM methods – Events- Regular Expressions – Form Validation-JSON-Jquery

Module:3	**Web Applications**	**5 hours**

Web applications- Web Application Frameworks-MVC framework-Angular JS – Single Page Applications-Responsive Web Design

Module:4	**Client/Server Communication**	**4 hours**

HTTP- Request/Response Model- HTTP Methods- RESTful APIs-AJAX-AJAX with JSON

Module:5	**Web Servers**	**5 hours**

Node.js-NPM- Callbacks -Events- Express framework-Cookies-Sessions-Scaling

Module:6	**Storage**	**3 hours**

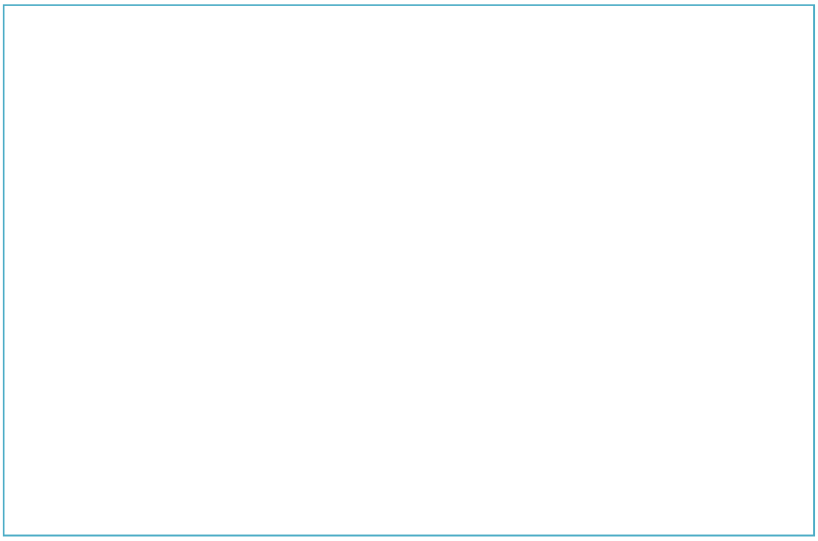
MongoDB-Manipulating and Accessing MongoDB Documents from Node js

Module:7	**Reactive frameworks**	**2 hours**
Meteor JS framework – Templates – Events – Sessions – Publish & Subscribe –Accounts		
Module:8	**Contemporary issues**	**2 hours**
	Total Lecture hours:	**30 hours**

Text Book(s)	
1.	Brad Dayley, Node.js, MongoDB, and AngularJS Web Development, Addison Wesley, 2014
2.	Morris Mano, Digital logic and Computer design, 4th Edition, Pearson, 2008.
Reference Books	
1.	Jon Duckett,HTML & CSSDesign and Build Websites,Wiley, 2011
2.	Jon Duckett,JavaScript and JQuery: Interactive Front-End Web Development,Wiley,2014
3.	Holdener, Ajax: The Definitive Guide,Oreilly,2010

List of Challenging Experiments (Indicative)

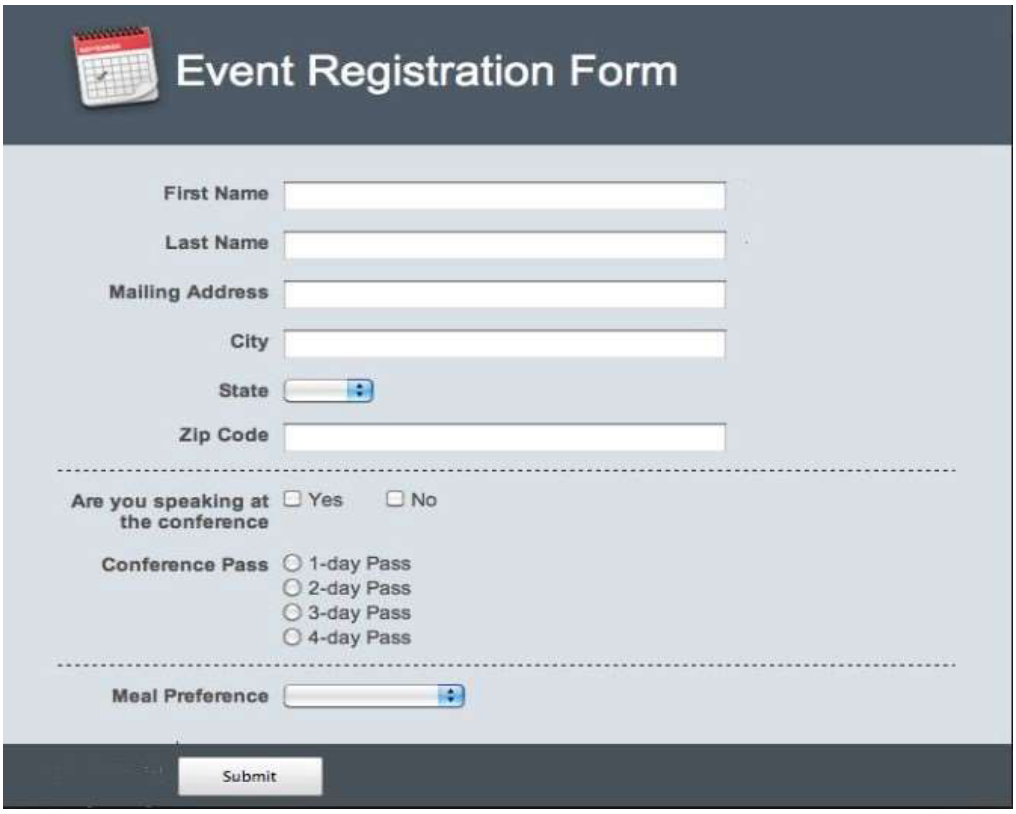
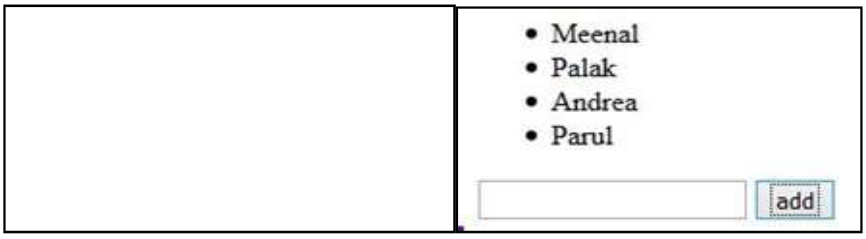
1. Use DHTML to perform the following**.**
   a) Design the spotlight section of VIT home page. Use Box properties of CSS.



   b) To create a web page which includes a map and display the related information when a hot spot is clicked in the map
   c) Create a web page which displays an image "ganesha.jpg" and the text "This is image of Lord Ganesh". Place three buttons in the web page which performs the following on clicking them
      - To right align the image.
      - To change the height, width and border of the image to 250, 350 and 3 pixels respectively
      - To change the source and alternate text of the image to "vinayaga.jpg" and "The image cannot be loaded" respectively.

   16. Design a web page with image gallery and sliding menu for movie reviews

2. Design the following using JavaScript and DOM

	a) Given an array of words, write a javascript code to count the number of vowels and number of consonants in each word. Use Regular Expressions. b) Include Image Slide Show Digital clock, Survey Poll to make your webpage i) Dynamic. Develop a web application to implement online quiz system. The application includes only client side script
3.	Create a popup Login form using jQuery which appears at the center of screen on loading the page after a specified time interval. Include Captcha text in the login page.
4.	a) Validate the Event Registration Form given below using Jquery for the following conditions. • All fields are mandatory • Zip code should be exactly five digits • Email validation  b) Create a JSON file for a list of cities. Provide autocomplete option for city field using the JSON file as source.
5.	Using Angular JS, add names that are entered in textbox to the list and clear the textbox once the name is added to list. 

6.	Design a shopping cart application using AngularJS. Your shopping webpage should have the provisions for selecting the list of items from different category, Once the items are selected on clicking the submit button the items in the cart with its price should be displayed. Sample design is given below. 
7.	Create a MongoDB collection of "books" with the following details: ***Title, ISBN(unique id), Authors, Publication ,Year of Publication and Price.*** Write commands for the following: a) Insert a new document with multiple authors. b) Update a document with change in price c) Remove documents with year of publication lesser than 1990.
8.	A MongoDB collection of words has the document structure as: *{* *word:<word>,* *first:<first_letter>,* *last:<last_letter>,* *size: <character_count>* *}* Perform the following operations on those documents using Nodejs. Find the set of words which starts with letters 'a','b' or 'c'. Find the set of words which exactly has 12 letters. Count the number of words that starts and ends with a vowel. Find the first ten words that end with the letter 'e' and display it in descending order.
9.	Develop an Online banking Web application over MEAN stack with the following scenarios. Initially the login page should contain only user id field. On entering the user id, if only the user id exists, password field should be displayed. On successful login, display the account summary with the following details retrieved from the database: Account no, Account type and Available Balance. On the left side top of the page display the Current date, Last Login date and UserName and User Id. The session should expire on logout or if the page is idle for more than 2 minutes.
10.	Create an application in node.js for employee management. The application should manage the following details of an employee: ID, name, surname, cadre and salary. Name and surname are strings, while ID, cadre and Salary are integers.

	The application should have the following functionalities: To search an employee using his/her ID If the employee exists, it will show his/her data in a form, otherwise an pop message should be displayed stating the employees does not exist. To delete an employee, by specifying his/her ID. To insert a new employee using a form. By default, the form is hidden, by pressing a button the form should appear. If the same button is clicked the form should disappear. Every time the form is shown, it should be empty. The form should allow to specify all data of an employee. If the ID field is left empty, the system will assign the next available ID. If the ID is already associated to an employee, the employee data are overwritten. If the ID is not associated to any employee, the employee is created. All the other fields cannot be empty.
11.	Design an online book store using ExpressJS which has the following features (use the MongoDB database created in Question.No.9): a) Search option based on Title , Author or ISBN b) On retrieving the results , display the book details in table format with the Price field in sorted order using AngularJS
12.	Design a student registration form which takes student name, register number, DOB, program, email id, temporary address, permanent address, phone number. Validate the following using jquery: a. Mobile number should be exactly 10 digits b. Register number should have alphabets and numbers only c. Name should not exceed 30 characters and can be only alphabets. d. Email validation e. Provide a checkbox saying “Permanent address is same as temporary address”. If checked, the value of permanent address should be added automatically from temp address. And should be in disabled mode.

		Total Laboratory Hours	30 hours
Recommended by Board of Studies	12-08-2017		
Approved by Academic Council	No. 47	Date	05-10-2017

ITE1003	Database Management Systems	L	T	P	J	C
		2	0	2	4	4
Pre-requisite	**CSE1001**	**Syllabus version**				
		1.00				

Course Objectives:

1. To understand the role of data, files and databases in information systems
2. To impart the knowledge of data modeling techniques
3. To provide the fundamentals of front-end and back-end of databases

Expected Course Outcome:

1. Explain the basic concepts of different data models, design models, query language
2. Design entity relationship diagrams to represent simple database application scenarios.
3. Convert high-level conceptual model to relational data model; populate database; formulate relational operations
4. Analyze and improve a database design by normalization
5. Apply transaction processing to speed up the query execution and make proper transaction in a multiuser environment.
6. Understand the Security and recovery measures in the database
7. Apply Query processing techniques to optimize the performance.
8. Populate and query a database using SQL DML/DDL commands in an application.

Module:1	Fundamental Concepts and Architecture	3 hours

Introduction to database system, Characteristics of the Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of using the DBMS Approach, Data Models, Schemas, and Instances, Three-Schema Architecture and Data Independence, The Database System Environment, Centralized and Client/Server Architectures for DBMSs, Classification of Database Management Systems

Module:2	Conceptual Database Design	4 hours

High-Level Conceptual Data Models for Database Design, Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, ER Diagrams, Naming Conventions, and Design Issues, Relationship Types of Degree Higher than Two, EER diagrams

Module:3	Relational Database Design	5 hours

Relational Model Constraints, Update Operations, Dealing with Constraint Violations, Relational Algebra, Unary Relational Operations: Operations from Set Theory, Binary Relational Operations, Additional Relational Operations, Database Design Using ER-to-Relational Mapping

Module:4	Normalization Theory	4 hours
Informal Design Guidelines for Relation Schemas, Functional Dependencies, Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Normal Forms Based on Primary Keys, Boyce-Codd Normal Form		
Module:5	**Transaction and Concurrency**	**4 hours**
Introduction to Transaction Processing, Desirable Properties of Transactions, Characterizing Schedules Based on Serializability, Concurrency, Two-Phase Locking Techniques for Concurrency Control, Concurrency Control Based on Timestamp Ordering, Multiversion Concurrency Control Techniques		
Module:6	**Recovery and Security**	**4 hours**
Recovery Concepts, NO-UNDO/REDO Recovery Based on Deferred Update, Recovery Techniques Based on Immediate Update, Shadow Paging, ARIES Recovery Algorithm, Security issues- Discretionary, Mandatory		
Module:7	**Query Processing and Indexing**	**4 hours**
Query Execution plan, Basic algorithms for query execution, Heuristic Query Optimization technique, sparse and dense index, primary, secondary and clustered index, B Tree Vs. Hash Index		
Module:8	**Contemporary issues**	**2 hours**
	Total Lecture hours:	**30 hours**

Text Book(s)

1.	Ramez Elmasri and Shamkant B.Navathe, Fundamentals of Database Systems, Pearson Education,7th edition, 2013

Reference Books

1.	Raghu Rama Krishnan, Database Management Systems, Tata Mcgraw Hill,6th edition,2010.
2.	Abraham Silberschatz, Henry F.Korth and S.Sudarshan, Database System Concepts, Tata Mc Graw Hill, 6th edition, 2011.
3.	Carlos Coronel and Steven Morris, Database System Design and Implementation, cennage learning, 11th edition, 2013.
4.	Bob Bryla and Kevin Loney, Oracle Database 12c The complete Reference, Tata McGraw Hill, 1st edition, 2013.

List of Challenging Experiments (Indicative)

Railway Reservation System -(Redesigning IRCTC database)

Train(train Number, name, source, destination,start_time, reach_time, traveltime, distance, class, days, type)

Ticket(PNRNo,Transactionid, from_station, To_station, date_of_journey, class date_of_booking, total_ticket_fare,train number)

Passenger(PNR No, Serial no, Name, Age, Reservation_status)

Train_Route(Train_No, route_no, station_code, name, arrival_time,depart_time, distance,day)

Train_Ticket_fare(Train_No, class, base_fare, reservation_charge, superfast_charge,

other_charge, tatkal_charge, service_tax)	
1.	Create all the tables specified above. Make underlined columns as primary key.(use number, number(m,n), varchar(n), date, time, timestamp datatypes appropriately) Insert atleast 5 rows to each table. (Check www.irctc.co.in website for actual data) 1. Use Interactive insertion for inserting rows to the table. 2. Use ADT(varray) for class and days column in Train table.
2.	Write simple DDL/DML Queries to 1. Remove all the rows from Passenger table permanently. 2. Change the name of the Passenger table to Passenger_Details. 3. List all train details. 4. List all passenger details. 5. Give a list of trains in ascending order of number. 6. List the senior citizen passengers details. 7. List the station names where code starts with 'M'. 8. List the trains details within a range of numbers. 9. Change the super fast charge value in train fare as zero, if it is null. 10. List the passenger names whose tickets are not confirmed. 11. List the base_fare of all AC coaches available in each train. Find the ticket details where transaction id is not known. 1) Use Interactive updation for updating the seat no for particular PNR NO. 2) Find the train names that are from Chennai to Mumbai, but do not have the source or destination in its name. 3) Find the train details that are on Thursday(Use the ADT column created).
3.	Create (Alter table to add constraint) the necessary foreign keys by identifying the relationships in the table. 1) Add a suitable constraint to train table to always have train no in the range 10001 to 99999. 2) Add a suitable constraint for the column of station name, so that does not take duplicates. 3) Change the data type of arrival time, depart time (date -> timestamp or timestamp to date), and do the necessary process for updating the table with new values. 4) Add a suitable constraint for the class column that it should take values only as 1A, 2A, 3A, SL, C. 5) Add a not null constraint for the column distance in train_route.
4.	Use SQL PLUS functions to. 1. Find the passengers whose date of journey is one month from today. 2. Print the train names in upper case. 3. Print the passenger names with left padding character. 4. Print the station codes replacing K with M. 5. Translate all the LC in class column (Train_fare) to POT and display. 6. Display the fare details of all trains, if any value is ZERO, print as NULL value. 7. Display the pnrno and transaction id, if transaction id is null, print 'not generated'. 8. Print the date_of_jounrney in the format '27th November 2010'. 9. Find the maximum fare (total fare). 10. Find the average age of passengers in one ticket. 11. Find the maximum length of station name available in the database. 12. Print the fare amount of the passengers as rounded value.

	13. Add the column halt time to train route. 14. Update values to it from arrival time and depart time. High Level: 15. Update values to arrival time and depart time using conversion functions. 16. Display the arrival time, depart time in the format HH:MI (24 hours and minutes).
5.	Write Queries to. Use SET Operators 1. Find the train numbers for which reservation have not yet been made. 2. Find the train names that donot have a first AC class coach. 3. Print all the PNR nos available in the database. 4. Find passenger names who have booked to 'Pune'. Use Nested Query(in Operators) 1. Find the train names that stop in 'Katpadi'. 2. Find the train names that are superfast and the service tax is zero. 3. Find the Passenger name who have booked for the train that starts from 'Chennai'. 4. Find the trains names that have all the AC coaches and the base fare is less than 3000 for each case. Use Join Query 1. Find the train names that stop in 'Katpadi'. 2. Find the train names that are superfast and the service tax is zero. 3. Find the Passenger name (and train name) who have booked for the train that starts from 'Chennai'. 4. Display the trains names, each type of class and the total fare for each type of class. 5. Display all the train details and the ticket details(if booked any). 6. Create a sequence to provide values for the PNR no. 7. Write a query for full outer join using any of the tables above.
6.	Write Queries to. Use Coorelated (and nested) Query 1. Find the train names for which ten tickets have been reserved. 2. Find the trains that have more than ten substations. 3. Find the passengers who do not pass through 'Mettupalam'. 4. Find passengers who have booked for super fast trains. Complex queries(use groupby/groupby having/join/nested) 1. Take the start station code and end station code and display the train details. 2. List the train names and the number of sub stations it has. 3. List the stations where all types of trains stop. 4. List the trains names that has atleast four bookings. 5. Create a table cancellation history(Insert values from ticket and passenger table). 6. Create a table for all the train numbers and class available in train_ticket_fare with total seats. 7. Find the station name that has highest number of trains stopping at.
7.	1. Write a simple PL/SQL block to. 1. Print the fibonacci series. 2. Print the factorial of a given number. 3. Print 'NOT confirmed' based on the reservation status, of a particular passenger. 4. Print the total seats available for a particular train and for a particular class.

	2. Write a cursor for the following. 1. Retrieve the passenger details for “x” train number and given journey date. 2. Display the train name(once) and the substation names. 3. Display the fare details of a particular train(use basic exceptions) 4.Write a cursor to update the reservation status of the passengers(generate seat number, if seats have reached maximum, put waiting list number(30% of total seats), if waiting list number reaches maximum, put PQWL(10%of total seats), RAC-20%)
8.	1. Write a PL/SQL procedure to. 1. List the details of passengers who has reserved next to “Mr. X”. 2. PNR No. of a passengers for a given source and a destination. 2. Write a PL/SQL function to. 1. Get the PNRNo and return the total ticket fare. 2. Get the Passenger name, train no and return the total journey time in hours and minutes.
9.	Write a Trigger for the following: 1) When a passenger cancels a ticket, do the necessary process and update the cancellation history table. 2) When train number is changed, update it in referencing tables. 3) When a passenger record is inserted reservation status should be automatically updated.
10.	1) Use TCL commands for your transactions. (commit,rollback,savepoint) 2) Create a role named 'clerk', and give permisson for him to select only the trains starting from 'Katpadi' along with fare details. 3) Create a nested table containing trainno,name,source,destination and passengers who have booked for it (PNR no,sno, name,age). Find the passengers whose name start with 'S' and train starts from 'Katpadi'

Total Laboratory Hours	30 hours

Recommended by Board of Studies	0 4-12-2015		
Approved by Academic Council	No. 39	Date	12-12-2015

ITE1004	Data Structures and Algorithms	L	T	P	J	C
		3	0	2	0	4
Pre-requisite	**NIL**	**Syllabus version**				
		1.00				

Course Objectives:

1. To study linear and non-linear data structures.
2. To learn the time and space complexity of algorithms for solving problems
3. Mastering, sorting and searching techniques and understanding their efficiencies.

Expected Course Outcome:

1. Understand, convert and evaluate the expressions using Stack.
2. Demonstrate the operations like insertion, deletion on queue and its applications
3. Apply the concepts of linked list, linked representation of queue for specified applications.
4. Solve problems using algorithmic design methods such as asymptotic notations.
5. Formulate new solutions for programming problems or improve existing code using learned algorithms and data structures.
6. Evaluate algorithms and data structures in terms of time and memory complexity of basic operations.
7. Understand and analyze the concepts of graphs and trees.

Module:1	**Stack**	**6 hours**

Operations on stack, array implementation of stack, applications of stack-balance of parenthesis in algebraic expressions, converting expressions from infix to postfix or prefix form, evaluating postfix or prefix form, Towers of Hanoi problem.

Module:2	**Queue**	**6 hours**

Operations on queue, circular queue, array implementation of queue, applications of queue.

Module:3	**List**	**6 hours**

Singly linked list, doubly linked list, circularly singly linked list, operations on linked lists, Linked representation of stack, Linked representation of Queue.

Module:4	**Algorithm Analysis**	**6 hours**

Asymptotic notations, Abstract data type, growth rate of functions, running time complexity, best, average and worst case analysis – examples.

Module:5	**Sorting and Searching**	**6 hours**

Bubble sort, insertion sort, selection sort, radix sort, merge sort, quick sort, heap sort, Shell sort, linear search, binary search, time complexity analysis of sorting and searching algorithms.

Module:6	**Hashing**	**6 hours**
Hash functions, open hashing-separate chaining, closed hashing - linear probing, quadratic probing, double hashing, random probing, rehashing, extendible hashing.		
Module:7	**Tree and Graph**	**6 hours**
Implementation of tree, binary tree traversals, expression tree, binary search tree, AVL tree, Graphs, Graph traversals, and shortest path algorithms-Dijkstra's algorithm.		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Mark Allen Weiss, "Data structures and algorithm analysis in C", 2nd edition, Pearson education, 2013.
Reference Books	
1.	Debasis Samanta, "Classic data structures", PHI, 2nd edition, 2014.
2.	Seymour Lipschutz "Data Structures by Schaum Series" 2nd edition, TMH 2013.
3.	Adam Drozdek, "Data structures and algorithms in C++", Cengage learning, 4th edition, 2015.
4.	Michael Goodrich, Roberto Tamassta, Michael H.GoldWasser "Data structures and algorithms in Java" 6th edition. 2014.
List of Challenging Experiments (Indicative)	
1.	Students of a Programming class arrive to submit assignments. Their register numbers are stored in a LIFO list in the order in which the assignments are submitted. Write a program using array to display the register number of the ten students who submitted first. Register number of the ten students who submitted first will be at the bottom of the LIFO list. Hence pop out the required number of elements from the top so as to retrieve and display the first 10 students.
2.	To facilitate a thorough net surfing, any web browser has back and forward buttons that allow the user to move backward and forward through a series of web pages. To allow the user to move both forward and backward two stacks are employed. When the user presses the back button, the link to the current web page is stored on a separate stack for the forward button. As the user moves backward through a series of previous pages, the link to each page is moved in turn from the back to the forward stack. When the user presses the forward button, the action is the reverse of the back button. Now the item from the forward stack is popped, and becomes the current web page. The previous web page is pushed on the back stack. Simulate the functioning of these buttons using array implementation of Stack. Also provide options for displaying the contents of both the stacks whenever required.
3.	Design a program to employ a stack for balancing symbols such as parentheses, flower braces and square brackets, in the code snippet given below.

	for(i=0;i<n;i++)
	{
	if(i<5)
	{ z[i]=x[i]+y[i];
	p=(((a+b)*c)+(d/(e+f)*g);
	}
	Ensure that your program works for any arbitrary expression.

4.	Most of the bugs in scientific and engineering applications are due to improper usage of precedence order in arithmetic expressions. Thus it is necessary to use an appropriate notation that would evaluate the expression without taking into account the precedence order and parenthesis. a) Write a program to convert the given arithmetic expression into i) Reverse Polish notation ii) Polish notation b) Evaluate the above notations with necessary input.
5.	Some priests are given three poles and a stack of 4 gold disks, each disk a little smaller than the one beneath it. Their assignment is to transfer all 4 disks from one of the 3 pole to another with 2 important constraints. They can move only one disk at a time, and they can never place a larger disk on top of a smaller one. Design a recursive program for the above Towers of Hanoi puzzle using stack.
6.	In a theme park, the Roller-Coaster ride is started only when a good number of riders line up in the counter (say 20 members). When the ride proceeds with these 20 members, a new set of riders will line up in the counter. This keeps continuing. Implement the above scenario of lining up and processing using arrays with Queue ADT.
7.	When burning a DVD it is essential that the laser beam burning pits onto the surface is constantly fed with data, otherwise the DVD fails. Most leading DVD burn applications make use of a circular buffer to stream data from the hard disk onto the DVD. The first part, the 'writing process' fills up a circular buffer with data, then the 'burning process' begins to read from the buffer as the laser beam burns pits onto the surface of the DVD. If the buffer starts to become empty, the application should continue filling up the emptied space in the buffer with new data from the disk. Implement this scenario using Circular Queue.
8.	a) There is a garage where the access road can accommodate any number of trucks at one time. The garage is built in such a way that only the last truck entered can be moved out. Each of the trucks is identified by a positive integer (a truck_id). Implement dynamically to handle truck moves, allowing for the following commands: i) On_road (truck_id); ii) Enter_garage (truck_ id); iii) Exit_garage (truck_id); iv) Show_trucks (garage or road); If an attempt is made to get a truck out which is not the closest to the garage entry, the error message "Truck x cannot be moved" should be displayed. b) For the aforementioned scenario, assume now a circular road and two entries: one for entry, another for exit. Trucks can get out only in the order they got in. Write a program dynamically to handle truck moves allowing for the following commands i) Enter garage (truck name) ii) Exit garage (truck name) iii) Show trucks

9.	Imagine an effective dynamic structure for storing polynomials. Write operations for addition, subtraction, and multiplication of polynomials. I/O description. Input: p1=3x7+5x6+22.5x5+0.35x2 p2=0.25x3+0.33x2 -0.01
10.	Given two sorted lists L1 and L2 write a program to merge the two lists in sorted order after eliminating duplicates.
11.	Write a program to maintain the records of students in an effective dynamic structure. Search a particular record based on the roll number and display the previous and next values of that node with time complexity of O(1).
12.	Assume FLAMES game that tests for relationship has to be implemented using a dynamic structure. The letters in the FLAMES stand for Friends, Love, Affection, Marriage, Enmity and Sister. Initially store the individual letters of the word 'flames' in the nodes of the dynamic structure. Given the count of the number of uncommon letters in the two names 'n', write a program to delete every nth node in it, till it is left with a single node. If the end of the dynamic structure is reached while counting, resume the counting from the beginning. Display the letter that still remains and the corresponding relationship Eg., If Ajay and Jack are the two names, there are 4 uncommon letters in these. So delete 4th node in the first iteration and for the next iteration start counting from the node following the deleted node.
13.	Assume in the Regional Passport Office, a multitude of applicants arrive each day for passport renewal. A list is maintained in the database to store the renewed passports arranged in the increased order of passport ID. The list already would contain there cords renewed till the previous day. Apply Insertion sort technique to place the current day's records in the list. Later the office personnel wish to sort the records based on the date of renewal so as to know the count of renewals done each day. Taking into consideration the fact that each record has several fields (around 25 fields), follow Selection sort logic to implement the same.
14.	Implement a comparison based sorting algorithm which is not in-place to sort the following strings. best, true, hill, dove, van, good, egg, lap
15.	Write a program to implement Bubble sort, Heap sort and Quick sort techniques to arrange the following sequence of elements in descending order. 9, -4, 5, 8,-3, 7, 0, 4, 1, 2. Display the count of number of comparisons and swaps made in each method. Apply the same sorting techniques for sorting a large data set [Randomly generate 5000 integers within the range -50000 to 50000 to build the data set]. From your observation and analysis, determine the best sorting technique for working with large numbers.

		Total Laboratory Hours	30 hours
Recommended by Board of Studies	0 4-12-2015		
Approved by Academic Council	No. 39	Date	17-12-2015

ITE1005	Software Engineering-Principles and Practices	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	**CSE1001**	**Syllabus version**				
		1.00				

Course Objectives:

1. To understand the concepts of process, product and project development.
2. To elucidate the knowledge of requirement analysis.
3. To provide the knowledge of software design and testing.

Expected Course Outcome:

1. Analyze the software development life cycle.
2. Understand the software requirements engineering concepts.
3. Demonstrate the various software design concepts and understand different designs like architectural, structured, object oriented and user interface.
4. Apply software validation and testing for real time applications.
5. Discuss software maintenance issues and challenges.
6. Perform the software project management techniques and team management.
7. Understand and use different software case tools and provide quality assurance.

Module:1	**Fundamentals of Software Engineering**	**6 hours**

Software Engineering Fundamentals- Software processes: Software life-cycle and process models- Process assessment models- Overview of Project Management activities.

Module:2	**Requirements Engineering**	**7 hours**

Software requirements and specifications- Requirements elicitation- Requirements analysis modeling techniques- Functional and nonfunctional requirements- User requirements, System requirements, requirement validation and software requirement specification document.

Module:3	**Software Design**	**8 hours**

Fundamental design concepts and principles-Design characteristics-System Models-Context, Behavioral, Data and, Object models-Architectural design- System structuring, Control models, Structured design- Object-oriented analysis and design- User interface design

Module:4	**Software Validation**	**6 hours**

Validation planning- Testing fundamentals-Test plan Creation and test case generation- Black-box and white-box testing techniques, Unit testing, Integration, validation, and system testing- Object-oriented testing.

Module:5	**Software Maintenance and Reengineering**	**5 hours**
Software Evolution- Software maintenance, Characteristics of maintainable software- Reengineering		
Module:6	**Software Project management**	**5 hours**
Team management, Role identification and assignment, Project tracking, Team problem resolution; Software measurement and estimation techniques.		
Module:7	**CASE tools**	**5 hours**
Software quality assurance- Software configuration management Overview of SEICMM, ISO 9000, CMMI, PCMM, TQM and Six Sigma-Overview of CASE tools. Software tools and environments.		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Ian Sommerville, Software Engineering, Ninth Edition, Pearson, 2013.
Reference Books	
1.	R. S. Pressman, Software Engineering- A Practitioner's Approach, Eighth Edition, Mc Graw Hill Higher Education, 2014.

Total Laboratory Hours	30 hours

Recommended by Board of Studies	12-08-2017		
Approved by Academic Council	No. 47	Date	05-10-2017

ITE1006	Theory of Computation	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	**MAT1014**	**Syllabus version**				
		1.00				

Course Objectives:

1. To introduce the mathematical foundations of computation
2. To develop mathematical proofs for computation and algorithms.
3. To prepare students in automation theory, formal languages, algorithms & logic

Expected Course Outcome:

1. Demonstrate the knowledge of fundamental concepts related to mathematical preliminaries and automata theory
2. Analyse the deterministic finite machine to accept the languages.
3. Analyse the non-deterministic finite machine to accept the languages.
4. Use and apply important properties of finite automaton to derive regular expressions from finite automation and vice versa
5. Analyse the context free grammar to simplify, remove ambiguity and perform conversion
6. Design push down automata for information technology related applications and to perform conversion between context free grammar and push down automation.
7. Design Turing machine for information technology related applications.

Module:1	**Mathematical preliminaries**	**5 hours**

Sets-Sequences and tuples- functions and relation-graphs-Types of proof-proof by construction, proof by contradiction, proof by induction-Introduction-Strings, Languages, Grammars, Automata.

Module:2	**Deterministic Finite Automata (DFA)**	**5 hours**

Introduction to Finite automata (FA) and examples – Language acceptance and string acceptance by a DFA-Closure properties-Minimization of finite automata-Regular languages- Non regular languages.

Module:3	**Non- Deterministic Finite Automata(NFA)**	**6 hours**

Introduction and examples-Conversion from DFA to NFA Finite Automata with Epsilon transitions- Equivalence of NFA and DFA - FA with output-Moore and mealy machine.

Module:4	**Regular Expression (RE)**	**5 hours**

Recursive definition of regular expression-Regular set-Identities of RE-Equivalence of RE-Identity rules-Inter Conversion RE and FA, Pumping lemma.

Module:5	Context-free Grammar (CFG)	6 hours
Introduction- Definition, Right-linear grammar-left linear grammar-conversion from right linear grammar to left linear grammar-derivation and ambiguity-Simplification of CFG-Normal forms		
Module:6	**Push down automata (PDA)**	**6 hours**
Definition- Construction of pushdown automata- Equivalence of push down automata and context-free grammar.		
Module:7	**Turing machine(TM)**	**10 hours**
Definition-Design of Turing machine-Types of Turing machines - Introduction to Context sensitive grammar and languages-Linear bounded automata. **Undecidabilty:** Recursively enumerable and recursive languages - Undecidable problems - Halting and PCP problem - Halting problem is undecidable - Chomsky hierarchy of languages.		
Module:8	**Contemporary issues**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Michael Sipser, Introduction to the Theory of Computation, Third Edition, Wadsworth Publishing Co Inc, 2012.
Reference Books	
1.	Lewis H.P. & Papadimition C.H., Elements of Theory of Computation, Second Edition, PHI, 2015.
2.	Peter Linz, Introduction to Formal Languages and Automata Theory, PHI, 2011.

Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016

ITE2001	Computer Architecture and Organization	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	**ITE1001**	**Syllabus version**				
		1.00				

Course Objectives:

1. To learn the architecture of computer system.
2. To introduce the various design aspects of computer system
3. To familiarize with the latest technologies of memory, I/O, ALU design, instruction execution

Expected Course Outcome:

1. Learn the fundamentals of architecture in computer systems.
2. Learn, design and implement the various algorithms of computer arithmetic operations.
3. Describe the various data representation techniques in number systems.
4. Comprehend the various architectures and organization of memory systems.
5. Understand the concepts of virtual memory in memory management.
6. Evaluate the latest technologies of memory, I/O, ALU design and instruction execution
7. Comprehend and understand the concepts of device subsystems in memory management.

Module:1	**Fundamentals Of Computer Architecture**	**9 hours**

Organization of the von Neumann machine; Instruction formats; Pipeline - fetch/execute cycle, instruction decoding and execution; Registers and register files; Instruction types and addressing modes; Subroutine call and return mechanisms; Other design issues.

Module:2	**Computer Arithmetic**	**5 hours**

Data Representation, Hardware and software implementation of arithmetic unit for common arithmetic operations: addition, subtraction, multiplication, division(Fixed point and floating point)-floating point IEEE standards

Module:3	**Data Representation**	**5 hours**

Conversion between integer and real numbers- rounding and truncation; The generation of higher order functions from square roots to transcendental functions; Representation of non-numeric data (character codes, graphical data)

Module:4	**Memory System Organization And Architecture**	**4 hours**

Memory systems hierarchy; Coding, data compression, and data integrity; Electronic, magnetic

and optical technologies; Main memory organization, Types of Main memories, and its characteristics and performance; Latency, cycle time, bandwidth, and interleaving; Cache memories (address mapping, line size, replacement and write-back policies)		
Module:5	**Virtual Memory**	**4 hours**
Virtual memory systems-paging, segmentation, address mapping, page tables, page replacement algorithms; Reliability of memory systems; error detecting and error correcting systems		
Module:6	**Interfacing And Communication**	**8 hours**
I/O fundamentals: handshaking, buffering; I/O techniques: programmed I/O, interrupt-driven I/O, DMA; Buses: bus protocols, local and geographic arbitration. Interrupt structures: vectored and prioritized, interrupt overhead, interrupts and reentrant code		
Module:7	**Device Subsystems**	**7 hours**
External storage systems; organization and structure of disk drives and optical memory; Flash memories, Basic I/O controllers such as a keyboard and a mouse;RAID architectures; I/O Performance; SMART technology and fault detection		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	J. L. Hennessy & D.A. Patterson, Computer architecture: A quantitative approach, Fifth Edition, Morgan Kaufman, 2012.
Reference Books	
1.	W. Stallings, Computer organization and architecture, Seventh Edition, Prentice-Hall, 2013
2.	M. M. Mano, Computer System Architecture, Third Edition, Prentice-Hall 2008.
3.	J. P. Hayes, Computer architecture and Organization, Third edition, McGraw Hill, 2012.

Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016

ITE2002	Operating Systems	L	T	P	J	C
		3	0	2	0	4
Pre-requisite	**ITE1004**	**Syllabus version**				
		1.00				

Course Objectives:

1. To impart major operating system components and its design principles.
2. To provide an in-depth exposure to process, memory, device and file management techniques.
3. To impart knowledge on various security challenges related to operating systems.
4. To design applications for PC based operating systems and mobile based operating systems.

Expected Course Outcome:

1. Demonstrate the knowledge on fundamental concepts of operating systems.
2. Analyse and provide solution to process management.
3. Develop solution for process synchronization in multiprocessing system and handle deadlocks
4. Apply methods to support and manage main memory, virtual memory and secondary memory
5. Use and apply file access, file mounting and file allocation concepts.
6. Analyse disk management concepts.
7. Develop applications targeted for windows and mobile operating systems.
8. Develop and implement the various OS concepts in Linux operating system.

Module:1	**Fundamentals**	**5 hours**

Computer-System Organization, Computer-System Architecture, Operating-System Structure, Operating-System Operations, Operating-System Services. User and Operating-System Interface, System Calls, Types of System Calls, System Programs.

Module:2	**Process and Thread Management Basics**	**7 hours**

Process Concept, Process Scheduling, Operations on Processes, Inter-process communication, Multicore Programming, Multithreading Models.
Scheduling:
Basic Concepts, Scheduling Criteria, Scheduling Algorithms.

Module:3	**Mutual Exclusion**	**7 hours**

The Critical-Section Problem, Peterson's Solution, Semaphores, Classic Problems of Synchronization.

Deadlock : Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection.		
Module:4	**Main Memory, virtual and Secondary storage Management**	**7 hours**
Swapping, Contiguous Memory Allocation. Segmentation, Paging, Structure of the Page Table Demand Paging, Page Replacement, Allocation of Frames, Thrashing.		
Module:5	**File Systems**	**7 hours**
File Concept, Access Methods, File-System Mounting, File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods.		
Module:6	**Disk Management**	**4 hours**
Disk Structure, Disk Attachment, Disk Scheduling.		
Module:7	**Windows Operating System**	**6 hours**
History, Design Principles, System Components, Terminal Services and Fast User Switching, File System, Networking, Programmer Interface Mobile operating system –An introduction to Android and its versions, iOS, Windows Phone.		
Module:8	**Contemporary issues**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Silberschatz, P.B. Galvin & G. Gagne, Operating System Concepts, John Wiley, Ninth Edition, 2013.
Reference Books	
1.	William Stallings, Operating Systems – Internals and Design Principles, Seventh Edition, Prentice Hall, 2011.
List of Challenging Experiments (Indicative)	
1.	**Shell programming** a. Identify the command to print the home directory of each user. b. Develop an interactive grep script that asks for a word and a file name and then finds the number of occurrences of that word in the file. c. Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else. d. Write a shell script that determines the period for which a specified user is working on the system. e. Write an interactive file-handling shell program. Let it offer the user the choice of copying, removing, renaming, or linking files. Once the user has made a choice, have the program ask the user for the necessary information, such as the file name, new name and so on.

	f. Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
2.	**Program to illustrate various methods for process and thread handling** a. Assume that you have given a complex program that contains large number of instructions. The program takes more time to execute if it is executed as a single thread of execution. Analyze the role of the system calls given below and restructure the program using it, so that the execution time of the program can be minimized considerably. Fork(), exec(), getpid(), exit(), wait(), close(), stat(), opendir(), readdir(). b. Programs using the I/O system calls of UNIX operating system (open, read, write, etc) c. Program to create processes, child processes and orphan process. d. Program to create a thread to find the factorial of a natural number n. e. The Collatz conjecture concerns what happens when we take any positive integer n and apply the following algorithm: n = n/2, if n is even n = 3 × n + 1, if n is odd The conjecture states that when this algorithm is continually applied, all positive integers will eventually reach 1. For example, if n = 35, the sequence is 35, 106, 53, 160, 80, 40, 20, 10, 5, 16, 8, 4, 2, 1.Write a C program using the fork () system call that generates this sequence in the child process. The starting number will be provided from the command line. For example, if 8 is passed as a parameter on the command line, the child process will output 8, 4, 2, 1. Because the parent and child processes have their own copies of the data, it will be necessary for the child to output the sequence. Have the parent invoke the wait () call to wait for the child process to complete before exiting the program. Perform necessary error checking to ensure that a positive integer is passed on the command line.
3.	a. Assume that two processes named client and server running in the system. It is required that these two processes should communicate with each other using shared memory concept. The server writes alphabets from a..z to the shared memory .the client should read the alphabets from the shared memory and convert it to A…Z. Write a program to demonstrate the above mentioned scenario. b. Design a program using ordinary pipes in which one process sends a string message to a second process, and the second process reverses the case of each character in the message and sends it back to the first process. For example, if the first process sends the message Hi There, the second process will return hI tHERE. This will require using two pipes, one for sending the original message from the first to the second process and the other for sending the modified message from the second to the first process. You can write this program using either UNIX or Windows pipes.
4.	Consider a corporate hospital where we have n number of patients waiting for consultation. The amount of time required to serve a patient may vary, say 10 to 30 minutes. If a patient arrives with an emergency, he /she should be attended immediately before other patients, which may increase the waiting time of other patients. If you are given this problem with the following algorithms how would you devise an effective scheduling so that it optimizes the overall performance such as minimizing the waiting time of all patients. [Single queue or

	multi-level queue can be used]. • Consider the availability of single and multiple doctors • Assign top priority for patients with emergency case, women, children, elders, and youngsters. • Patients coming for review may take less time than others. This can be taken into account while using SJF. a. FCFS b. SJF (primitive and non-pre-emptive)
5.	Apply the following algorithms for the above case and determine the variations in the resulting parameters. a. Priority b. Round robin.
6.	a. Write a program to calculate the below mentioned parameters and write your inference on implementing future knowledge algorithm [which starts scheduling only after fixed amount of time, even if processes have arrived]. Suppose that the following processes arrive for execution at the times indicated. Each process will run for the amount of time listed. [use non pre-emptive scheduling] Process Arrival Time Burst Time P1 0.0 8 P2 0.4 4 P3 1.0 1 b. Calculate the average turnaround time for these processes with the FCFS and SJF scheduling algorithm. c. The SJF algorithm is supposed to improve performance, but notice that we chose to run process P1 at time 0 because we did not know that two shorter processes would arrive soon. Compute what the average turnaround time will be if the CPU is left idle for the first 1 unit and then SJF scheduling is used. Remember that processes P1 and P2 are waiting during this idle time, so their waiting time may increase. [This type of algorithm is called as future knowledge algorithm]. d. Consider a system running ten I/O-bound tasks and one CPU-bound task. Assume that the I/O-bound tasks issue an I/O operation once for every millisecond of CPU computing and that each I/O operation takes 10 milliseconds to complete. Also assume that the context-switching overhead is 0.1 Milli second and that all processes are long-running tasks. Write a program to calculate the CPU utilization for a round-robin scheduler when: • The time quantum is 1 millisecond • The time quantum is 10 milliseconds
7.	Many CPU-scheduling algorithms are parameterized. For example, the RR algorithm requires a parameter to indicate the time slice. Multilevel feedback queues require parameters to define the number of queues, the scheduling algorithm for each queue, the criteria used to move processes between queues, and so on. These algorithms are thus really sets of algorithms (for example, the set of RR algorithms for all time slices, and so on). One set of algorithms may include another (for example, the FCFS algorithm is the RR algorithm with an infinite time quantum). What (if any) relation holds between the following pairs of algorithm sets? Implement the below

	mentioned algorithms for the data given below and determine the efficiency of each algorithm. 1. Priority and SJF 2. Multilevel feedback queues and FCFS 3. Priority and FCFS 4. RR and SJF
8.	a. Write a program to find the Fibonacci series using multi-threaded concept. b. Write a multithreaded program that calculates various statistical values for a list of numbers. This program will be passed a series of numbers on the command line and will then create three separate worker threads. One thread will determine the average of the numbers, the second will determine the maximum value, and the third will determine the minimum value. For example, suppose your program is passed the integers 90 81 78 95 79 72 85 The program will report The average value is 82 The minimum value is 72 The maximum value is 95 The variables representing the average, minimum, and maximum values will be stored globally. The worker threads will set these values, and the parent thread will output the values once the workers have exited.
9.	A pair of processes involved in exchanging a sequence of integers. The number of integers that can be produced and consumed at a time is limited to 100. Write a Program to implement the producer and consumer problem using POSIX semaphore for the above scenario.
10.	a. Write a Program to implement the solution for dining philosopher's problem. b. Servers can be designed to limit the number of open connections. For example, a server may wish to have only N socket connections at any point in time. As soon as N connections are made, the server will not accept another incoming connection until an existing connection is released. Write a program to illustrate how semaphores can be used by a server to limit the number of concurrent connections.
11.	a. Write a Program to implement banker's algorithm for Deadlock avoidance b. Consider the following snapshot of a system: Allocation Max A B C D A B C D P0 3 0 1 4 5 1 1 7 P1 2 2 1 0 3 2 1 1 P2 3 1 2 1 3 3 2 1 P3 0 5 1 0 4 6 1 2 P4 4 2 1 2 6 3 2 5 Using the banker's algorithm, determine whether or not each of the following states is unsafe. If the state is safe, illustrate the order in which the processes may complete. Otherwise, illustrate why the state is unsafe. a. Available = (0, 3, 0, 1) b. Available = (1, 0, 0, 2)
12.	Consider a memory hole of size 1kb initially. When a sequence of memory request arrives as

	following, illustrate the memory allocation by various approaches and calculate the total amount memory wasted by external fragmentation and internal fragmentation in each approach. a. First fit; b. Best fit c. Worst fit
13.	Write a program to implement the page replacement algorithms. a. FIFO b. LRU c. OPT
14.	Write a program that implements the FIFO, LRU, and optimal pager replacement algorithms. First, generate a random page-reference string where page numbers range from 0 to 9. Apply the random page-reference string to each algorithm, and record the number of page faults incurred by each algorithm. Implement the replacement algorithms so that the number of page frames can vary from 1 to 7. Assume that demand paging is used.
15.	Consider a file of size 1 MB. The size of a disk block is 512Bytes. Assume any number of available free blocks in the disk contiguously or non-contiguously. Implement the following algorithms to perform file allocation. Determine the efficiency of each file allocation strategies. a. Sequential b. Indexed c. Linked

		Total Laboratory Hours	30 hours
Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016

ITE3001	Data Communication and Computer Networks	L	T	P	J	C
		3	0	2	0	4
Pre-requisite	**ITE1004**	**Syllabus version**				
		1.00				

Course Objectives:

1. To learn the principles of computer networks through the Internet protocol stack and the OSI model
2. To introduce the basics of data communication and the functions of layered structure.
3. To understand the concepts of Error Control and Flow Control Protocols, various Routing and Congestion Control Algorithms, Network Management and Performance Analysis.

Expected Course Outcome:

1. Demonstrate the knowledge of fundamental elements and concepts related to data communication and Networks
2. Analyse the physical layer transmission medium concepts to meet the challenges in implementing Computer Networks.
3. Identify and Analyse the Data link layer error and flow control issues in Computer Networks
4. Examine the applications of Medium Access control Protocol in LAN standards and its switching methods in Networks.
5. Provide solutions such as reliability, scalability and robustness of routing algorithm and congestion control in Networks.
6. Analyze, design and implement the Internetworks by using IP addresses and routing protocol.
7. Examine the services and Analyze the protocols of Transport and Application Layers.
8. Demonstrate, Design and Analyze the various network topologies and protocols using network tools.

Module:1	**Introduction**	**5 hours**

Uses of Computer Networks – Network Hardware – Network Software – Reference Models – Network Standardization.

Module:2	**Physical layer**	**5 hours**

Basis for Data Communication - Guided Transmission Media – Wireless Transmission – Digital Modulation and Multiplexing – PSTN.

Module:3	**Datalink layer**	**7 hours**

Design Issues – Error Detection and Correction –Protocols – ARQ - Sliding Window Protocols.

Module:4	**Mac Sub Layer**	**6 hours**
Channel Allocation Problems – MAC – Ethernet – Datalink Layer Switching.		
Module:5	**Network layer**	**8 hours**
Design Issues – Routing Algorithms – Congestion Control Algorithms.		
Module:6	**Internetworking**	**5 hours**
IPv4- IP address – IPv6 - OSPF-BGP.		
Module:7	**Transport layer**	**7 hours**
Transport Services – Elements – Congestion Control – QoS - UDP – TCP - Application Layer – DNS – Email – WWW – HTTP.		
Module:8	**Contemporary issues**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Andrew S Tanenbaum and David J. Wetherall, Computer Networks, Fifth Edition, Pearson Publisher, 2010.
Reference Books	
1.	Behrouz A Forouzan, Data communication and Networking, McGraw-Hill, Fifth Edition, New York, 2012.
List of Challenging Experiments (Indicative)	
1.	There are 20PC's in your network. Five PC's are connected to one Ethernet hub, and five PC's are connected to another hub. Each hub is connected to separate switch and both the switches are connected to a separate router. The routers are connected via an Ethernet bridge. The remaining 10 PC's are connected directly to one of the two switches. How many Ethernet segments are there? Implement this scenario using cisco packet tracer.
2.	Two PC's are located in adjacent rooms and a third PC is in a building 300 yards away. Explain how you could connect the three PC's in a single network. Implement this scenario using cisco packet tracer.
3.	In CRC error correction scheme, choose pattern 1101 and data 100100. Write a code to encode the given data.
4.	There is trouble ticket raised by users of an organization that their files are not getting uploaded in ftp server. Measure the performance between the ftp server and client and diagnose using iperf tool.
5.	A company needs is granted the site address 201.70.64.0. The company needs six subnets. Design the subnets using cisco packet tracer.
6.	In an IPv4 packet the value of header length is 1000 in binary. Write a code to find, how many bytes of options are being carried by this packet?
7.	Write a code to implement border gateway protocol (BGP).
8.	Implement a TCP/IP socket based ATM System. Make the server to maintain the customer details (name, card no, pin and balance). When a client wants to withdraw amount, validate

	his login with card no & pin, display a welcome message and perform the withdraw operation if he is having sufficient balance or display a warning message.
9.	Write a UDP based server code to get the date of birth of the client and calculate the age as on today. Client has to enter year, month and day of birth. For example, if the date of birth of a user is 1/07/2001 then his age is 14 years 0 months and 17 days if today's date is 18/07/2015. Get today's date from the server.
10.	A reputed organization has two branches in Vellore. In one of the branch office a new manager has been appointed. The Senior Manager from the main office has to send the important records to the branch office. Implement a client server model to accomplish this.
11.	The finance office of VIT wishes to make the transactions more secured. If you are a programmer how you will implement a system to validate the login credentials obtained from the user thereby denying the access to unauthorized users.
12.	Establish a wired network running many applications level services and measure the performance of same. Establish a wireless network running many applications level services and measure the performance of same. Compare the performance of above two scenarios and list out the challenges.

		Total Laboratory Hours	30 hours
Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016

ITE4001	Network and Information Security	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**ITE3001**	**Syllabus version**				
		1.00				

Course Objectives:

1. To learn principles of cryptography, network and information security
2. To acquire knowledge on algorithms to provide confidentiality, integrity and authenticity.
3. To understand how to deploy encryption techniques to secure data in transit across networks.

Expected Course Outcome:

1. Understand the fundamentals of security.
2. Have a theoretical understanding of the principles underlying cryptography and have a technical understanding of the main cryptographic concepts and technologies.
3. Provide data integrity using hashing algorithms.
4. Sign and verify messages using well known signature generation and verification algorithms.
5. Analyze user authentication techniques and provide identity management.
6. Analyze the cause for classical network attacks and describe the working of advanced security controls.
7. Analyze the IP and wireless security.
8. Apply cryptography and network security technology in practical applications.

Module:1	**Fundamentals of Security**	**8 hours**

Definitions & challenges of security, OSI security architecture, attacks & services. Cryptography & cryptanalysis. Classical encryption techniques, substitution techniques, transposition techniques. Block ciphers, DES, AES structure, multiple encryption-triple DES.

Module:2	**Public Key Crypto Systems, Key Management & Distribution**	**8 hours**

Number theory fundamentals, principles of pubic key crypto systems, RSA algorithm, Strength of RSA, Diffie-Hellman key exchange, Elliptic curve cryptography. Symmetric key distribution using symmetric and asymmetric encryptions, distribution of public keys, X.509 Certificates, PKI.

Module:3	**Hash Functions**	**5 hours3**

Cryptographic hash functions, applications, security requirements, hash function based on block

chaining, SHA-512		
Module:4	**MAC Codes & Digital Signatures**	**4 hours**
MAC, security requirements, HMAC, CMAC, key wrapping, Digital signatures.		
Module:5	**User Authentication**	**5 hours**
Remote user authentication, symmetric and asymmetric encryptions for user authentications, Kerberos, identity management & verification.		
Module:6	**Transport Level Security & E-mail Security**	**6 hours**
Web security, Secure Socket Layer (SSL), Transport Layer Security (TLS), Secure Shell (SSH), HTTPS, E-mail security, PGP, S/MIME.		
Module:7	**IP & Wireless Security**	**6 hours**
IP Security, Policy, encapsulating security payload, combining security association, internet key exchange. Wireless security, IEEE 802.11 overview & its security.		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	William Stallings, Cryptography & Network Security- Principles and Practices, Sixth Edition, Pearson Publishers, 2014.
Reference Books	
1.	Christof Paar & Jan Pelzl, Understanding cryptography, Heidelberg [u.a.] Springer 2014.
2.	Bragg et al., Network security – The complete reference, Tata Mc Graw Hill, 2012.

Recommended by Board of Studies	12-08-2017		
Approved by Academic Council	No. 47	Date	05-10-2017

MAT1014	Discrete Mathematics and Graph Theory	L	T	P	J	C
		3	2	0	0	4
Pre-requisite	None	Syllabus Version				
		1.0				

Course Objectives (CoB):

1. To address the challenge of the relevance of lattice theory, coding theory and algebraic structures to computer science and engineering problems.
2. To use number theory, in particular congruence theory to cryptography and computer science problems.
3. To understand the concepts of graph theory and related algorithm concepts.

Course Outcome (CO):

At the end of this course, students are expected to

1. Form truth tables, proving results by truth tables, finding normal forms,
2. Learn proof techniques and concepts of inference theory
3. Understand the concepts of groups and application of group codes, use Boolean algebra forminimizing Boolean expressions.
4. Learn basic concepts of graph theory, shortest path algorithms, concepts of trees andminimum spanning tree and graph colouring, chromatic number of a graph.
5. Solve Science and Engineering problems using Graph theory.

Module:1	Mathematical Logic and Statement Calculus	6 hours

Introduction-Statements and Notation-Connectives–Tautologies–Two State Devices and Statement logic -Equivalence - Implications–Normal forms - The Theory of Inference for the Statement Calculus.

Module:2	Predicate Calculus	4 hours

The Predicate Calculus - Inference Theory of the Predicate Calculus.

Module:3	Algebraic Structures	5 hours

Semigroups and Monoids - Groups – Subgroups – Lagrange's Theorem Homomorphism – Properties-Group Codes.

Module:4	Lattices	5 hours

Partially Ordered Relations -Lattices as Posets – Hasse Digram – Properties of Lattices.

Module:5	Boolean algebra	5 hours

Boolean algebra - Boolean Functions-Representation and Minimization of Boolean Functions – Karnaugh map – McCluskey algorithm.

Module:6	Fundamentals of Graphs	6 hours

Basic Concepts of Graph Theory – Planar and Complete graph - Matrix representation of Graphs

– Graph Isomorphism – Connectivity–Cut sets-Euler and Hamilton Paths–Shortest Path algorithms.		
Module:7	**Trees, Fundamental circuits , Cut sets, Graph colouring, covering, Partitioning**	**12 hours**
Trees – properties of trees – distance and centres in tree –Spanning trees – Spanning tree algorithms- Tree traversals- Fundamental circuits and cut-sets. Bipartite graphs - Chromatic number – Chromatic partitioning – Chromatic polynomial - matching – Covering– Four Colour problem.		
Module:8	**Contemporary Issues**	**2 hours**
Industry Expert Lecture		
	Total Lecture hours:	**45 hours**
Tutorial	• A minimum of 10 problems to be worked out by students in every Tutorial class. • Another 5 problems per Tutorial Class to be given as home work. **Mode:** Individual Exercises, Team Exercises, Online Quizzes, Online, Discussion Forums	**30 hours**

Text Book(s)

1. Discrete Mathematical Structures with Applications to Computer Science, J .P. Trembley and R. Manohar, Tata McGraw Hill-35th reprint, 2017.
2. Graph theory with application to Engineering and Computer Science, Narasing Deo, Prentice Hall India 2016.

Reference Books

1. Discrete Mathematics and its applications, Kenneth H. Rosen, 8th Edition, Tata McGraw Hill, 2019.
2. Discrete Mathematical Structures, Kolman, R.C.Busby and S.C.Ross, 6th Edition, PHI, 2018.
3. Discrete Mathematics, Richard Johnsonbaugh, 8th Edition, Prentice Hall, 2017.
4. Discrete Mathematics, S. Lipschutz and M. Lipson, McGraw Hill Education (India) 2017.
5. Elements of Discrete Mathematics–A Computer Oriented Approach, C.L.Liu, Tata McGraw Hill, Special Indian Edition, 2017.
6. Introduction to Graph Theory, D. B. West, 3rd Edition, Prentice-Hall, Englewood Cliffs, NJ, 2015.

Mode of Evaluation

Digital Assignments, Quiz, Continuous Assessments, Final Assessment Test

Recommended by Board of Studies	03-06-2019		
Approved by Academic Council	No.55	Date	13-06-2019

MAT2002	Applications of Differential and Difference Equations	L	T	P	J	C
		3	0	2	0	4

Pre-requisite	MAT1011 - Calculus for Engineers	Syllabus Version
		1.0

Course Objectives (CoB):

The course is aimed at

1. Presenting the elementary notions of Fourier series, which is vital in practical harmonic analysis
2. Imparting the knowledge of eigenvalues and eigen vectors of matrices and the transform techniques to solve linear systems, that arise in sciences and engineering
3. Enriching the skills in solving initial and boundary value problems
4. Impart the knowledge and application of difference equations and the Z-transform in discrete systems, that are inherent in natural and physical processes

Course Outcome (CO):

At the end of the course the student should be able to

1. Employ the tools of Fourier series to find harmonics of periodic functions from the tabulated values
2. Apply the concepts of eigenvalues, eigen vectors and diagonalisation in linear systems
3. Know the techniques of solving differential equations
4. understand the series solution of differential equations and finding eigen values, eigen functions of Strum-Liouville's problem
5. Know the Z-transform and its application in population dynamics and digital signal processing
6. demonstrate MATLAB programming for engineering problems

Module:1	Fourier series	6 hours

Fourier series - Euler's formulae - Dirichlet's conditions - Change of interval - Half range series – RMS value – Parseval's identity – Computation of harmonics

Module:2	Matrices	6 hours

Eigenvalues and Eigen vectors - Properties of eigenvalues and eigen vectors – Cayley-Hamilton theorem - Similarity of transformation - Orthogonal transformation and nature of quadratic form

Module:3	Solution of ordinary differential equations	6 hours

Linear second order ordinary differential equation with constant coefficients – Solutions of homogenous and non-homogenous equations - Method of undetermined coefficients – method of variation of parameters – Solutions of Cauchy-Euler and Cauchy-Legendre differential equations

Module:4	Solution of differential equations through Laplace transform and matrix method	8 hours

Solution of ODE's - Nonhomogeneous terms involving Heaviside function, Impulse function - Solving nonhomogeneous system using Laplace transform – Reduction of *n*th order differential equation to first order system - Solving nonhomogeneous system of first order differential equations and

Module:5	Strum Liouville's problems and power series Solutions	6 hours

The Strum-Liouville's Problem - Orthogonality of Eigen functions - Series solutions of differential equations about ordinary and regular singular points - Legendre differential equation - Bessel's differential equation		
Module:6	**Z-Transform**	**6 hours**
Z-transform -transforms of standard functions - Inverse Z-transform: by partial fractions and convolution method		
Module:7	**Difference equations**	**5 hours**
Difference equation - First and second order difference equations with constant coefficients - Fibonacci sequence - Solution of difference equations - Complementary function - Particular integral by the method of undetermined coefficients - Solution of simple difference equations using Z-transform		
Module:8	**Contemporary Issues**	**2 hours**
	Total Lecture hours: **45 hours**	

Text Book(s)

1.	Advanced Engineering Mathematics, Erwin Kreyszig, 10th Edition, John Wiley India, 2015

Reference Books

1.	Higher Engineering Mathematics, B. S. Grewal, 43rd Edition, Khanna Publishers, India, 2015
2.	Advanced Engineering Mathematics by Michael D. Greenberg, 2nd Edition, Pearson Education, Indian edition, 2006

Mode of Evaluation

Digital Assignments (Solutions by using soft skills), Continuous Assessment Tests, Quiz, Final Assessment Test

1.	Solving Homogeneous differential equations arising in engineering problems	2 hours
2.	Solving non-homogeneous differential equations and Cauchy, Legendre equations	2 hours
3.	Applying the technique of Laplace transform to solve differential equations	2 hours
4.	Applications of Second order differential equations to Mass spring system (damped, undamped, Forced oscillations), LCR circuits etc.	2 hours
5.	Visualizing Eigen value and Eigen vectors	2 hours
6.	Solving system of differential equations arising in engineering applications	2 hours
7.	Applying the Power series method to solve differential equations arising in engineering applications	2 hours
8.	Applying the Frobenius method to solve differential equations arising in engineering applications	2 hours
9.	Visualising Bessel and Legendre polynomials	2 hours
10.	Evaluating Fourier series-Harmonic series	2 hours
11.	Applying Z-Transforms to functions encountered in engineering	2 hours
12.	Solving Difference equations arising in engineering applications	2 hours

		Total Laboratory Hours	**24 hours**
Mode of Evaluation: Weekly Assessment, Final Assessment Test			
Recommended by Board of Studies	03-06-2019		
Approved by Academic Council	No. 55	Date	13-06-2019

MAT3004	Applied Linear Algebra	L	T	P	J	C
		3	2	0	0	4

Pre-requisite	MAT2002 Applications of Differential and Difference Equations	Syllabus Version
		1.0

Course Objectives

1. understanding basic concepts of linear algebra to illustrate its power and utility through applications to computer science and Engineering.
2. apply the concepts of vector spaces, linear transformations, matrices and inner product spaces in engineering.
3. solve problems in cryptography, computer graphics and wavelet transforms

Expected Course Outcome

At the end of this course the students are expected to learn

1. the abstract concepts of matrices and system of linear equations using decomposition methods
2. the basic notion of vector spaces and subspaces
3. apply the concept of vector spaces using linear transforms which is used in computer graphics and inner product spaces
4. applications of inner product spaces in cryptography
5. Use of wavelet in image processing.

Module:1	System of Linear Equations	6 hours

Gaussian elimination and Gauss Jordan methods - Elementary matrices- permutation matrix - inverse matrices - System of linear equations - - LU factorizations.

Module:2	Vector Spaces	6 hours

The Euclidean space and vector space- subspace –linear combination-span-linearly dependent-independent- bases - dimensions-finite dimensional vector space.

Module:3	Subspace Properties	6 hours

Row and column spaces -Rank and nullity – Bases for subspace – invertibility- Application in interpolation. R^n

Module:4	Linear Transformations and applications	7 hours

Linear transformations – Basic properties-invertible linear transformation - matrices of linear transformations - vector space of linear transformations – change of bases – similarity

Module:5	Inner Product Spaces	6 hours

Dot products and inner products – the lengths and angles of vectors – matrix representations of

inner products- Gram-Schmidt orthogonalisation		
Module:6	**Applications of Inner Product Spaces**	**6 hours**
QR factorization- Projection - orthogonal projections – relations of fundamental subspaces – Least Square solutions in Computer Codes		
Module:7	**Applications of Linear equations**	**6 hours**
An Introduction to coding - Classical Cryptosystems –Plain Text, Cipher Text, Encryption, Decryption and Introduction to Wavelets (only approx. of Wavelet from Raw data)		
Module:8	**Contemporary Issues**	**2 hours**
	Total Lecture hours:	**45 hours**
Tutorial	• A minimum of 10 problems to be worked out by students in every Tutorial Class • Another 5 problems per Tutorial Class to be given as home work.	**30 hours**

Text Book(s)

1. Linear Algebra, Jin Ho Kwak and Sungpyo Hong, Second edition Springer(2004). (Topics in the Chapters 1,3,4 &5)
2. Introductory Linear Algebra- An applied first course, Bernard Kolman and David, R. Hill, 9th Edition Pearson Education, 2011.

Reference Books

1. Elementary Linear Algebra, Stephen Andrilli and David Hecker, 5th Edition, Academic Press(2016)
2. Applied Abstract Algebra, Rudolf Lidl, Guter Pilz, 2nd Edition, Springer 2004.
3. Contemporary linear algebra, Howard Anton, Robert C Busby, Wiley 2003
4. Introduction to Linear Algebra, Gilbert Strang, 5th Edition, Cengage Learning (2015).

Mode of Evaluation

Digital Assignments, Continuous Assessments, Final Assessment Test

Recommended by Board of Studies	25-02-2017		
Approved by Academic Council	No. 47	Date	05-10-2017

Course Code	Information Security Analysis and Audit	L	T	P	J	C
CSE3501	Job Role: SSC/Q0901	2	0	2	4	4
Pre-requisite	NIL		Syllabus version			
			1.0			

Objective of the course

1. To introduce system security related incidents and insight on potential defenses, counter measures against common threat/vulnerabilities.
2. To provide the knowledge of installation, configuration and troubleshooting of information security devices.
3. To make students familiarize on the tools and common processes in information security audits and analysis of compromised systems.

Expected Outcome

After successfully completing the course the student should be able to

1. Contribute to managing information security
2. Co-ordinate responses to information security incidents
3. Contribute to information security audits
4. Support teams to prepare for and undergo information security audits
5. Maintain a healthy, safe and secure working environment
6. Provide data/information in standard formats
7. Develop knowledge, skills and competence in information security

1	**Information Security Fundamentals**	7 hours

Definitions & challenges of security, Attacks & services, Security policies, Security Controls, Access control structures, Cryptography, Deception, Ethical Hacking, Firewalls, Identify and Access Management (IdAM).

2	**System Security**	6 hours

System Vulnerabilities, Network Security Systems, System Security, System Security Tools, Web Security, Application Security, Intrusion Detection Systems,

3	**Information Security Management**	3 hours

Monitor systems and apply controls, security assessment using automated tools, backups of security devices, Performance Analysis, Root cause analysis and Resolution, Information Security Policies, Procedures, Standards and Guidelines

4	**Incident Management**	5 hours

Security requirements, Risk Management, Risk Assessment, Security incident management, third party security management, Incident Components, Roles.

5	**Incident Response**	4 hours

Incident Response Lifecycle, Record, classify and prioritize information security incidents using standard templates and tools, Responses to information security incidents, Vulnerability Assessment, Incident Analysis

6	**Conducting Security Audits**	3 hours

Common issues in audit tasks and how to deal with these, Different systems and structures that may need information security audits and how they operate, including: servers and storage devices, infrastructure and networks , application hosting and content management, communication routes such as messaging, Features, configuration and specifications of information security systems and devices and associated processes and architecture, Common audit techniques, Record and report audit tasks, Methods and techniques for testing compliance.

7	**Information Security Audit Preparation**	2 hours

Establish the nature and scope of information security audits, Roles and responsibilities, Identify the procedures/guidelines/checklists, Identify the requirements of information security, audits and prepare for audits in advance, Liaise with appropriate people to gather data/information required for information security audits.

8	**Self and Work Management**	2 hours

Establish and agree work requirements with appropriate people, Keep the immediate work area clean and tidy, utilize time effectively, Use resources correctly and efficiently, Treat confidential information

correctly, Work in line with organization's policies and procedures, Work within the limits of their job role.		
	Total Lecture hours:	**30 hours**
Text Book(s)		
1.	William Stallings, Lawrie Brown, Computer Security: Principles and Practice, 3rd edition, 2014.	
2.	Nina Godbole, Information Systems Security: Security Management, Metrics, Frameworks and Best Practices, Wiley, 2017	
3.	Nina Godbole, Sunit Belapure, Cyber Security- Understanding cyber-crimes, computer forensics and legal perspectives, Wiley Publications, 2016	
4.	Andrew Vladimirov Michajlowski, Konstantin, Andrew A. Vladimirov, Konstantin V. Gavrilenko, Assessing Information Security: Strategies, Tactics, Logic and Framework, IT Governance Ltd, O'Reilly, 2010	
Reference Books		
1.	Charles P. Pfleeger, Security in Computing, 4th Edition, Pearson, 2009.	
2.	Christopher J. Alberts, Audrey J. Dorofee , Managing Information Security Risks, Addison-Wesley Professional, 2004	
3.	Peter Zor, The Art of Computer Virus Research and Defense, Pearson Education Ltd, 2005	
4.	Lee Allen, Kevin Cardwell, Advanced Penetration Testing for Highly-Secured Environments - Second Edition, PACKT Publishers, 2016	
5.	Chuck Easttom , System Forensics Investigation and Response, Second Edition, Jones & Bartlett Learning, 2014	
6.	David Kennedy, Jim O'Gorman, Devon Kearns, and Mati Aharoni, Metasploit The Penetration	
7	Tester's Guide, No Starch Press, 2014	
8.	Practical Malware Analysis by Michael Sikorski and Andrew Honig, No Starch Press, 2015	
9.	Ref Links: https://www.iso.org/isoiec-27001-information-security.html https://csrc.nist.gov/publications/detail/sp/800-55/rev-1/final https://www.sans.org/reading-room/whitepapers/threats/paper/34180 https://www.sscnasscom.com/qualification-pack/SSC/Q0901/	
List of Experiments (Indicative)		
	• Install and configure information security devices • Security assessment of information security systems using automated tools. • Vulnerability Identification and Prioritization • Working with Exploits • Password Cracking • Web Application Security Configuration • Patch Management • Bypassing Antivirus Software • Static Malware Analysis • Dynamic Malware Analysis • Penetration Testing • MySQL SQL Injection • Risk Assessment • Information security incident Management • Exhibit Security Analyst Role	
Total Laboratory Hours		**30 hours**

Recommended by Board of Studies	05.02.2020		
Approved by Academic Council	58	Date	26.02.2020

Course Code	Information Security Management	L	T	P	J	C
CSE3502	Job Role: SSC/Q0901	2	0	2	4	4
Pre-requisite	NIL	Syllabus version				
		1.0				

Objective of the course

4. To introduce system security related incidents and insight on potential defenses, counter measures against common threat/vulnerabilities.
5. To provide the knowledge of installation, configuration and troubleshooting of information security devices.
6. To make students familiarize on the tools and common processes in information security audits and analysis of compromised systems.

Expected Outcome

After successfully completing the course the student should be able to

8. Contribute to managing information security
9. Co-ordinate responses to information security incidents
10. Contribute to information security audits
11. Support teams to prepare for and undergo information security audits
12. Maintain a healthy, safe and secure working environment
13. Provide data/information in standard formats
14. Develop knowledge, skills and competence in information security

1	**Information Security Devices**	5 hours

Identify And Access Management (IdAM), Networks (Wired And Wireless) Devices, Endpoints/Edge Devices, Storage Devices, Servers, Infrastructure Devices (e.g. Routers, Firewall Services) , Computer Assets, Servers And Storage Networks, Content management, IDS/IPS

2	**Security Device Management**	6 hours

Different types of information security devices and their functions,
Technical and configuration specifications, architecture concepts and design patterns and how these contribute to the security of design and devices.

3	**Device Configuration**	5 hours

Common issues in installing or configuring information security devices, Methods to resolve these issues, Methods of testing installed/configured information security devices,

4	**Information Security Audit Preparation**	5 hours

Establish the nature and scope of information security audits, Roles and responsibilities, Identify the procedures/guidelines/checklists, Identify the requirements of information security, audits and prepare for audits in advance, Liaise with appropriate people to gather data/information required for information security audits. **Security Audit Review -**
Organize data/information required for information security audits using standard templates and tools, Audit tasks, Reviews, Comply with the organization's policies, standards, procedures, guidelines and checklists, Disaster Recovery Plan

5	**Team Work and Communication**	2 hours

Communicate with colleagues clearly, concisely and accurately , Work with colleagues to integrate their work effectively, Pass on essential information to colleagues in line with organizational requirements, Identify any problems they have working with colleagues and take the initiative to solve these problems, Follow the organization's policies and procedures for working with colleagues

6	**Managing Health and Safety**	2 hours

Comply with organization's current health, safety and security policies and procedures, Report any identified breaches in health, safety, and Security policies and procedures, Identify, report and correct any hazards, Organization's emergency procedures, Identify and recommend opportunities for improving health, safety, and security.

7	**Data and Information Management**	3 hours

Fetching the data/information from reliable sources, Checking that the data/information is accurate,

complete and up-to-date, Rule-based analysis of the data/information, Insert the data/information into the agreed formats, Reporting unresolved anomalies in the data/information.		
8	**Learning and Self Development**	2 hours
Identify accurately the knowledge and skills needed, Current level of knowledge, skills and competence and any learning and development needs, Plan of learning and development activities to address learning needs, Feedback from appropriate people, Review of knowledge, skills and competence regularly and appropriate action taken		
	Total Lecture hours:	**30 hours**

Text Book(s)

1. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices, Nina Godbole, Wiley, 2017
2. Rhodes-Ousley, Mark. Information Security: The Complete Reference, Second Edition, . Information Security Management: Concepts and Practice. New York, McGraw-Hill, 2013.
3. Christopher J. Alberts, Audrey J. Dorofee , Managing Information Security Risks, Addison-Wesley Professional, 2004

Reference Books

1. Andrew Vladimirov Michajlowski, Konstantin, Andrew A. Vladimirov, Konstantin V. Gavrilenko, Assessing Information Security: Strategies, Tactics, Logic and Framework, IT Governance Ltd, O'Reilly 2010
2. Christopher J. Alberts, Audrey J. Dorofee , Managing Information Security Risks, Addison-Wesley Professional, 2004
3. Chuck Easttom , System Forensics Investigation and Response, Second Edition, Jones & Bartlett Learning, 2014
4. David Kennedy, Jim O'Gorman, Devon Kearns, and Mati Aharoni, Metasploit The Penetration
5. Tester's Guide, No Starch Press, 2014

Ref Links:
https://www.iso.org/isoiec-27001-information-security.html
https://www.sans.org/reading-room/whitepapers/threats/paper/34180
https://csrc.nist.gov/publications/detail/sp/800-40/version-20/archive/2005-11-16
https://www.sscnasscom.com/qualification-pack/SSC/Q0901/

List of Experiments (Indicative)

1.
- Install and configure information security devices
- Penetration Testing
- MySQL SQL Injection
- Information security incident Management
- Intrusion Detection/Prevention
- Port Redirection and Tunneling
- Exploring the Metasploit Framework
- Working with Commercial Tools like HP Web Inspect and IBM AppScan etc.,
- Explore Open Source tools like sqlmap, Nessus, Nmap etc
- Documentation with Security Templates from ITIL
- Carry out backups of security devices and applications in line with information security policies, procedures and guidelines
- Information security audit Tasks - Procedures/guidelines/checklists for the audit tasks

Total Laboratory Hours **30 hours**

Recommended by Board of Studies	05.02.2020		
Approved by Academic Council	58	Date	26.02.2020

ITE1007	Object Oriented Analysis and Design	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**CSE1002**	**Syllabus version**				
		1.00				

Course Objectives:

1. To learn the basic principles of object orientation and notation
2. To familiarize Unified Modeling Language
3. To understand the Analysis and Design workflow

Expected Course Outcome:

1. Understand and analyse the fundamentals of Object oriented design elements.
2. Comprehend the limitations of object oriented analysis and design.
3. Implement different techniques available for object modeling techniques based on the limits and features.
4. Analyzie the objects and elements required for efficient design.
5. Provide design solutions to various case studies by applying modelling techniques.
6. Analyze and design unified modeling diagrams for various case studies.
7. Map Unified Modelling Language to the analysis and design components.

Module:1	**Introduction**	**6 hours**

Structure of Complex Systems, Decomposing Complexity - Elements of Analysis and Design, Object Modeling - Unified Process - Phases of Unified Process.

Module:2	**Object Oriented Paradigm**	**6 hours**

Benefits and Risks of Object Oriented Development, Macro and Micro Process Development, Object Interoperability- Designing Interface Objects.

Module:3	**Methodology and Modeling**	**6 hours**

Object Oriented Methodologies-Rumbaugh et al.'s object modeling technique-The Booch Methodology-The Jacobson et al. Methodologies, Discussion on few Examples of OOAD Application Scenarios-Choosing a case study for OOAD.

Module:4	**Object Oriented Analysis**	**6 hours**

Elements of Analysis – Requirements Workflow – Analysis Workflow

Module:5	**Object Oriented Design**	**6 hours**

Elements of Design – O-O Design Workflow – Mapping of Elements onto Phases of Unified

Process – UML Diagrams for Design – Iterations – Case Study.		
Module:6	**Design using UML Diagrams –Phase I**	**6 hours**
Introduction to UML as an Analysis and Design Tool, Class Diagrams, State Transition Diagrams, Object Diagrams, Interaction Diagrams, Use case Diagrams, Activity Diagrams, Collaboration Diagrams and Module Diagrams.		
Module:7	**Design using UML Diagrams –Phase II**	**6 hours**
Component Diagram, Deployment Diagrams – Mapping of Diagrams to Analysis and Design Components.		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Grady Booch, Robert A. Maksimchuk , Michael W. Engle, Bobbi J. Young, Jim Conallen, Kelli A. Houston, Object Oriented Analysis and Design with Application, 3rd edition, Addison Wesley, 2012.
Reference Books	
1.	Ali Bahrami, Object Oriented System Development, Tata McGraw-Hill, 2012.
2.	Grady Booch, Ivar Jacobson, James Rumbaugh, The Unified Modelling Language User Guide, Second Edition, Pearson, 2012.

Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016

ITE1008	Open Source Programming	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**CSE1001**	**Syllabus version**				
		1.00				

Course Objectives:

1. To understand the free and open source technologies
2. To develop web pages using PHP and Perl.
3. To learn various tools for developing web pages.

Expected Course Outcome:

1. Differentiate between open source software and free software
2. Build applications software using Open Source Software
3. Demonstrate the knowledge of fundamental concepts related to open source technologies.
4. Demonstrate the knowledge of fundamental concepts using open source databases.
5. Provide solutions to reliability, security, scalability and robustness in Internet.
6. Design and develop a web crawler to traverse a local repository of webpages.
7. Design of web domains.
8. Develop applications targeted for Internet considering the recent exploration such as real time web applications.

Module:1	**OSS Fundamentals**	**4 hours**

FOSS- Open Source Philosophy -OSD – Licensing - Open Source vs Closed Source– Open Source vs Free Software – Copyright Vs. Copyleft.

Module:2	**Open Source Technologies**	**4 hours**

Open Source Servers – browsers – packages.

Module:3	**Basic PHP**	**7 hours**

Installation & Setting Path -Overview - Basics - GUI Programming - Arrays - Functions - Files- Exception Handling.

Module:4	**Open Source Data Base**	**6 hours**

Introduction to MYSQL -Data types - Queries-Interfaces with PHP

Module:5	**Advanced PHP**	**6 hours**

OOPs – File Uploading - Regular Expressions - Sending Mail – Cookies – Session Handling

Module:6	**Perl**	**8 hours**

Introduction – Statements – Arrays – Strings – File Handling.		
Module:7	**Tools for OSS**	**7 hours**
Moodle: Installation – Themes – Course & Activity – File Uploading. Ecllipse - IDE PHP: Creating Project – Adding files to Repository – Parsing functionality – Executing the project. Introduction to R-Programming		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)			
1. Micheal K. Glass, Rommnle Scouarnec, Beginning PHP, Apache, MYSQL Web Development, Wiley Dream Tech publishing Inc. New Delhi 2010.			
Reference Books			
1. William Rice, Moodle E-learning Course Development, Packt Publishing, Third Edition 2015.			
2. Larry Wall, Tom Christiansen & Randal L. Schwartz, Programming Perl, Fourth Edition, O'Reilly, 2012.			
3. Gosselin, Diana Kokoska, Robert Easter Brooks, PHP Programming with MySQL, Second Edition, Course Technology, 2010.			
Recommended by Board of Studies		05-03-2016	
Approved by Academic Council	No. 40	Date	18-03-2016

ITE1010	Digital Image Processing	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**MAT3004**	**Syllabus version**				
		1.00				

Course Objectives:

1. To introduce the principles of image processing.
2. To gain expertise in advanced image processing and analysis systems.
3. To emphasize the areas such as restoration, enhancement, segmentation and their applications.

Expected Course Outcome:

1. Analyze general terminology of digital image processing.
2. Examine the core image enhancement techniques using Spatial and frequency domain.
3. Understand the core image enhancement techniques using various domains.
4. Identify and apply the knowledge by analysing various image compression techniques for effective solutions.
5. Design and create practical solutions to a range of common image processing problems and assess the results of their solutions.
6. Conduct the study and analysis of image segmentation and representation techniques.
7. Learn polygonal approximation, image representation and descriptors
8. Design and develop domain specific application using various digital image processing techniques.

Module:1	**Digital Image Processing Fundamentals**	**6 hours**

Introduction, Digital Image Fundamentals, Image acquisition and display using digital devices - Human visual perception, properties –Image Sampling and Quantization-Basic Relationship between Pixels – Color models.

Module:2	**Image Enhancement in the Spatial Domain**	**6 hours**

Introduction- Basic grey level transformation, Histogram Processing, Enhancement using arithmetic/Logic operations – Spatial filtering: smoothing and sharpening.

Module:3	**Image enhancement in the frequency domain**	**6 hours**

Introduction to two-dimensional transforms-Discrete Fourier Transform, Discrete Cosine Transform, Discrete Wavelet Transform-smoothing frequency domain filtering-sharpening frequency domain filtering.

Module:4	**Image Restoration and Reconstruction**	**6 hours**

Noise Models – Restoration in the presence of Noise only- spatial filtering, periodic noise

reduction by frequency domain filtering.		
Module:5	**Image Compression**	**7 hours**
Lossless Image Compression- The Concept of entropy and Huffman coding; Run-length coding for grey images, Lossy Image Compression – Predictive coding, transform coding – JPEG compression standard, Wavelet-based image compression JPEG2000.		
Module:6	**Image Segmentation**	**6 hours**
Detection of discontinuities- Object Detection Methods, Edge Linking and Boundary Detection, Thresholding Methods, Region Oriented Methods.		
Module:7	**Representation and Description**	**6 hours**
Chain codes, Polygonal approximation, Signature Boundary Segments, Skeletons. Descriptors: Boundary Descriptors, Regional Descriptors, Relational Descriptors.		
Module:8	**Contemporary issues**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	R. C. Gonzalez, R. E. Woods, Digital Image Processing, Pearson Education, Third Edition, 2013.
Reference Books	
1.	S. Jayaraman, S. Esakkirazan, T.Veerakumar, Digital Image Processing, First Edition, Tata Mc Graw Hill, 2011
2.	A. K. Jain, Fundamentals of Digital Image Processing, Pearson Education (Asia) Pvt. Ltd. / Prentice Hall of India, 2015.
3	John C. Russ, The Image Processing Hand Book, Seventh Edition, CRC Press, 2017
4	B. Chanda and D. Dutta Majumdar, Digital Image Processing and Analysis, PHI, 2011

		Total Laboratory Hours	30 hours
Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016

ITE1011	Computer Graphics	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**MAT 3003**	**Syllabus version**				
		1.00				

Course Objectives:

1. To provide a comprehensive introduction to computer graphics.
2. To understand basic terminology, progress, issues, and trends in Computer Graphics.
3. To study the various applications of computer graphics.

Expected Course Outcome:

1. Understand computer graphics and interactive computer graphics architecture.
2. Analyze different algorithms for the construction of graphic models.
3. Understand the technical aspects of computer graphics and various transformations.
4. Enhance the perspective of modern computer system using modeling, analysis and interpretation of 2D and 3D visual information.
5. Develop skills with respect to various clipping algorithms in computer graphics
6. Design and implement advanced algorithms for curves and modeling with illumination models and shading techniques.
7. Understand and implement the various visible surface and shading algorithms.
8. Apply and implement the various algorithms on computer graphics for the real-time application.

Module:1	**Introduction**	**5 hours**

Basic Elements of computer graphics and its Applications, Graphics Rendering Pipeline, Input/output Devices, Raster graphics system, vector graphics system.

Module:2	**Graphics primitives generation algorithms**	**7 hours**

Line drawing algorithms, Circle drawing algorithms, Ellipse drawing algorithms and filling algorithms. Attributes of Output Primitives. Colour models.

Module:3	**Two dimensional and Three dimensional transformations**	**5 hours**

Translation, rotation, scaling, reflection and shearing, Homogenous Coordinates, Composition of Transformations.

Module:4	**Two dimensional viewing**	**6 hours**

2D viewing pipeline, Window to viewport transformation. Three dimensional viewing transformations: 3D viewing pipeline, Projection, Types of projection, Transformation matrix for parallel and perspective projection.

Module:5	**2D Clipping algorithms**	**7 hours**
Point clipping, line clipping and polygon clipping algorithms. 3D clipping algorithms: point and line clipping algorithms.		
Module:6	**Curves and Modelling**	**6 hours**
Parametric Curves: Cubic Splines, Bezier Curves and B-Splines. Solid modelling: Representing solids regularised Boolean set operations, primitive instancing. Object representation techniques: Sweep, Boundary, spatial-partitioning, constructive solid geometry and its comparison.		
Module:7	**Visible surface determination, Illumination and shading**	**6 hours**
Visible line determination algorithms: Area-subdivision, BSP tree, octrees and Ray Tracing. Illumination Models: Diffuse, Specular and Ambient Reflection. Polygon Shading: Flat Shading, Gouraud Shading and Phong Shading.		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)

1.	James D.Foley, Andries Van Dam, Steven K.Feiner and F.Hughes John, Computer Graphics principles and Practice in C , Second edition, Pearson Publication, 2012.

Reference Books

1.	Hearn, Donald D. and Baker, M. Pauline, Computer Graphics using C, Third edition, Prentice Hall Professional Technical Reference, 2010
2.	Steve Marschner and Peter Shirley, Fundamentals of Computer Graphics, CRC Press, 2015.
3	Hearn, Donald D. and Baker, M. Pauline, Computer Graphics using OpenGL, Fourth edition, Prentice Hall Professional Technical Reference, 2011.

Total Laboratory Hours	30 hours

Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016

ITE1014	Human Computer Interaction	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**EEE1001**	**Syllabus version**				
		1.00				

Course Objectives:

1. To study the level of computer interaction of Human with computers.
2. To understand the techniques and technologies available for the requirement gathering of interactive machines.
3. To evaluate the tools and techniques for interactive system.

Expected Course Outcome:

1. Comprehend the concepts of Human Computer Interaction(HCI) for computer utlizalition.
2. Understand the various input and output techniques for Human Computer Interaction.
3. Understand the various input and output techniques for Human Computer Interaction.
4. Explore the various tools for effective design and development of Human Computer Interaction systems.
5. Learn and understand the various testing strategies for Human Computer Interaction.
6. Explore the domain specific applications to gain knowledge to build Human Computer Interaction systems.
7. Understand and analyse the concepts of emerging phenomena in HCI.
8. Design and develop an application which will address the contemporary issues.

Module:1	**Humans in HCI:**	**6 hours**

Perceptual-Motor Interaction: Some Implications for Human–Computer Interaction, Human Information Processing: An Overview for Human–Computer Interaction, Mental Models in Human–Computer Interaction, Task Loading and Stress in Human–Computer Interaction, Choices and Decisions of Computer Users.

Module:2	**Computers in HCI:**	**6 hours**

Input Technologies and Techniques, Sensor- and Recognition-Based Input for Interaction, Visual Displays, Haptic Interface, Non-speech Auditory and Cross modal Output, Network-Based Interaction, Wearable Computers, Design of Fixed, Portable, and Mobile Information Devices

Module:3	**Requirements Specification:**	**7 hours**

User Experience Requirements Analysis within the Usability Engineering Lifecycle, Task Analysis, Contextual Design, Grounded Theory Method in Human–Computer Interaction and Computer-Supported Cooperative Work, An Ethnographic Approach to Design

Module:4	**Design and Development:**	**7 hours**
Putting Personas to Work, Prototyping Tools and Techniques, Scenario-Based Design, Participatory Design		
Module:5	**Testing, Evaluation, and Technology Transfer:**	**6 hours**
Usability Testing, Usability for Engaged Users, Survey Design and Implementation in HCI, Inspection-Based Evaluations, Model-Based Evaluation		
Module:6	**Application-/Domain-Specific Design:**	**5 hours**
Human–Computer Interaction in Health Care, Motor Vehicle–Driver Interfaces, Human–Computer Interaction in Aerospace, Human–Computer Interaction for Kids		
Module:7	**Emerging Phenomena in HCI:**	**6 hours**
Augmenting Cognition in HCI, Social Networks and Social Media, Changing Human–Computer Interaction to Change the World, Ubiquitous Computing.		
Module:8	**Industry Expert Lecture**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)

1.	Dr. Julie A Jacko, Human Computer Interaction Handbook: Fundamentals, Evolving Technologies, and Emerging Applications, Third Edition, CRC Press, Taylor and Francis Group, 2012.

Reference Books

1.	Sharp, Rogers, Preece, Interaction Design-Beyond Human Computer Interaction, Fourth Edition, Wiley, 2015.
2.	Don Norman, The Design of Everyday Things, Revised and Expanded Edition, Basic Books, Perseus Books Group, 2013.

Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016

ITE1015	Soft Computing	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**MAT2001**	**Syllabus version**				
		1.00				

Course Objectives:

1. To introduce the fundamental concepts behind soft computing techniques.
2. To explain the various architectures and algorithms of neural networks.
3. To explore the fuzzy sets, fuzzy logic, rough sets and genetic algorithms.

Expected Course Outcome:

1. Identify the essential components of soft computing.
2. Describe and recognize the various types of memory models associated with neural networks.
3. Demonstrate various unsupervised learning techniques.
4. Examine the fundamentals of fuzzy sets and operations associated with them .
5. Establish fuzzy rules for decision making in real-time scenarios.
6. Investigate the idea behind rough sets.
7. Investigate the idea behind searching strategies.
8. Determine and construct a soft computing system required to address a computational task.

Module:1	**Neural networks**	**7 hours**

Introduction to Soft computing, basics. Neural networks, introduction, evolution, basic models, terminologies of ANN, Pitts model, Perceptron, Adaline, Back-propagation network, RBF network.

Module:2	**Memory Models**	**5 hours**

Pattern association, auto & hetero associative memory models, BAM, Hopfiled network.

Module:3	**Unsupervised Networks**	**6 hours**

Self-organizing maps, LVQ network, ART network.

Module:4	**Fuzzy sets**	**6 hours**

Introduction, fuzzy sets, operations, fuzzy relations, membership functions, fuzzification & defuzzification.

Module:5	**Fuzzy logic and approximate reasoning**	**7 hours**

Fuzzy truth values, fuzzy propositions, fuzzy rules, formation, decomposition and aggregation of

rules, fuzzy reasoning, FIS, Fuzzy Decision Making.		
Module:6	**Rough Sets**	**5 hours**
Information & decision systems, indiscernability, set approximations, properties of rough sets, rough memberships, reducts, and approximations.		
Module:7	**Search Strategies**	**6 hours**
Genetic algorithms, hybrid systems.		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Sivanandam, Deepa, Principles of Soft Computing, Second Edition, Wiley India, 2011.
Reference Books	
1.	Samir Roy and Udit Chakraborty, Introduction to Soft Computing, Pearson Education, 2013.
2.	T.J. Ross, Fuzzy logic with Engineering Applications, Third Edition, Wiley India, 2010.
3.	Laurene Fausett, Fundamentals of Neural networks: architectures, algorithms and applications, Pearson India, 2008.

Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016

ITE1016	Mobile Application Development	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**CSE1001**	**Syllabus version**				
		1.00				

Course Objectives:

1. To expose the technology and business trends in mobile applications.
2. To understand the mobile design principles
3. To gain the working knowledge of Apple's Xcode app development tool.

Expected Course Outcome:

1. Understand different mobile application models/architectures and patterns.
2. Evaluate and contrast the requirements for mobile platforms.
3. Describe the components and structure of a mobile development framework.
4. Apply mobile development framework for the development of mobile applications.
5. Create apps for Android and iOS platform devices.
6. Interpret a scenario to plan, design and develop a prototype as a native mobile application.
7. Understand, design and implement the data storage of iPhone for various applications.
8. Develop the various mobile applications for the operating systems of Android and iPhone.

Module:1	**Introduction to Mobile Application**	**6 hours**

A brief history of mobile-Mobile ecosystem, Designing for context, Developing a Mobile Strategy, Mobile Information Architecture, Mobile Design, Types of mobile application.

Module:2	**Technologies**	**6 hours**

Introduction-HTML5, CSS3, Javascript, JQuery.

Module:3	**Introduction to Android programming**	**5 hours**

Android toolkit, Java for android, components of an Android Application.

Module:4	**Android software development**	**7 hours**

Eclipse Concepts and Terminology, Eclipse Views and Perspectives, Eclipse and Android, Effective java for Android

Module:5	**Android Framework**	**6 hours**

Building a View, Fragments and Multiplatform Support, Drawing, Handling and Persisting Data.

Module:6	**Introduction to iOS**	**6 hours**
Basic iPhone Styling, Advanced iPhone Styling, Animation		
Module:7	**Iphone data storage**	**6 hours**
local Storage and session Storage, Client-Side Database PhoneGap tool.		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	App Programming Guide for iOS-Apple developer - 2014 Apple Inc
Reference Books	
1.	Jonathan Stark, Building iPhone Apps with HTML, CSS and JavaScript, O'Reilly Media, 2011.
2.	Paul Deitel, Harvey Deitel, Android for programmers an app-driven approach Deiteldeveloper series, Abbey Deitel,Michael Morgano-2012 Pearson Education, Inc.
3.	Laird Dornin, G. Blake Meike, and Masumi Nakamura, Programming Android by Zigurd Mednieks, O'Reilly Media, 2011.

Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016

ITE1017	Transformation Techniques	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	**MAT2002**	**Syllabus version**				
		1.00				

Course Objectives:

1. To introduce the various mathematical transform techniques that can be used in diverse areas of engineering domains.
2. To apply the orthogonal and non-orthogonal techniques for image processing applications
3. To learn various statistical based and directional transformation techniques

Expected Course Outcome:

1. Analyze the use of 2D Z -Transform techniques.
2. Understand how integral transforms can be used to solve a variety of differential equations
3. Formulate important results and theorems of various sinusoidal orthogonal transforms
4. Formulate important results and theorems of various non-sinusoidal orthogonal transforms.
5. Demonstrate statistical based and directional transforms for automotive applications.
6. Use directional transforms as a techniques for solving real-time problems
7. Apply wavelet and other advanced transforms to video processing applications (surveillance)

Module:1	**2D signals and Systems**	**6 hours**

Separable Sequence - Periodic sequence - Classification of 2D Systems - 2D Convolution - 2D Z-Transform - Properties - 2D Inverse Z transform - 2D Digital Filter

Module:2	**Convolution and Correlation**	**7 hours**

2D Convolution through Graphical Method - Convolution through Z-Transform - 2D Convolution through Matrix Analysis - Circular Convolution – Applications

Module:3	**Sinusoidal, Orthogonal transforms**	**7 hours**

Orthogonal sinusoidal basis function - Fourier transform - Fast FFT - Properties - Discrete Cosine transform - Discrete sine transform – Applications

Module:4	**Non-sinusoidal Orthogonal Transforms**	**6 hours**

Non-sinusoidal orthogonal basis function - Haar Tansform - Walsh transform - Hadamard Transform - Slant Transform – Applications

Module:5	**Statistics based transforms**	**4 hours**

KL transform - Singular value decomposition – Applications		
Module:6	**Directional Transforms**	**6 hours**
Hough transform - Radon transform - Ridgelet transform - Contourlet transform – Applications		
Module:7	**Wavelet Transform**	**6 hours**
Continuous Wavelet Transform - Multi-resolution Analysis - Image Compression - Image Coding - SPIHT - JPEG2000 - Wavelet based denoising - Watermarking - Applications.		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)			
1.	Rafael C. Gonzalez, Digital Image Processing, Pearson Education, New Delhi, 2013		
Reference Books			
1. S. Sridhar, Digital Image Processing, Oxford University Press, Sixth impression, New Delhi, 2014			
Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016

ITE2003	Principles and Practices of Communication System	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**ITE1001**	**Syllabus version**				
		1.00				

Course Objectives:

1. To understand the various devices used in Analog Communication
2. To comprehend the impact of interference in signaling devices
3. To learn the various issues in communication systems

Expected Course Outcome:

1. Demonstrate the knowledge of fundamental elements and concepts related to Communication System.
2. Design and construct devices used in Communication Systems
3. Address the challenges imposed on different types of Communication Systems.
4. Use and apply important methods in communication systems to support both analog and digital communication.
5. Provide solutions to digital communication by using different modulation techniques.
6. Develop applications by using digital transmission systems.
7. Understand the concepts of digital transmission techniques

Module:1	**Amplitude Modulation Systems**	**6 hours**

Review of Spectral Characteristics of Periodic and Non-periodic signals; Generation and Demodulation of AM, DSBSC, SSB and VSB Signals; Comparison of Amplitude Modulation Systems

Module:2	**Angle Modulation Systems**	**6 hours**

Frequency Translation; Non – Linear Distortion; Phase and Frequency Modulation; Single tone, Narrow Band and Wideband FM; Transmission Bandwidth; Generation and Demodulation of FM Signal, FDM and OFDM

Module:3	**Fundamentals of Noise Theory**	**5 hours**

Review of Probability, Random Variables and Random Process; Gaussian Process Shot noise, Thermal noise and white noise; Narrow band noise, Noise margin; Noise temperature; Noise Figure

Module:4	**Performance of Continuous Wave Modulation Systems**	**5 hours**

Super heterodyne Radio receiver and its characteristic; SNR; Noise in DSBSC systems using coherent detection; Noise in AM system using envelop detection Envelop Detection for FM; FM threshold effect; Pre-emphasis and De-emphasis in FM; Comparison of performances.		
Module:5	**Digital Communication**	**7 hours**
Introduction, Shannon limit for information capacity, digital amplitude modulation, frequency shift keying, FSK bit rate and baud, FSK transmitter, BW consideration of FSK, FSK receiver, phase shift keying –binary phase shift keying QPSK, Quadrature Amplitude modulation, bandwidth efficiency, carrier recovery types- squaring loop, Costas loop, DPSK.		
Module:6	**Digital Transmission**	**6 hours**
Introduction, Pulse modulation, PCM sampling, sampling rate, signal to quantization noise rate, companding analog and digital percentage error, delta modulation, adaptive delta modulation, differential pulse code modulation, pulse transmission types-Intersymbol interference, eye patterns.		
Module:7	**Satellite and Optical Communication**	**8 hours**
Satellite Communication Systems Keplers Law, LEO and GEO Orbits, footprint, Link model-Optical Communication Systems-Elements of Optical Fiber Transmission link, Types, Losses, Sources and Detectors.		
Module:8	**Contemporary issues**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)

1.	Analog and Digital Communications, Sudakshina Kundu, Pearson Education 2010.

Reference Books

1.	Herbert Taub & Donald L Schilling, Principles of Communication Systems, Third Edition, Tata McGraw Hill, 2013.
2.	Wayne Tomasi, Advanced Electronic Communication Systems, Sixth edition, Pearson Education, 2011
3.	Bruce Carlson, Communication Systems, Third Edition, McGraw Hill.
4.	B.P.Lathi, Modern Digital and Analog Communication Systems, Third Edition, Oxford, 2011.

Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016

ITE2004	Software Testing	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**ITE1005**	**Syllabus version**				
		1.00				

Course Objectives:

1. To familiarize the testing concepts and evolution
2. To learn the testing strategies and their usage
3. To understand the features and guidelines of testing

Expected Course Outcome:

1. Demonstrate the knowledge of fundamentals of software testing.
2. Test adequacy assessment using: control flow, data flow, and program mutations.
3. Apply a wide variety of testing techniques in an effective and efficient manner.
4. Communicate clearly and effectively use the technical language of the field correctly.
5. Evaluate the limitations of a given testing process and provide a summary of those limitations.
6. Check and confirm the quality standards.
7. Prepare software quality plan for a software project - focussing on change management, configuration management, defect elimination, validation and verification and measurement.
8. Have basic understanding and knowledge of contemporary issues in software testing, such as component-based software testing problems.

Module:1	**Introduction**	**6 hours**

Basic definitions-software testing principles- Role of tester- testing as a process- Overview of Testing maturity model- Defects -Hypothesis and tests

Module:2	**Black box testing strategies**	**6 hours**

Black-Box Testing Techniques- Random testing- Equivalent partitioning-Boundary Value Analysis (BVA)- Equivalence Class Testing - State Transition Testing - Cause-Effect Graphing Based Testing - Error Guessing -Black box TMM Maturity goals

Module:3	**White box testing strategies**	**6 hours**

White-Box Testing Techniques- Test adequacy Criteria – coverage and control flow graphs- Basis Path Testing - - Loop Testing - Data Flow Testing - Mutation Testing Evaluating adequacy – white box and TMM levels

Module:4	**Levels of testing- Phase-I**	**6 hours**

Unit testing – Need- Functions- Plan –Design-Considerations – Test Harness, Integration testing-

Goals-Strategies-Design- Plan-System testing		
Module:5	**Levels of testing- Phase– II**	**6 hours**
Function test- Performance test-Stress test-Configuration test- Security test – Recovery test, Regression testing-Alpha - beta - Acceptance test- Special role of Use cases- levels of testing and TMM.		
Module:6	**Testing policies and organization**	**6 hours**
Test planning- Components- Attachments-Locating test items- Test reports- Role of three critical groups-Building a test group- Structure- Technical training- Career paths- Certification- Integrating Testing Activities.		
Module:7	**Software quality**	**6 hours**
Quality concepts- Cost estimation- Quality control- Role of operational Profiles and Usage models-statistical testing -Software Reliability –Measurements- applying reliability models- Confidence level-Usability Testing-Software quality control and critical views		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Ilene Burnstein, Practical Software Testing, Springer Verlag International Edition, Springer (India) Pvt Ltd, 2012.
Reference Books	
1.	Naresh Chauhan, Software Testing Principles and Practices, Oxford University Press, 2013.

Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016

ITE2005	Advanced Java Programming	L	T	P	J	C
		3	0	2	0	4
Pre-requisite	**ITE1002**	**Syllabus version**				
		1.00				

Course Objectives:

1. To apply the core Java fundamentals to learn the advanced concepts in J2SE
2. To design and develop web application development and database connectivity using Servlets, JSP and JDBC
3. To apply the advanced Java frameworks for improving the web application design

Expected Course Outcome:

1. Provide a basic understanding of core Java concepts.
2. Comprehend Java's support in parallel programming, GUI creation and network programming.
3. Design and develop server side programming using Servlets.
4. Develop web applications using JSP.
5. Understand and implement MVC architecture with Struts framework.
6. Use JSF framework to build better user interfaces.
7. Integrate Hibernate framework with applications for Object Relational Mapping.
8. Design and develop advanced enterprise web applications and rich internet applications

Module:1	**Introduction to Java Programming:**	**6 hours**

Features of Java, Data Types, Variables, Operators, Arrays, Control Statements. Introducing Classes and Objects, Methods, Inheritance, Packages and Interfaces, Exception Handling, Inner classes, String Handling

Module:2	**Exploring Core Java**	**6 hours**

Multithreaded Programming, Files and IO Streams, Object Serialization ,Applets , Java GUI Programming and Event Handling, Java Networking, RMI, Reflection, Collections, Generics, Java Auto boxing and Annotations

Module:3	**Introducing JavaEE**	**6 hours**

Enterprise Java, Basic Application Structure, Using Web Containers, Creating Servlets, Configuring Servlets, Understanding HTTP methods, Using Parameters and Accepting Form Submissions, Using Init parameters, File Uploading, JDBC

Module:4	**Java Server Pages**	**6 hours**

Creating JSPs, Using Java within JSP, Combining Servlets and JSPs, Maintaining State using Sessions, JSP 2.0 EL, Using Javabeans components in JSP Documents, JSP Custom Tag Library, Integrating Servlets and JSP: Model View Controller Architecture

Module:5	**Struts Framework**	**6 hours**

Introduction to Struts – Building a Simple Struts Application – Understanding Model, View and Controller Layer- Overview of Tiles

Module:6	**Java Server Faces(JSF)**	**7 hours**

Introduction to Java Server Faces (JSF)- JSF Application Architecture – Building a simple JSF Application - JSF Request Processing Lifecycle – The Facelets View Declaration Language – User Interface Component Model- JSF Event Model

Module:7	**Spring Framework and Hibernate**	**6 hours**

Understanding Inversion of Control (IoC), Aspect Oriented Programming (AOP) and Dependency Injection, MVC pattern for Web Applications, Spring Framework, Understanding Application Context, Bootstrapping Spring framework, Configuring Spring framework, Data Persistence, Object/relational Mapping, Hibernate ORM, Mapping Entities to Tables

Module:8	**Contemporary issues**	**2 hours**

	Total Lecture hours:	**45 hours**

Text Book(s)

1. Herbert Schildt, The Complete Reference-Java, Tata Mcgraw-Hill Edition, Eighth Edition, 2014.

Reference Books

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

List of Challenging Experiments (Indicative)

1. Write a program to read the First name and Last name of a person, his weight and height using command line arguments. Calculate the BMI Index which is defined as the individual's body mass divided by the square of their height.

Category	BMI Range-Kg/m^2
Underweight	<18.5
Normal (healthy weight)	18.5 to 25
Overweight	25 to 30
Obese Class	Over 30

   Display the name and display his category based on the BMI value thus calculated.

2. If there are 4 batches in B.Tech (IT) learning 'ITE101' course, read the count of the slow learners (who have scored <25) in each batch. Tutors should be assigned in the ratio of 1:4

	(For every 4 slow learners, there should be one tutor). Determine the number of tutors for each batch. Create a 2-D jagged array with 4 rows to store the count of slow learners in the 4 batches. The number of columns in each row should be equal to the number of groups formed for that particular batch (Eg., If there are 23 slow learners in a batch, then there should be 6 tutors and in the jagged array, the corresponding row should store 4, 4, 4, 4, 4,3). Use for-each loop to traverse the array and print the details. Also print the number of batches in which all tutors have exactly 4 students.
3.	Write a program to read a chemical equation and find out the count of the reactants and the products. Also display the count of the number of molecules of each reactant and product. Eg., For the equation, 2NaOH + H2SO4 -> Na2SO4+ 2H2O, the O/P should be as follows. Reactants are 2 moles of NaOH, 1 mole of H2SO4. Products are 1 mole of Na2SO4 and 2 moles of H2O.
4.	(Bioinformatics: finding genes) Biologists use a sequence of letters A, C, T, and G to model a genome. A gene is a substring of a genome that starts after a triplet ATG and ends before a triplet TAG, TAA, or TGA. Furthermore, the length of a gene string is a multiple of 3 and the gene does not contain any of the triplets ATG, TAG, TAA, and TGA. Write a program that prompts the user to enter a genome and displays all genes in the genome. If no gene is found in the input sequence, displays no gene. Here are the sample runs: Enter a genome string: TTATGTTTTAAGGATGGGGCGTTAGTT O/P: TTT GGGCGT
5.	Create a class Film with string objects which stores name, language and lead_actor and category (action/drama/fiction/comedy). Also include an integer data member that stores the duration of the film. Include parameterized constructor, default constructor and accessory functions to film class. Flim objects can be initialized either using a constructor or accessor functions. Create a class Film Main that includes a main function. In the main function create a vector object that stores the information about the film as objects. use the suitable methods of vector class to iterate the vector object to display the following a. The English film(s) that has Arnold as its lead actor and that runs for shortest duration. b. The Tamil film(s) with Rajini as lead actor. c. All the comedy movies.
6.	Define an abstract class 'Themepark' and inherit 2 classes 'Queensland' and 'Veegaland' from the abstract class. In both the theme parks, the entrance fee for adults is Rs.500 and for children it is Rs.300. If a family buys 'n' adult tickets and 'm' children tickets, define a method in the abstract class to calculate the total cost. Also, declare an abstract method playGame() which must be redefined in the subclasses. In Queensland, there are a total of 30 games. Hence create a Boolean array named 'Games' of size 30 which initially stores false values for all the elements. If the player enters any game code that has already been played, a warning message should be displayed and the user should be asked for another choice. In Veegaland, there are a total of 40 different games. Thus create an integer array with 40 elements. Here, the games can be replayed, until the user wants to quit. Finally display the total count of games that were repeated and count of the games which were not played at all.

7.	Read the Register Number and Mobile Number of a student. If the Register Number does not contain exactly 9 characters or if the Mobile Number does not contain exactly 10 characters, throw an Illegal Argument Exception. If the Mobile Number contains any character other than a digit, raise a Number Format Exception. If the Register Number contains any character other than digits and alphabets, throw a No Such Element Exception. If they are valid, print the message 'valid' else 'invalid'
8.	Within the package named 'primes package', define a class Primes which includes a method checkForPrime() for checking if the given number is prime or not. Define another class named Twin Primes outside of this package which will display all the pairs of prime numbers whose difference is 2. (Eg, within the range 1 to 10, all possible twin prime numbers are (3,5), (5,7)). The TwinPrimes class should make use of the checkForPrime() method in the Primes class.
9.	Define a class 'Donor' to store the below mentioned details of a blood donor. - Name, age, Address, Contact number, bloodgroup, date of last donation. Create 'n' objects of this class for all the regular donors at Vellore. Write these objects to a file. Read these objects from the file and display only those donors' details whose blood group is 'A+ve' and had not donated for the recent six months.
10.	Three students A, B and C of B.Tech-IT II year contest for the PR election. With the total strength of 240 students in II year, simulate the vote casting by generating 240 random numbers (1 for student A, 2 for B and 3 for C) and store them in an array. Create four threads to equally share the task of counting the number of votes cast for all the three candidates. Use synchronized method or synchronized block to update the three count variables. The main thread should receive the final vote count for all three contestants and hence decide the PR based on the values received.
11.	Draw a ball, filled with default color. Move the ball from top to bottom of the window continuously with its color changed for every one second. The new color of the ball for the next second should be obtained by adding 20 to the current value of Red component, for the second time by adding 20 to the blue component, and for the third time by adding 20 to the blue component, till all reach the final limit 225, after which the process should be repeated with the default color.
12.	Develop a UDP based client-server application to notify the client about the integrity of data sent from its side. Check sum calculation: 1. Add the 16-bit values up. Each time a carry-out (17th bit) is produced, swing that bit around and add it back into the LSb (one's digit). 2. Once all the values are added in this manner, invert all the bits in the result. For example, separate the data into groups of 4 bits only for readability. 1000 0110 0101 1110 1010 1100 0110 0000 0111 0001 0010 1010 First, add the 16-bit values 2 at a time: 1000 0110 0101 1110 First 16-bit value + 1010 1100 0110 0000 Second 16-bit value ---------- 1 0011 0010 1011 1110 Produced a carry-out, which gets added + \----------> 1 back into LBb

	---------- 0011 0010 1011 1111 + 0111 0001 0010 1010 Third 16-bit value ---------- 0 1010 0011 1110 1001 No carry to swing around (**) ---------- 0010 0101 1001 1111 Our "one's complement sum" Then take the one's complement of the sum which is 1101 1010 0110 0000 The "one's complement" So the checksum stored in the header should be 1101 1010 0110 0000.
13.	Develop an RMI application to invoke a remote method that takes two numbers and returns true if one number is an exact multiple of the other and false otherwise. Eg., 5 and 25 -> true 26 and 13 -> true 4 and 18 -> false
14.	a) Assume two cookies are created whenever a VIT student visits the VIT webpage-one for his/her name and the other for his campus. For subsequent visits, he/she should be greeted with the message similar to the one below "Hi Ajay from Chennai Campus!!". Write a servlet program to do the needful. b) Build an application using JSF framework to implement a Celsius to Fahrenheit converter. Note: Fahrenheit=(Celsius*9/5)+32
15.	Using Hibernate framework, simulate the course registration process for Advanced Java Programming. Let the registration number and name of the students who register for the course, be stored in a database. The tool should allow deletion of the registered course for a particular student, if he/she wishes. At any instant, the list of students who have registered for the course should be displayed, if requested for.

Total Laboratory Hours	30 hours

Recommended by Board of Studies	12-08-2017		
Approved by Academic Council	No. 47	Date	05-10-2017

ITE2006	Data Mining Techniques	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**ITE1003**	**Syllabus version**				
		1.00				

Course Objectives:

1. To understand the fundamental data mining methodologies and the ability to formulate and solve problems.
2. To comprehend the overall architecture of a data warehouse, methods for data gathering and data pre-processing
3. To learn practical, efficient and statistically sound techniques, capable of solving real world issues

Expected Course Outcome:

1. Demonstrate the knowledge of fundamental elements and concepts related to data mining and its applications.
2. Analyse and understand the various data pre-processing techniques and improve the quality of data and efficiency.
3. Understand the concept of knowledge representation and visualization techniques.
4. Use and apply important methods for finding frequent item sets and association rule mining.
5. Understand the concept of data classification methods.
6. Understand the advanced classification techniques.
7. Understand the unsupervised learning techniques and the algorithm used for data clustering.
8. Design and develop a domain specific application which will address the contemporary issues.

Module:1	**Introduction**	**6 hours**

Data Mining – Stages of the Data Mining Process – Data Mining Knowledge Representation - Technologies – Major Issues in Data Mining- Data Warehousing- Multidimensional data – OLAP Vs OLTP

Module:2	**Data Preprocessing**	**6 hours**

Data cleaning - Data reduction - Data Integration - Data Transformation – Feature Selection – Dimensionality Reduction- Discretization and generating concept hierarchies

Module:3	**Data mining knowledge representation**	**6 hours**

Task relevant data -Interestingness measures - Representing input data and output knowledge -

Visualization techniques		
Module:4	**Mining Frequent Patterns, Associations and Correlations**	**6 hours**
Market Basket Analysis – Frequent Item Set Mining methods- Apriori algorithm –Generating Association Rules- A Pattern Growth Approach – Association Analysis to Correlation Analysis		
Module:5	**Data Mining Algorithms : Classification**	**6 hours**
Basic concepts – Bayesian Classification Methods -Decision Tree Induction – Rule based Classification -Experiments with Weka.		
Module:6	**Advanced Classification Methods**	**6 hours**
Bayesian Belief Networks- Classification by Back propagation- Lazy Learners- Genetic Algorithm – Rough Set Approach.		
Module:7	**Clustering**	**6 hours**
Basic issues in clustering - Partitioning methods- K-means, K-Medoids - Hierarchical methods: distance-based agglomerative and divisible clustering- Density Based Methods		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	J. Han and M. Kamber, Data Mining: Concepts and Techniques, Third Edition, Morgan Kaufman, 2013.
Reference Books	
1.	Charu C. Aggarwal, Data Mining: The Textbook, Springer, 2015.
2.	Zaki and Meira, Data Mining and Analysis Fundamental Concepts and Algorithms, 2014
3.	G. K. Gupta, Introduction to Data Mining with Case Studies, Easter Economy Edition, Prentice Hall of India, 2014.

Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016

ITE2009	Storage Technologies	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**ITE1003**	**Syllabus version**				
		1.00				

Course Objectives:

1. To provide better understanding of guidelines, principles, and architecture used in storage technology
2. To provide an insight into the technologies in storage management
3. To impart the knowledge in designing secure storage system

Expected Course Outcome:

1. Comprehend the various concepts of information storage systems.
2. Describe various mechanisms involved in storage systems for different environments.
3. Understand the logic in usage of RAID for data protection for effective storage management.
4. Learn and apply the concepts of intelligent storage in real-time information systems
5. Comprehend the direct attached storage for SCSI systems.
6. Analyze the usage of storage area network for effective storage.
7. Use the network storage concepts and apply for effective information storage.
8. Understand the characteristics of various storage technologies.

Module:1	**Introduction to Information Storage and Management**	**6 hours**

Information storage, Evolution of storage technology and architecture, Data center infrastructure, Key challenges in managing information, Information lifecycle

Module:2	**Storage System Environment**	**6 hours**

Components of a storage system environment, Disk drive components, Disk drive performance and fundamental laws of governing disk performance, Logical components of the Host, Application requirements and disk performance

Module:3	**Data Protection using RAID**	**6 hours**

RAID and its implementation aspects, RAID array components, RAID levels and comparison, RAIP impact of disk performance, Hot spares

Module:4	**Intelligent Storage System**	**6 hours**

Components of an intelligent storage system, intelligent storage array, Concepts in practice

Module:5	**Direct-attached storage and introduction to SCSI**	**6 hours**
Benefits, limitations and types of direct-attached storage (DAS), Disk drive interfaces, Introduction to SCSI and its command model.		
Module:6	**Storage Area Networks**	**6 hours**
Fiber channel, Evolution and components of SAN, Fiber channel (FC), connectivity, FC ports and architecture, Zoning, FC login types, FC topologies.		
Module:7	**Network-attached storage**	**6 hours**
General purpose servers versus network attached storage (NAS) devices, NAS file I/O, NAS components and implementation, NAS file-sharing protocols and I/O operations, Factors affecting NAS performance and availability		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)

1.	Somasundaram Gnanasundaram, Alok Shrivastava, Information Storage and Management, Wiley Publishing Inc, 2nd Edition, 2012.

Reference Books

1.	Data Storage Networking: Real World Skills for the CompTIA Storage+ Certification and Beyond Nigel Poulton John Wiley & Sons, 2014.
2.	Storage Networks Explained Ulf Troppens, Rainer Erkens, Wolfgang Muller-Friedt, Rainer Wolafka, Nils HausteinJohn Wiley & Sons, 24-Aug-2011
3.	Securing Storage: A Practical Guide to SAN and NAS Security Himanshu Dwivedi, Prentice Hall, 2012.

Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016

ITE2010	Artificial Intelligence	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**ITE1006**	**Syllabus version**				
		1.00				

Course Objectives:

1. To understand and explain the basics of Artificial Intelligence
2. To improve the problem of solving techniques, knowledge representation and reasoning systems capability.
3. To gain the knowledge for developing Expert systems

Expected Course Outcome:

1. Comprehend the fundamentals of problem solving methods using artificial intelligence and intelligent agents.
2. Understand the problem space and searching methods and their merits and demerits in the context of artificial intelligence.
3. Analyze the heuristic searching procedure for problem solving.
4. Eloborate different data representations and languages for artificial intelligent systems.
5. Understand Predicate Logic and use it to slove problems
6. Comprehend the knowledge to take decisions under uncertainties.
7. Develop skills for planning and learning.
8. Develop applications using artificial intelligence to solve optimization problems.

Module:1	**AI-Foundations**	**5 hours**

History-Intelligent Agents –Types - AI Techniques –Data and Knowledge- Problem Solving.

Module:2	**Problem Spaces and Search:**	**7 hours**

Search Problem – Production Rules – Breadth-First Search(BFS) – Depth-First Search(DFS) – Solution of search problems by BFS and DFS – Travelling Salesman Problem – Merits and Demerits of BFS and DFS.

Module:3	**Heuristic Search**	**8 hours**

Generate-and-Test – Hill Climbing — Steepest-Ascent Hill Climbing –Local maximum, Plateau and Ridge - Best-First Search – OR- Graphs - AND-OR Graphs – Problem Reduction – Constraint Satisfaction – Cryptarithmetic Problem.

Module:4	**Knowledge Representation**	**6 hours**

Representations and Mappings – Approaches to Knowledge Representation – Important Attributes: instance and is a - Property Inheritance – Inheritable Knowledge – Slot-and-Filter Structure – Queries.		
Module:5	**Predicate Logic**	**7 hours**
Representing Facts in Logic (wff ' s) – Conversion of wff ' s to Clause Form – Resolution – Propositional Resolution – Problems using Propositional Resolution- The Unification.		
Module:6	**Uncertainty-Probabilistic Reasoning**	**5 hours**
Prior and Posterior Probabilities - Making simple and complex decisions – Bayes' Theorem - Nonmonotonic reasoning and Justification-Based Truth Maintenance System (TMS).		
Module:7	**Planning and Learning**	**4 hours**
Representation for planning-Partial orderplanning – Total order Planning – Learning – Learning by -Analyzing Differences-Explaining Experiences - Correcting Mistakes.		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Elaine Rich and Kevin Knight, Artificial Intelligence, Third Edition, Tata McGraw Hill,2008.
Reference Books	
1.	Patrick Henry Winston, Artificial Intelligence, Third Edition, Addison Wesley, 2011.
2.	Stuart J. Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Third Edition, PHI, 2015.

Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016

ITE2011	Machine Learning	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**ITE1015**	**Syllabus version**				
		1.00				

Course Objectives:

1. To introduce fundamental supervised and unsupervised learning algorithms, models and their corresponding applications
2. To provide deep understanding of Bayesian decision theory, Multivariate Methods, and Clustering approaches.
3. To educate about Decision Trees, Multilayer Perceptron, and Kernel Machines.

Expected Course Outcome:

1. Demonstrate the knowledge of fundamental elements and concepts related to Supervised, Unsupervised and Probably Approximately Correct Learning.
2. Apply the suitable Bayesian Decision Theory for various types of learning problems.
3. Develop the learning models and suitable solutions for Multivariate dataset.
4. Use and apply important methods in clustering for various real-world problems.
5. Apply the knowledge and skills for solving realistic and logical issues using decision trees.
6. Ability to work with multilayer perceptron model parameters and implementing the model successfully.
7. Develop improved machine learning methods, related kernel computing models and programming framework for practical applications.
8. Implement various solutions with the help of machine learning approaches for solving everyday problems.

Module:1	**Basics**	**5 hours**

Definition-Machine Learning, Classification, Supervised/Unsupervised Learning, Probably Approximately Correct (PAC) Learning

Module:2	**Bayesian Decision Theory**	**6 hours**

Classification, Losses and Risks, Discriminant Functions, Utility Theory, Evaluating an Estimator: Bias and Variance, The Bayes' Estimator, Parametric Classification, Model Selection Procedures

Module:3	**Multivariate Methods**	**7 hours**

Multivariate Data - Parameter Estimation - Estimation of Missing Value - Multivariate Normal Distribution - Multivariate Classification - Multivariate Regression - Dimensionality Reduction-

Factor Analysis - Multidimensional Scaling - Locally Linear Embedding		
Module:4	**Clustering**	**7 hours**
k-Means Clustering - Mixtures of Latent Variable Models - Hierarchical Clustering - Nonparametric Methods : Nonparametric Density Estimation - k-Nearest Neighbor Estimator - Nonparametric Classification - Smoothing Models		
Module:5	**Decision Trees**	**6 hours**
Univariate Trees - Pruning - Rule Extraction from Trees - Multivariate Trees - Linear Discrimination : Generalizing the Linear Model - Logistic Discrimination - Discrimination by Regression		
Module:6	**Multilayer Perceptrons**	**6 hours**
Neural Networks - Training a Perceptron - Learning Boolean Functions - Multilayer Perceptrons - Back propagation Algorithm - Training Procedures - Tuning the Network Size - Radial Basis Functions		
Module:7	**Kernel Machines**	**6 hours**
Optimal Separating Hyperplane - The Nonseparable Case: Soft Margin Hyperplane - v-SVM - Kernel Machines for Regression- One-Class Kernel Machines - Kernel Dimensionality Reduction.		
Module:8	**Contemporary issues**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Ethem Alpaydi, Introduction to Machine Learning, Second Edition, The MIT Press, 2015.
Reference Books-	
1.	Russell and Norvig, Artificial Intelligence, Third Edition, Prentice Hall, 2015
2.	Mitchell, Tom, Machine Learning, Tata McGraw-Hill, 2017.

Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016

ITE2012	.Net-Programming	L	T	P	J	C
		3	0	2	0	4
Pre-requisite	**ITE1002**	**Syllabus version**				
		1.00				

Course Objectives:

1. To understand the fundamentals of developing modular application by using object oriented concepts
2. To utilize the C# and .NET framework to build distributed enterprise applications.
3. To develop Console application, windows application, ASP.NET Web application and Services.

Expected Course Outcome:

1. Develop working knowledge of C# programming constructs and the .NET Framework.
2. Build and debug the well-formed Web Forms with ASP. NET Controls.
3. Apply the knowledge of computing and mathematics for real life problem solving.
4. Use ADO.NET in windows and web application to work with database.
5. Develop client/server applications using network programming.
6. Develop multi-threading applications.
7. Design web forms, web form controls and validation controls using ASP.NET

Module:1	**.NET Framework**	**5 hours**

Common language Runtime (CLR) – Common Type System (CTS) – Common language Specification (CLS) – Compilation process – Assemblies – Namespaces – Command line compiler.

Module:2	**C# language fundamentals**	**6 hours**

Programming constructs – value types and reference types – object oriented concepts – Encapsulation – Inheritance – polymorphism – Interfaces – collections – Multithreading.

Module:3	**File I/O and Attribute based Programming**	**6 hours**

Console Application – Indexers - Multicast delegates – Events - Registry programming – File I/O - Serialization – Binary format – SOAP format – Type Reflection and attribute-based programming – Late binding.

Module:4	**Graphics and Windows Forms**	**6 hours**

Tool box controls – Container control – Menu – Tool bar – Tool tip Controls during design time – Run time – Graphics programming GDI+.

Module:5	**Networking**	**6 hours**
Remoting – Architecture - Marshal By value (MBV) – Marshal By Reference (MBR) – Network programming using C# - Socket – TCP – UDP		
Module:6	**Database Programming**	**7 hours**
Data Access with ADO.NET – Architecture – Data reader – Data Adapter – Command – Connection – Data set – Data binding – Data Grid Control – XML based Data sets.		
Module:7	**Web Development**	**6 hours**
Web Development and ASP.NET – Architecture – web forms – web form controls – Life time Management - Application – Session – ASP with ADO.NET Validation controls – website security.		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Andrew Troelsen, Pro C# 5.0 and the .NET 4.5 Framework, Sixth edition, A Press, 2012.
Reference Books	
1.	Joh Skeet, C# in depth, Manning publications, Third Edition, 2014.
2.	Adrew Stellman and Jennifer Greene, Head First C#, Third Edition, O'Reilly, 2013.
List of Challenging Experiments (Indicative)	
1.	Create a DLL using VB.NET for ATM Object with necessary fields, properties and methods such as initiating, deposit and withdrawal. Write a menu driven program to perform the following in c#, (i) Discover all the types that are available in the DLL using the concept of multicast delegates. (ii) After initiating the basic information of the customer perform serialization using SOAP format. (iii) Deserialize the above and invoke the methods such as deposit and withdrawal using the concept of late binding. While performing withdrawal, check for the minimum balance value that has to be retrieved from registry.
2.	Create a DLL using VB.NET named Sum with overloaded methods such as, Sum_a(double s, double t); Sum_a(int i, int j); Sum_a(int k, double b); Write a menu driven program to perform the following using C#, (i) Discover all the types that are available in the DLL using the concept of multicast delegates. (ii) After initiating the values perform serialization using Binary format. (iii)Deserialize the above and invoke the methods using the concept of late binding.

	If the signature of a method which is invoked is (double, double) then store the result value in registry.
3.	Create a DLL using C# for foreign currency to Indian rupees convertor calculator with following specifications, 1 dollar = 65.58 Indian rupees 1 Euro = 73.47 Indian rupees 1 Saudi Riyal = 3.75 Indian rupees 1 Ringgit = 15.36 Indian rupees 1 Chinese Yuan = 1.49 Indian rupees Write a Menu driven program using console application to invoke the above DLL with the below given functionalities using VB.NET (i) Use the concept of multicast delegates to perform the above. (ii) Store the latest calculated values of conversion done for all the above five in user defined registry. (iii) Provide an option for displaying the largest conversion done foreign currency name with Rupee value stored in the registry.
4.	Write a database program using ADO for students CAT Analysis system that performs various basic operations such as addition, modify, delete and viewing of student records. Also, provide an option for calculating the grades for the subjects based on the marks and display the results in grid control.
5.	Develop a website for E-shopping with necessary functionalities.
6.	Create a DLL for mobile phone object that has set of interfaces, properties, fields and methods related to it. Write a program to discover all the types available in the DLL using the concept of reflection and display it in windows form.
7.	Create a generalized DLL that displays the signature information of any method which is passed as an input.
8.	Develop a chat application using client/server programming.
9.	Write a program using indexer for storing the temperature at various time of a day. Provide an option to retrieve the temperature at any given time. Store the maximum temperature of the day in registry.
10.	Create a DLL for User Authentication System with methods and propertie. Using the concept of Remoting validate a user from the client side whereas, the user information has to be stored at the side of server Registry.

Total Laboratory Hours	30 hours

Recommended by Board of Studies	12-08-2017		
Approved by Academic Council	No. 47	Date	05-10-2017

ITE2013	Big Data Analytics	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**ITE1003**	**Syllabus version**				
		1.00				

Course Objectives:

1. To introduce Big Data and Data analytics lifecycle to address business challenges that leverage big data.
2. To understand the importance of mining data streams and social network graphs.
3. To introduce big data analytics technology and tools including MapReduce and Hadoop.

Expected Course Outcome:

1. Reframe a business challenge as an analytics challenge.
2. Create models and identify insights that can lead to actionable results.
3. Design of big data analytics projects.
4. Use tools such as MapReduce / Hadoop.
5. Implement suitable analytics for big data clustering for resolving challenges in real-time business problems
6. Develop suitable social network analysis models, appraise the quality of the inputs, gain understanding from the outcomes.
7. Implement Multiple and huge scaling analytics tools for resolving contemporary big data challenges

Module:1	**Big Data Concepts and Environment**	**6 hours**

Big Data Overview-Big Data Challenges and Opportunities- Data analytics lifecycle overview – Phases of Data Analytics: Discovery, Data preparation, Model planning, Model building, Communicate results, Operationalize – Case Study.

Module:2	**Overview of Hadoop and HDFS**	**6 hours**

Introduction to Hadoop - The Distributed File System: HDFS, GPFS – The Design of HDFS – HDFS-Concepts-Blocks, Name Nodes and Data Nodes; Components of Hadoop- Hadoop Cluster Architecture-Batch Processing- Serialization - Hadoop ecosystem of tools-NoSQL .

Module:3	**Map Reduce**	**6 hours**

MapReduce Basics - Functional Programming Roots - Mappers and Reducers - The Execution Framework -MapReduce Algorithm Design –Shuffling, Grouping, Sorting- Custom Partitioners and Combiners- MapReduce Formats and Features.

Module:4	**Algorithms for Handling Big Data**	**6 hours**

Random Forest Algorithm, Unstructured Data Analytics, Randomized Matrix Algorithms in

Parallel and Distributed Environments, Mahout: Probabilistic Hashing for Efficient Search and Learning on Massive Data, Dirichlet process clustering, Latent Dirichlet Allocation, Singular value decomposition, Parallel Frequent Pattern mining, Complementary Naive Bayes classifier, Random forest decision tree based classifier.		
Module:5	**Lambda Architecture**	**6 hours**
Different layers of Lambda Architecture, Data storage on the batch layer. Serving Layer- Requirements for a serving layer database, Indexing strategies. Speed Layer- Storing and Computing Real time views, Queuing and Streaming – Illustration using Cassandra data model.		
Module:6	**Big Data Clustering**	**6 hours**
K-means Algorithms - K-Means Basics - Initializing Clusters for K-Means -Picking the Right Value of k - The Algorithm of Bradley, Fayyad, and Reina - Processing Data in the BFR Algorithm.		
Module:7	**Mining Social Network Graphs**	**6 hours**
Link Analysis: Page Rank- Efficient computation of Page Rank- Topic Sensitive Page Rank- Link Spam- Hubs and Authorities. Mining Social Network Graphs: Web Advertising: Online and Offline Algorithms; Social Network Graphs: Clustering of Social Network Graphs- Direct Discovery of Communities- Partitioning of Graphs- Finding overlapping communities- Simrank- Counting Triangles- Neighborhood properties of Graphs.		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Paul C. Zikopoulos, Chris Eaton, Dirk deRoos, Thomas Deutsch, George Lapis, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw-Hill, 2015.
Reference Books	
1.	Lin and Chris Dyer, Data-Intensive Text Processing with MapReduce, Jimmy, Morgan & Claypool Synthesis, 2010.
2.	Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2014.
3.	Tom White, Hadoop, the Definitive guide, O'Reilly Media, 2015.
4.	Noreen Burlingame, Little Book of Big Data, Ed. 2016.

Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016

ITE2014	Software Project Management	L	T	P	J	C
		2	0	0	0	2
Pre-requisite	**ITE1005**	**Syllabus version**				
		1.00				

Course Objectives:

1. To learn project management activities
2. To learn cost benefit analysis for project evaluation
3. To know network planning model for project scheduling
4. To learn risk management techniques

Expected Course Outcome:

1. Define the success criteria for a project and understand some problems and concerns of software project managers.
2. Describe the project portfolio management and carry out an evaluation and selection of projects against strategic, technical and economic criteria.
3. Develop an activity plan for project and estimate the overall duration of a project by creating a critical path and a precedence network.
4. Identify the factors putting a project at risk and categorize and prioritize actions for risk elimination or containment.
5. Monitor the progress of projects, assess the risk of slippage, visualize and assess the state of a project, revise targets to correct or counteract drift.
6. Comprehend to reduce the unnecessary stress and threats to health and safety, identify some of the factors that influence people's behaviour in a project environment.
7. Understand and comprehend the best methods for organizational behavior and management.

Module:1	**Introduction To Software Project Management**	**3 hours**

Project Definition – Contract Management – Activities covered By Software Project Management – Overview of Project Planning – Stepwise Project Planning.

Module:2	**Project Evaluation**	**4 hours**

Strategic Assessment – Technical Assessment – Cost Benefit Analysis –Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation

Module:3	**Activity Planning**	**4 hours**

Objectives – Project Schedule – Sequencing and Scheduling Activities –Network Planning Models – Forward Pass – Backward Pass – Activity Float – Shortening Project Duration – Activity on

Arrow Networks		
Module:4	**Risk Management**	**4 hours**
Nature Of Risk – Types Of Risk – Managing Risk – Hazard Identification – Hazard Analysis – Risk Planning And Control		
Module:5	**Monitoring**	**3 hours**
Creating Framework – Collecting The Data – Visualizing Progress – Cost Monitoring – Earned Value – Prioritizing Monitoring – Getting Project Back To Target		
Module:6	**Control**	**4 hours**
Change Control – Managing Contracts – Introduction – Types Of Contract – Stages In Contract Placement – Typical Terms Of A Contract – Contract Management – Acceptance.		
Module:7	**Managing People And Organizing Teams**	**5 hours**
Introduction – Understanding Behavior – Organizational Behavior: A Background – Selecting The Right Person For The Job – Instruction In The Best Methods – Motivation – The Oldham – Hackman Job Characteristics Model – Working In Groups – Becoming A Team –Decision Making – Leadership – Organizational Structures – Stress –Health And Safety – Case Studies.		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**30 hours**

Text Book(s)	
1.	Bob Hughes, Mike Cotterell, Rajib Mall, Software Project Management, Fifth Edition, McGraw Hill, 2011
Reference Books	
1.	Greg Horine-Project Management Absolute Beginner's Guide, 3/E-Que Publishing ,2012

Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016

ITE2015	Information System Audit	L	T	P	J	C
		2	0	0	0	2
Pre-requisite	**ITE1005**	**Syllabus version**				
		1.00				

Course Objectives:

1. To understand the models of system audit.
2. To impart knowledge of security control and database access.
3. Managing and evaluating the audit function.

Expected Course Outcome:

1. Elaborate the steps of audit in detail
2. Impart the knowledge of various approaches and models of system audit
3. Solve real life problems using security and quality assurance.
4. Analyse all the controls such as database and output.
5. Understand the concurrent auditing and performance management tools.
6. Comprehend data integrity and system efficiency.
7. Select and analyze features of information systems auditing and management.

Module:1	**Overview of Information System**	**3 hours**

Auditing-Conducting an Information Systems Audit - Overview & steps in an Audit.

Module:2	**The Management Control Framework-I**	**4 hours**

Introduction - Systems Development Management Controls - Approaches to Auditing Systems Development - Normative Models of the Systems Development Process - Evaluating the Major phases in the Systems Development Process

Module:3	**The Management Control Framework-II**	**4 hours**

Security Management Controls - Operations management Controls - Quality assurance Management Controls.

Module:4	**The Application Control Framework**	**5 hours**

Boundary Controls - Input Controls- Processing Controls - Database Controls - output Controls

Module:5	**Evidence Collection**	**4 hours**

Audit Software - Code Review - Test Data and Code Comparison - Concurrent Auditing techniques – Interviews -Questionnaires - Control Flowcharts- Performance Management tools.

Module:6	**Evidence Evaluation**	**4 hours**

Evaluating Asset Safeguarding and Data Integrity - Evaluating System Effectiveness -

Evaluating System Efficiency.		
Module:7	**Information Systems Audit and Management**	**4 hours**
Managing the Information Systems Audit Function - Planning Function - Organizing Function - Staffing Function - Leading Function - Controlling Function - Some Features of Information Systems Auditing – Troubleshooting the Audit Service.		
Module:8	**Contemporary issues**	**2 hours**
	Total Lecture hours:	**30 hours**

Text Book(s)	
1.	CA. Manoj Agarwal, Information Systems Control and Audit, Fifth Edition, Bharat Law House, 2017
Reference Books	
1.	David L Cannon, Timothy S Beigmann, Brandy Pamplin, Certified Information System, Auditor study guide, Wiley Publications, 2011.
2.	JamesA.Hall, Information Technology Auditing and Assurance, Fourth Edition, South-Western College Pub, 2015.

Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016

ITE3002	Embedded Systems	L	T	P	J	C
		3	0	2	0	4
Pre-requisite	**ITE2001**	**Syllabus version**				
		1.10				

Course Objectives:

1. To learn the fundamentals of embedded systems and understand the programs and tools.
2. To impart the knowledge about real time embedded systems.
3. To elucidate the knowledge of embedded system types and its interfacing mechanisms.

Expected Course Outcome:

1. Understand the basic concepts of embedded systems and recognize the categories.
2. Comprehend the hardware and software architecture of the embedded system and its programming aspects using assembly Languages) and testing tools.
3. Understand the key concepts like interaction with peripheral devices.
4. Design real time embedded systems using the concepts of RTOS.
5. Understand the RTOS and its use in Portable Handheld Devices
6. Explore the emerging technologies of embedded systems.
7. Elaborate the concept of embedded system and its applications.

Module:1	**Introduction to Embedded Systems**	**6 hours**

Application Areas- Categories of Embedded Systems-Overview of Embedded System Architecture- Specialties of Embedded Systems-Recent trends in Embedded Systems.

Module:2	**Architecture of Embedded Systems**	**6 hours**

Hardware Architecture-Software Architecture-Development / Testing Tools.

Module:3	**Communication Interfaces**	**7 hours**

Need for Communication Interfaces-RS232/UART- USB-IEEE 1394 Fire wire-Ethernet-IEEE 802.11- Bluetooth.

Module:4	**Embedded / RTOS Concepts**	**7 hours**

Architecture of Kernel- Tasks and task Schedulers-Interrupt service Routines-Semaphores-Mutex-Mail Boxes-Message Queues-Event registers-Timers-Memory Management-Priority Inversion Problem.

Module:5	**Overview of Embedded / ROT System**	**7 hours**
Embedded OS-RTOS-Handheld Oss-Representative embedded Systems.		
Module:6	**Future Trends**	**5 hours**
Emerging Technologies- Pervasive / Ubiquitous.		
Module:7	**Security of Embedded systems**	**5 hours**
Embedding Intelligence- Emerging Applications.		
Module:8	**Contemporary issues**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Dr. K V K K Prasad, Embedded / Real-Time Systems: Concepts, Design And Programming, Black Book, DreamTech Press, 2016.
Reference Books	
1.	Wayner Wolf, Computers as components – Principles of embedded computing system design, Morgan Kaufman, 2016
2.	Arnold S Berger, Embedded Systems Design: An Introduction to Processes, Tools &Techniques, CMP books, 2010.
3.	Vahid F., Givargies T., Embedded Systems Design, Third Edition, John Wiley & Sons, paperback-2011.
4.	Muhammad Ali Mazidi., Janice GillispieMazidi., The 8051 Microcontroller and Embedded Systems, Pearson Education Asia, 2012.
List of Challenging Experiments (Indicative)	
1.	Generate and store the following series up to 'N' terms: Value of 'N' is available in location 30H. The series is presented using decimal number system. 1, 2,3,11,12,13,21,22,23,31... up to N terms.
2.	A few random unsigned integers are stored from the internal data memory location 31H onwards. Number of terms (N) is available in location 30H. Assuming that none of these numbers is greater than 5, find the factorials of these integers and then find their sum. Assume that the sum would not exceed 8-bit value.
3.	Create a new array by removing only those integers that are perfectly divisible by 4 from an array, starting from 31H. Location 30H contains number of terms of this array. The new array is to be created from the location 60H. At return, the accumulator should indicate number of terms found. Original locations with digits divisible by 4 should be replaced by null.
4.	Write a subroutine to find the sum of the following series up to N terms. N is stored in location 30H. At return, the sum should be available in the accumulator. Assume that the value of N would not be more than 5. (Term)=$n^3-(n-1)^2$ Sum= $(1^3-0^2)+(2^3-1^2)+(3^3-2^2)+$ up to N terms.
5.	Some random hexadecimal numbers are stored from location 31H onwards. The number of

	terms (N) of the array is available in the location 30H. Convert all numbers to their corresponding BCD forms and store in their original locations. Assume no stored number is more than 63H.
6.	Develop a subroutine to update the display of a clock that can be called at every minute. The clock should display hours and minutes in BCD format. After displaying 23.59, the display should be shown as 00.00. Assume that the hour count is stored at location 31H and the minute count in location 30H, both in packed BCD format.
7.	A 4-digit BCD display should be shifted left by one digit in order to accumulate a freshly entered BCD digit available in the accumulator. Develop a subroutine to accomplish this task, assuming that locations 31H and 30H contain the higher and lower order numbers, respectively, in packed BCD format.
8.	A portion of a written text is stored in the internal data memory location from 40H to 7FH so that it occupies 64 bytes. The text is in the form of ASCII and contains several words. ASCII character 'space' of code 20H separates any two words in the text. The text may or may not start with a space and may or may not end with a space. Multiple spaces are also possible in between the words and at the start and at the end. Develop a program to count the number of words within the text, and store this number in the accumulator.
9.	There are 25 prime numbers between 2 and 100. Find a method to generate these prime numbers.
10.	Find out another method of sorting, and compare its efficiency with the bubble sorting method.
11.	A random array of integers was generated and stored from location 31H onwards, storing its number of terms at location 30H. However, although the algorithm generally does not permit the repeat of any integer, to check this, develop a program ensuring that there is no repetition of any term. In case of repetition, the program should come out with CY flag as set; otherwise, CY flag should be cleared.
12.	Develop a program to generate prime numbers by the method of divisions.
	Total Laboratory Hours | 30 hours

Recommended by Board of Studies	12-08-2017		
Approved by Academic Council	No. 47	Date	05-10-2017

ITE3003	Parallel Processing	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**ITE2001**	**Syllabus version**				
		1.00				

Course Objectives:

1. To learn to develop parallel algorithms and map them with processor architectures
2. To understand the parallelization of basic mathematical and engineering algorithms
3. To learn the contemporary parallel architectures and their programming

Expected Course Outcome:

1. Parallelize basic algorithms and analyze their speedup and efficiency.
2. Understand the properties of various interconnection networks and suggest the suitable network based on performance requirements
3. Comprehend the mapping of data and scheduling of tasks to appropriate processors for better efficiency
4. Develop and analyze summation algorithms for different parallel processing architectures.
5. Design matrix multiplication algorithms for various SIMD and MIMD architectures.
6. Design an efficient sorting algorithm for a given parallel architecture.
7. Elaborate various searching techniques and sorting algorithms.
8. Design the applications for modern parallel architectures.

Module:1	**Pram Algorithms**	**9 hours**

Basics of Parallel Processing-Introduction to Flynn's Taxonomy-PRAM model of parallel computation - EREW-CREW-CRCW- Mapping theorem -Parallel reduction – prefix sums – list ranking – preorder tree traversal – merging two sorted lists – graph coloring – reducing processors –Brent's theorem.

Module:2	**Processor Networks**	**4 hours**

Mesh Networks – binary tree – hyper tree – pyramid – butterfly – hypercube – cube connected cycles and Shuffle exchange networks – De Brujin networks.

Module:3	**Mapping and Scheduling**	**5 hours**

Mapping data to processors: Embedding – Dilation – Ring to 2D mesh -2D mesh to 2Dmesh – Binary tree to 2D mesh – Binomial tree to 2Dmesh –Embedding graphs to hypercubes- binary tree to hypercubes – Binomial tree to hypercubes – rings and mesh to hypercubes. Static scheduling on UMA models. Grahams list scheduling algorithm. Coffman Grahams scheduling algorithm.

Module:4	Summation Algorithms	5 hours
Hypercube SIMD model – shuffle exchange SIMD summation algorithm – 2D Mesh SIMD summation algorithm – UMA summation model – Broadcast – Binomial tree communication pattern.		
Module:5	**Matrix Multiplication Algorithms**	**6 hours**
Matrix multiplication on 2D Mesh SIMD model – Related theorems -Hypercube SIMD model – shuffle exchange SIMD model – UMA Multiprocessor – Block matrix multiplication – Algorithms for multicomputer – Row-column and block oriented algorithms.		
Module:6	**Sorting**	**6 hours**
Enumeration sort – Lower bounds on Parallel sorting – Odd Even Transposition sort – Bitonic merge – sequence – Bitonic merge on shuffle exchange network – two dimensional mesh network – Hypercube network – Parallel quicksort – Recurrence equation and analysis – Hyperquick sort.		
Module:7	**Searchiing and Graph Algorithms**	**7 hours**
Parallel search – Ellis's algorithm – Manber and Ladner's algorithms. P- Depth Search – Breadth Depth Search – Connected components –All pairs shortest path – single source shortest path – Minimum cost spanning tree – Sollin's algorithm – Kruskal's algorithm.		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)

1.	Michael J. Quinn, Parallel computing theory and practice, McGraw Hill, Second Edition, 2012.

Reference Books

1.	David B. Kirk, Wen-mei W. Hwu, Programming Massively Parallel Processors: A Hands-on Approach, MK Publishers, 2010.
2.	Pavan Balaji, Programming Models for Parallel Computing (Scientific and Engineering Computation) , MIT Press, 2016
3.	Patrick Amestoy, Daniela di Serafino, Rob Bisseling, Quitana Orti E.S., Vajtersic M, Parallel Numerical Algorithms, Springer, 2010

Recommended by Board of Studies	05-03-2016		
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ITE3004	Distributed Systems	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**ITE2001**	**Syllabus version**				
		1.00				

Course Objectives:

1. To explore the characteristics of Distributed systems and understand its features.
2. To impart knowledge about remote communication between processes or applications in heterogeneous environment.
3. To provide an exposure to commercial distributed applications / tools / technologies.

Expected Course Outcome:

1. Demonstrate the knowledge of fundamental elements and concepts related to distributed system technologies.
2. Analyse the core architectural concepts to meet the challenges in implementing the distributed systems
3. Develop applications targeted for Internet.
4. Use and apply important methods in distributed systems to support scalability and fault tolerance.
5. Provide solutions to reliability, security, scalability and robustness in Internet.
6. Develop applications targeted for Internet using Cloud for real time applications.
7. Develop distributed applications / tools / technologies.

Module:1	**Introduction**	**7 hours**

Introduction to Distributed Systems – System Models – Networking and Internetworking – Inter process Communications - Case Study: IPC in UNIX

Module:2	**Distributed Objects and File System**	**7 hours**

Distributed Objects and Remote Invocation – Distributed File Systems -Architecture – Recent Advances

Module:3	**Name Services and Directory Service**	**7 hours**

Name services – Domain Name Systems – Coordination and Agreement – Time and Global states

Module:4	**Transaction and Concurrency Control- Distributed Transactions**	**7 hours**

Transaction and Nested Transactions – Concurrency Control – Distributed Transactions

Module:5	**Distributed OS and Shared Memory**	**5 hours**
Distributed Operating System Support – Distributed Shared Memory- Web Services Overview		
Module:6	**Google search Engine**	**5 hours**
Introduction: The Google Search Engine, crawling, Indexing, Ranking, Anatomy of Search Engine, Google as a cloud provider, Software as a service, Platform as a service. Overall Architecture and Design Philosophy: Physical Model, Overall Infrastructure, Google Infrastructure Underlying communication paradigm: Remote invocation, Supporting RPC, Publish - subscribe.		
Module:7	**Google File system**	**4 hours**
Data Storage and coordination services: The Google file System [GFS], Chubby, BigTable. Distributed Computation services: MapReduce, Sawzall		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Coulouris, J. Dollimore, and T. Kindberg, Distributed Systems:Concepts and Designs, Fifth Edition, Addison Wesley, 2012.
Reference Books	
1.	Andrew.S.Tanenbaum, Maarten Van Steen, Distributed Systems –Principles and Paradigms, Third Edition, Prentice Hall -2016.
2.	Mukesh Singhal and N. G. Shivaratri, Advanced Concepts in Operating Systems, Distributed, Database, and Multiprocessor Operating Systems, McGraw Hill paperback edition, 2017.
3.	Vijay K. Garg, Elements of Distributed Computing, Wiley & Sons, 2014.

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ITE3005	Information Coding Theory	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**ITE2003**	**Syllabus version**				
		1.00				

Course Objectives:

1. To understand various devices used in Digital Communication.
2. To understand the impact of interference on discrete time devices.
3. To learn the various coding and sampling techniques

Expected Course Outcome:

1. Understand the design and construction of devices used in Communication Systems.
2. Address the challenges imposed in different types of Communication Systems
3. Design and construct various digital communication systems and implement various sampling and coding techniques.
4. Use and apply various coding techniques to analyze different communication systems.
5. Comprehend how the compression techniques are used in the communication mediums.
6. Understand the error control techniques to find the error during transmission.
7. Learn and implement error control coding and block codes.

Module:1	**Information Theory**	**6 hours**

Information – Entropy, Information rate, classification of codes, Kraft McMillan inequality, Source coding theorem, Shannon-Fano coding, Huffman coding, Extended Huffman coding - Joint and conditional entropies, Mutual information - Discrete memory less channels – BSC, BEC – Channel capacity, Shannon limit.

Module:2	**Data Coding Techniques**	**5 hours**

Pulse Code Modulation-Delta modulation-Adaptive Delta Modulation-Differential Pulse code modulation-Comparison of Different Pulse code Modulation Techniques.

Module:3	**Textual Data Encoding Techniques**	**4 hours**

ASCII-Unicode- Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm.

Module:4	**Audio and Speech Coding**	**6 hours**

Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audio layers I,II,III, Dolby AC3 - Speech: Coding Speech at lower pulse rate(ADPCM) Channel Vocoder, Linear Predictive Coding.

Module:5	Source Coding: Image and Video	5 hours
Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF.		
Module:6	**Compression Techniques**	**7 hours**
Image compression: READ, JPEG – Video Compression: Principles-I,B,P frames, Motion estimation, Motion compensation, H.261, MPEG standard.		
Module:7	**Error Control Coding: Block Codes**	**9 hours**
Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding - Single parity codes, Hamming codes, Repetition codes - Linear block codes, Cyclic codes - Syndrome calculation, Encoder and decoder - CRC -Convolutional codes – code tree, trellis, state diagram - Encoding – Decoding: Sequential search and Viterbi algorithm – Principle of Turbo coding.		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)

1.	R Bose, Information Theory, Coding and Cryptography, TMH, 2008.

Reference Books

1.	Stefan M. Moser, Po-Ning Chen, A student's guide to Coding and Information Theory, Cambridge University Press, 2012.
2.	K Sayood, Introduction to Data Compression, Third Edition, Elsevier, 2012.
3.	S Gravano, Introduction to Error Control Codes, Oxford University Press, 2007
4.	Amitabha Bhattacharya, Digital Communication, TMH 2006, Fred Halsall, Multimedia Communications: Applications, Networks, Protocols and Standards, Pearson Education Asia, 2011

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ITE3007	Cloud Computing and Virtualization	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**ITE2001**	**Syllabus version**				
		1.00				

Course Objectives:

1. To provide comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture and applications
2. To learn basic concepts of MapReduce programming models for big data analysis on cloud.
3. To expose the students to frontier areas of Cloud Computing and virtualization concepts.

Expected Course Outcome:

1. Analyse and solve industry-related problems using cloud computing solutions.
2. Design different workflows according to requirements and apply Map Reduce programming model.
3. Design and develop highly scalable cloud-based applications by creating and configuring virtual machines on the cloud.
4. Use cloud computing tools offered by industry leaders such as Amazon and Google.
5. Assess cloud Storage systems and Cloud security, the risks involved, its impact.
6. Compare, contrast, and evaluate the key trade-offs between multiple approaches to cloud system design.
7. Design and evaluate a cloud-based system, process, component, or program to meet the desired needs.

Module:1	**Overview of Computing Paradigm**	**5 hours**

Recent trends in Computing- Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Web services.

Module:2	**Introduction to Cloud Computing**	**6 hours**

Introduction to Cloud Computing- System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture. Cloud Models:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud – Community Cloud – Hybrid Cloud.

Module:3	**Basics of Virtualization**	**6 hours**

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

Module:4	Virtualization Techniques	6 hours
Storage Virtualization – System-level or Operating Virtualization – Control-Plane Virtualization– Virtual Machine Basics – Taxonomy of Virtual machines - Server Virtualization – Physical and Logical Partitioning - Types of Server Virtualization.		
Module:5	**Parallel and Distributed Programming Paradigms**	**6 hours**
MapReduce, The map-Reduce model, Parallel efficiency of Map-Reduce, Relational operations using Map-Reduce, Enterprise batch processing using Map-Reduce, Cloud Software Environments -Google App Engine, Amazon AWS, Azure - Open Source tools.		
Module:6	**Cloud infrastructure**	**6 hours**
Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.		
Module:7	**Security Overview**	**7 hours**
Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)

1.	Kai Hwang, Geoffrey C Fox, Jack G Dongarra, Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, Morgan Kaufmann Publishers, 2012.

Reference Books

1.	Tim Mather, Subra Kumaraswamy, and Shahed Latif, Cloud Security and Privacy, Oreilly, 2009
2.	Barrie Sosinsky, Cloud Computing Bible, Wiley-India, 2011.
3.	Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 2011.
4.	Ronald L. Krutz, Russell Dean Vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley-India, 2010.
5.	John W.Rittinghouse and James F.Ransome, Cloud Computing: Implementation, Management, and Security, CRC Press, 2010.
6.	Rajkumar Buyya, Chirstian Vecchiola, S.Thamarai Selvi, Mastering Cloud Computing, Tata McGraw Hill ,2013

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ITE3008	Information Retrieval	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**ITE2006**	**Syllabus version**				
		1.00				

Course Objectives:

1. To learn the classical techniques of Information Retrieval and extract meaningful patterns from it.
2. To get an insight into practical algorithms of textual document indexing, relevant ranking, web mining, text analytics and their performance evaluations.
3. To acquire the necessary experience to design, and implement applications using Information Retrieval systems

Expected Course Outcome:

1. Apply information retrieval principles to locate relevant information in large collections of data
2. Implement features of retrieval systems for web-based search tasks.
3. Apply the common algorithms and techniques for information retrieval related to document indexing and query processing
4. Demonstrate a thorough understanding and solid knowledge of the principles and techniques of human-computer interaction
5. Implement graphical user interfaces with modern software tools
6. Develop and design interactive software systems applications for real time applications
7. Design and develop web applications for the effective informational retrieval

Module:1	**Introduction**	**6 hours**

Basic Concepts – Retrieval Process – Modeling – Classic Information Retrieval – Set Theoretic, Algebraic and Probabilistic Models.

Module:2	**Retrieval Techniques**	**6 hours**

Structured Text Retrieval Models –Retrieval Evaluation –Word Sense Disambiguation.

Module:3	**Querying**	**6 hours**

Languages – Key Word based Querying – Pattern Matching – Structural Queries – Query Operations – User Relevance Feedback – Local and Global Analysis.

Module:4	**Text Operations**	**6 hours**

Document Pre-processing – Clustering – Text Compression - Indexing and Searching – Inverted files – Boolean Queries – Sequential searching – Pattern matching.

Module:5	**User Interface**	**6 hours**
User Interface and Visualization – Human Computer Interaction – Access Process – Starting Points – Query Specification - Context – User relevance Judgment – Interface for Search.		
Module:6	**Applications**	**6 hours**
Searching the Web – Challenges – Characterizing the Web – Search Engines – Browsing – Meta-searchers – Online IR systems – Online Public Access Catalogs.		
Module:7	**Digital Libraries**	**6 hours**
Introduction – Architectural Issues – Document Models, Representations and Access – Prototypes and Standards.		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Ricardo Baeza-Yate, Berthier Ribeiro-Neto, Modern Information Retrieval, Pearson Education Asia, 2012.
Reference Books	
1.	G.G. Chowdhury, Introduction to Modern Information Retrieval, Second Edition, Neal- Schuman Publishers, 2010.

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ITE4002	Network Management Systems	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**ITE3001**	**Syllabus version**				
		1.00				

Course Objectives:

1. To learn the principles behind monitoring and managing networks.
2. To understand the basic requirements of network design.
3. To understand the various open source tools used for network management.

Expected Course Outcome:

1. Understand the principles of Network management architecture, standards and models.
2. Analyse the network management functional areas and components.
3. Identify the fault, isolate the network components and enhance the MIBs.
4. Examine and analyze the models of SNMPv3 protocol.
5. Apply the network management architectures, standards and models.
6. Demonstrate the functions of remote network monitoring tools.
7. Demonstrate the functions to manage open source tools.
8. Design and conduct experiments related to network tools, analyze and interpret data.

Module:1	**Network Management Architectures & Applications**	**6 hours**

Management Standards and Models, Network Design Issues for the Project, Network Management Functions – Configuration, Configuration Management & Auto-discovery, Configuration Database & Reports, Abstract Syntax Notation One (ASN.1)

Module:2	**Network management and functions**	**6 hours**

Introduction- Basic Concepts and task: functional areas, SNMP, Client Pull & Server Push, Ports & UDP, Parts of SNMP, Nodes, SNMP Agents, Proxy & Gateway Agents, Basic Operations, Languages of SNMP, SNMP Data Types, Managed "Objects" & MIBs, Commercial SNMP Applications, SNMP & Windows services

Module:3	**Network Management Functions – Fault**	**6 hours**

Fault Management, Fault Identification and Isolation, Event Correlation Techniques, Simple Network Management Protocol - SNMP v2, Protocol Specification, Version 2 MIB Enhancements, MIB-II, Case Diagrams

Module:4	**Simple Network Management Protocol - SNMP v3**	**6 hours**
Version 3 Protocol & MIB, Simple Network Management Protocol - SNMP v3, User Based Security Model, View Based Access Model, Network Management Functions - Accounting & Performance, Accounting Management, Performance Management, Network Usage, Metrics and Quotas		
Module:5	**Network Management Architectures & Applications**	**6 hours**
Management Standards and Models, NM Standards - International standard (ISO/OSI), Internet model, TMN Architecture, Organization Model, 2 &3 tier models, Information Model, Communication Model		
Module:6	**Remote Network Monitoring RMON 1**	**7 hours**
Statistics Collection, Alarms and Filters, Remote Network Monitoring RMON 2, Monitoring Network Protocol Traffic, Application-Layer Visibility		
Module:7	**Management Open Source Tools**	**5 hours**
OpenNMS, NMIS, op5, Nagios		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Verma, Dinesh Chandra, Principles of Computer Systems and Network Management, Springer, 2010
Reference Books	
1.	Mani Subramanian, Network Management Principles and practice, Addison Wesley New York, 2010.
2.	Ghislain Hachey, Instant OpenNMS Starter, packt, June 2013

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ITE4003	Internet of Things	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**ITE3001**	**Syllabus version**				
		1.00				

Course Objectives:

1. To explore the design characteristics of IoT, Communication models between processes or applications in heterogeneous environments for engineering problems.
2. To impart knowledge on enabling technologies, techniques, resources and use of modern IT tools for providing IoT based solutions.
3. To apply the contextual knowledge to assess the commercial applications / tools / technologies by considering societal, health, safety, legal and cultural issues for IoT applications.

Expected Course Outcome:

1. Demonstrate the knowledge of fundamental elements and concepts related to Internet of Things.
2. Analyse the core architectural concepts to meet the challenges in implementing the connected devices.
3. Describe the industrial sensors, health sensors, etc. programming aspect for the domain specific IoT.
4. Use and apply important methods in retrieving the sensor data from the cloud and perform analytics.
5. Provide platforms and methodology for reliability, scalability and robustness in IoT and M2M system management.
6. Solve Real World Problems by developing a prototype, targeted for Cloud and big data analytics time applications.
7. Identify and analyze core concepts of IoT Physical Server and cloud offerings.
8. Design and Develop a Domain Specific Application which will address the contemporary issues, IOT techniques and cloud computing.

Module:1	**Introduction to Internet of Things**	**6 hours**

Definition & Characteristics of IoT, Physical Design of IoT, Things in IoT, IoT Protocols, Logical Design of IoT, IoT Communication Models, IoT Communication APIs, IoT Enabling Technologies.

Module:2	**IoT Enabling Technologies**	**6 hours**

Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, Embedded Systems, IoT Level-1, IoT Level-2, IoT Level-3, IoT Level-4, IoT Level-5.

Module:3	**Domain Specific IoTs I**	**6 hours**
Home Automation, Smart Lighting, Smart Appliances, Intrusion Detection, Smoke/Gas Detectors, Cities- Smart Parking, Smart Lighting, Structural Health Monitoring, Surveillance, Environment- Weather Monitoring, Air Pollution Monitoring, Noise Pollution Monitoring, Forest Fire Detection, River Floods Detection.		
Module:4	**Domain Specific IoTs II**	**7 hours**
Energy- Smart Grids, Renewable Energy Systems, Prognostics, Retail- Inventory Management, Smart Payments, Smart Vending Machines, Logistics- Route Generation & Scheduling, Shipment Monitoring, Remote Vehicle Diagnostics, Agriculture- Smart Irrigation, Green House Control, Industry- Machine Diagnosis & Prognosis, Indoor Air Quality Monitoring, Health & Lifestyle, Wearable Electronics.		
Module:5	**IoT and M2M**	**6 hours**
Introduction to M2M, Difference between IoT and M2M, SDN and NFV for IoT, Software Defined Networking, Network Function Virtualization, IoT System Management with NETCONF-YANG, Need for IoT Systems Management, Network Operator Requirements, NETCONF, YANG.		
Module:6	**IoT Platforms Design Methodology**	**6 hours**
Process Specification, Domain Model Specification, Information Model Specification, Service Specifications, IoT Level Specification, Functional View Specification, Operational View Specification, Device & Component Integration, Case Study on IoT System for Weather Monitoring, IoT Physical Devices & Endpoints, Basic building blocks of an IoT Device, Exemplary Device: Raspberry Pi , pcDuino, BeagleBone Black, Cubieboard.		
Module:7	**IoT Physical Servers & Cloud Offerings**	**6 hours**
Introduction to Cloud Storage Models & Communication APIs, WAMP - AutoBahn for IoT, Xively Cloud for IoT, Django Architecture, Starting Development with Django, Amazon Web Services for IoT, Amazon EC2, Amazon AutoScaling, Amazon S3, Amazon RDS, Amazon DynamoDB, Amazon Kinesis, Amazon SQS, Amazon EMR, SkyNet IoT Messaging Platform.		
Module:8	**Contemporary issues**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)

1.	Vijay Madisetti and Arshdeep Bahga, Internet of Things: A Hands-On Approach, VPT edition1, 2014.

Reference Books

1.	Jonathan Follett, Designing for Emerging - UX for Genomics, Robotics, and the Internet of Things Technologies, O'Reilly, 2014.

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ITE4004	Wireless Mobile Networking	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**ITE3001**	**Syllabus version**				
		1.00				

Course Objectives:

1. To learn about different types of wireless and mobile systems
2. To understand the various layers in wireless network
3. To have in-depth knowledge in routing protocols

Expected Course Outcome:

1. Demonstrate knowledge of the fundamentals of wireless, mobile and next generation networks
2. Design and implement adhoc wireless networks
3. Design and choose appropriate MAC protocols for Adhoc networks
4. Design and choose appropriate routing protocols for Adhoc networks based on their need
5. Design transport layer protocols for adhoc networks and and provide QoS for wireless networks
6. Develop applications using Wireless and Mobile Networking
7. Comprehend the need of QoS in wireless and mobile networks
8. Design, implement and evaluate the various protocols and architectures of wireless and mobile networks

Module:1	**Introduction**	**6 hours**

Fundamentals of wireless and mobile systems - IEEE 802.11 - Wireless LAN's, PAN's.

Module:2	**Wireless WAN's and MAN's**	**6 hours**

Cellular concept and architecture, UMTS, 2G/3G Versus LTE, Next Generation Mobile Networks.–Wireless Internet.

Module:3	**Ad hoc wireless networks**	**6 hours**

Sensor networks – Challenges and Constraints – Node architecture – Layered and cluster architecture - Mesh networks.

Module:4	**Mac Protocols**	**6 hours**

Issues in designing MAC Protocol and goals –Classification –Contention based- Contention based with reservation- Contention based with scheduling.

Module:5	**Routing Protocols**	**6 hours**
Introduction - Issues of routing protocol - Classification - DSDV, WRP, CSGR, DSR, AODV, TORA, ZRP, OLSR, HSRP, PAR, Secure routing in ad hoc networks.		
Module:6	**Transport Layer Protocols**	**6 hours**
Issues in designing transport layer protocols for ad hoc networks— Classification – TCP over ad hoc networks.		
Module:7	**QoS for Wireless Networks**	**6 hours**
Issues and challenges in providing the QoS in wireless networks –Energy Management.		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book	
1.	C. Siva Ram Murthy, B. S. Manoj, Ad Hoc Wireless Networks – Architecture and Protocols, Pearson Education, 2010.
Reference Books	
1.	Asoke K. Talukder, Roopa R.Yavagal, Mobile Computing-Technology, Applications and Service Creation, Tata McGraw Hill, 2010
2.	Waltenegus Dargie, Christian Poellabauer, Fundamentals of wireless sensor Networks - theory and practice, John Wiley & Sons, 2010.
3.	Ian F. Akyildiz, Mehmet Can Vuran, Wireless Sensor Networks, John Wiley & Sons, 2010.

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ITE4010	Network Programming, Protocols and Standards	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**ITE3001**	**Syllabus version**				
		1.00				

Course Objectives:

1. To learn the foundation of various techniques for Network Programming.
2. To understand the TCP/IP protocol suite
3. To get an insight into network standards.

Expected Course Outcome:

1. Demonstrate the knowledge of fundamentals of Network Layer Protocols
2. Comprehend the basics of network programming models
3. Provide a basic knowledge of network programming and client server architecture.
4. Demonstrate the URL and HTTP.
5. Use and apply the function, services, header formats of TCP and UDP.
6. Provide solutions using socket programming and UDP sockets.
7. Use the network standard in wired and wireless networks.
8. Design and implement the protocols and standards of network programming in real time applications.

Module:1	**Network Layer Protocols**	**6 hours**

IPv4 – IPv6 - RIP – OSPF – BGP – Multicasting

Module:2	**Basics of Network Programming**	**5 hours**

Internet – Client Server Model – Streams – Internet Address

Module:3	**URL and HTTP**	**6 hours**

URL's and URI's - HTTP Methods – URL Connections

Module:4	**Transport Layer Protocols**	**5 hours**

Functions, Services and Header Formats of TCP and UDP

Module:5	**Socket Programming for Clients and Server**	**10 hours**

Using Sockets – Constructing and connecting sockets – Getting information about a socket – Setting socket options - Using Server sockets – Constructing Server sockets – Server socket options

Module:6	**UDP Sockets**	**5 hours**
UDP Protocol-UDP clients and Servers- Datagram Packet Class – Datagram Socket class – Socket options		
Module:7	**Network Standards**	**5 hours**
Wired Standards – Wireless Standards		
Module:8	**Contemporary issues**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Elliotte Rusty Harold, Java Network Programming, O'Reilly Media, 2013
Reference Books	
1.	Behrouz A. Forouzan, TCP/IP Protocol Suite, McGrawHill Publication, 2011
2.	W. Richard Stevens, Unix Network Programming-The Sockets Networking API, Pearson, 2013

Total Laboratory Hours	30 hours

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