VIT®

Vellore Institute of Technology

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

SCHOOL OF INFORMATION TECHNOLOGY & ENGINEERING

Bachelor of Computer Applications

(B.C.A)

Curriculum

(*2018-2019 admitted students*)

VISION STATEMENT OF VELLORE INSTITUTE OF TECHNOLOGY

- Transforming life through excellence in education and research.

MISSION STATEMENT OF VELLORE INSTITUTE OF TECHNOLOGY

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 and solve 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.

VISION STATEMENT OF THE SCHOOL OF INFORMATION TECHNOLOGY 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 INFORMATION TECHNOLOGY 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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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

1. Graduates will be successful in pursuing higher studies in their chosen field.

2. Graduates will interact with their peers in other disciplines in their work place and society and contribute to the economic growth of the country.

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

PROGRAMME OUTCOMES (POs)

PO_01: Having a clear understanding of the subject related concepts and of contemporary issues.

PO_02: Having problem solving ability- solving social issues and computer domain specific problems

PO_03: Having adaptive thinking and adaptability

PO_04: Having a clear understanding of professional and ethical responsibility

PO_05: Having cross cultural competency exhibited by working in teams

PO_06: Having a good working knowledge of communicating in English

PO_07: Having interest in lifelong learning

PROGRAMME SPECIFIC OUTCOMES (PSOs)

On completion of B.C.A. (Bachelor of Computer Applications) programme, graduates will be able to

PSO1: To assimilate technical knowledge in diverse areas of computer applications with practical competencies.

PSO2: To acquire technical and professional skills that support career growth and higher educational opportunities.

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CREDIT STRUCTURE

Category-wise Credit distribution

Category	Credits
University core (UC)	**33**
Programme core (PC)	**61**
Programme elective (PE)	**32**
University elective (UE)	**06**
Bridge course (BC)	-
Total credits	**132**

Bachelor of Computer Applications

DETAILED CURRICULUM

University Core

S. No.	Course Code	Course Title	L	T	P	J	C
1.	ENG1001	BASIC ENGLISH	0	0	4	0	2
2.	ENG1012	COMMUNICATIVE ENGLISH	0	0	4	0	2
3.	CHY1003	ENVIRONMENTAL STUDIES	3	0	0	0	3
4.	HUM1032	ETHICS AND VALUES	2	0	0	0	2
5.	ITA3098	COMPREHENSIVE EXAMINATION	0	0	0	0	2
6.	ITA3099	CAPSTONE PROJECT	0	0	0	0	12
7.	MAT1012	STATISTICAL APPLICATIONS	2	0	2	0	3
8.	EXC4097	CO-EXTRA CURRICULAR BASKET	0	0	0	0	2
9.	STS1011	INTRODUCTION TO SOFT SKILLS	3	0	0	0	1
10.	STS2011	REASONING SKILL ENHANCEMENT	3	0	0	0	1
11.	STS2012	INTRODUCTION TO ETIQUETTE	3	0	0	0	1
12.	STS3003	SOFT SKILLS FOR PROFESSIONAL DEVELOPMENT	3	0	0	0	1
13.	STS3011	PREPAREDNESS FOR EXTERNAL OPPORTUNITIES	3	0	0	0	1

Bachelor of Computer Applications

Programme Core

S. No.	Course Code	Course Title	L	T	P	J	C
1.	ITA1001	COMPUTATIONAL THINKING	2	2	0	0	3
2.	ITA1002	DIGITAL COMPUTER FUNDAMENTALS	3	0	2	0	4
3.	ITA1003	PRINCIPLES OF ACCOUNTING	3	0	2	0	4
4.	ITA1004	SOFTWARE ENGINEERING	3	0	0	0	3
5.	ITA1005	DATABASE MANAGEMENT SYSTEMS	3	0	2	4	5
6.	ITA1006	COMPUTER NETWORKS	3	0	0	0	3
7.	ITA1007	WEB DEVELOPMENT	3	0	2	4	5
8.	ITA2001	PROGRAMMING IN C	3	0	2	0	4
9.	ITA2002	SOFTWARE TESTING	3	0	2	0	4
10.	ITA3001	OBJECT ORIENTED PROGRAMMING	3	0	2	4	5
11.	ITA3002	DATA STRUCTURES	3	0	2	0	4
12.	ITA3006	PROGRAMMING IN JAVA	3	0	2	4	5
13.	ITA3007	OPEN SOURCE PROGRAMMING	3	0	2	0	4
14.	ITA3008	OPERATING SYSTEMS	3	0	2	0	4
15.	MAT1013	DISCRETE MATHEMATICS FOR COMPUTER SCIENCE	3	2	0	0	4

Programme Elective

S. No.	Course Code	Course Title	L	T	P	J	C
1.	ITA1008	M-COMMERCE	3	0	0	0	3
2.	ITA1009	DECISION SUPPORT SYSTEM	3	0	0	0	3
3.	ITA1010	LINUX/UNIX PROGRAMMING	3	0	2	0	4
4.	ITA2003	COMPUTER ARCHITECTURE	3	0	0	0	3
5.	ITA2004	FUNDAMENTALS OF DATA ANALYTICS	3	0	2	0	4
6.	ITA2005	COMPUTER GRAPHICS	3	0	0	0	3
7.	ITA2006	MULTIMEDIA SYSTEMS	3	0	2	0	4
8.	ITA2007	DATA COMMUNICATION AND NETWORKS	3	0	0	0	3
9.	ITA2008	DATA WAREHOUSING AND DATA MINING	3	0	0	4	4
10.	ITA2009	CRYPTOGRAPHY	3	0	0	0	3
11.	ITA2010	USER EXPERIENCE DESIGN	3	0	0	4	4
12.	ITA2011	MOBILE APPLICATION DEVELOPMENT	3	0	2	4	5
13.	ITA2012	CLOUD COMPUTING	3	0	0	4	4
14.	ITA3003	SOFTWARE PROJECT MANAGEMENT	3	0	0	0	3
15.	ITA3004	SCRIPTING LANGUAGES	3	0	2	0	4
16.	ITA3005	COMPUTER HARDWARE	3	0	0	0	3
17.	ITA3009	INTERNET OF THINGS	3	0	0	4	4
18.	ITA3010	OBJECT ORIENTED ANALYSIS AND DESIGN	3	0	0	0	3
19.	ITA3011	NETWORK ADMINISTRATION	3	0	2	0	4
20.	MGT1014	SUPPLY CHAIN MANAGEMENT	3	0	0	0	3

ENG1001	Basic English	L	T	P	J	C
		0	0	4	0	2
Pre-requisite	**Nil**	**Syllabus version**				
		1.2				

Course Objectives:

1. To make students understand and help in right pronunciation.
2. To prepare students to participate effectively in critical conversations and demonstrate the ability to communicate effectively.
3. To enable students comprehend complex English texts.

Expected Course Outcome:

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

1. Enhance the listening skills of the learners by exposing them to documentaries, speeches etc.,
2. Comprehend language and communication skills in academic and social contexts.
3. Strengthen the informal, formal and creative writing skills of the learners in social media.
4. Communicate clearly and precisely in formal and informal contexts
5. Describe and narrate incidents with clarity, coherence suitable for purpose and audience

Module:1	Listening	**4 hours**

Active Listening, Casual Conversations

Activity: Medium level and answering MCQs

Module:2	Speaking	**6 hours**

Conversations

Activity: Talking about the weather, current events, at the office, at social event, out for a walk.

Module:3	Reading	**4 hours**

Reading Newspaper Articles

Activity: Answering factual comprehension questions

Module:4	Writing	**6 hours**

Letter Writing

Activity: Writing letters to the editor, leave letter, asking for general information.

Module:5	Listening and Responding	**4 hours**

TED Talks

Activity: Answering Critical Questions

Module:6	Speaking	**6 hours**
Activity: Narrating Short stories/ Anecdotes		
Module:7	Reading	**4 hours**
Skimming and Scanning Activity: Reading a short story and summarizing.		
Module:8	Writing	**4 hours**
Activity: Writing Blogs on Nature/Environment/Science/Technology		
Module:9	Listening	**4 hours**
Motivational Speeches Activity : Short Speeches on simple topics		
Module:10	Speaking	**4 hours**
Narrating Incidents Activity: Short Speeches on unforgettable incidents/happenings		
Module:11	Writing	**4 hours**
Sentence Patterns Activity: Analyzing different sentence patterns.		
Module:12	Speaking	**4 hours**
Describing People Activity: Short Speeches on people's features		
Module:13	Writing	**6 hours**
Digital Writing Skills e-mail writing, SMS writing, Posting messages on social media		
	Total Practical hours:	**60hours**

Text Book(s)

1.	Thomson, Kenneth. **English for Meetings**. OUP : 2015

Reference Books

1.	ParulPopat. **Communication Skills**. Pearson Education: 2015.
2.	Professional Speaking skills, ArunaKoneru, Oup, 2015

3.	English For Meetings, Kenneth Thomson, Oup , 2015		
Mode of Evaluation: MCQs, Presentation, Discussion, Assignments, Mini Projects			
List of Challenging Experiments (Indicative)			
1.	Creating a Digital Profile – LinkedIn (Résumé/Video Profile)		10 hours
2.	Crossword Puzzles		6 hours
3.	Writing SOPs		6 hours
4.	Exploring multi-cultural perspectives		6 hours
5.	Analyzing a challenging scenario		8 hours
6	Word games		6 hours
7	Writing slogans		6 hours
8	Role play		6 hours
9	Solving riddles in English		2 hours
10	Speaking on an imaginary situation (If I were)		4 hours
	Total Practical Hours		60 hours
Mode of evaluation: Presentation, Discussion, Assignments, Mini Project			
Recommended by Board of Studies	22-07-2017		
Approved by Academic Council	No. 46th	Date	24-8-2017

ENG1012	Communicative English	L	T	P	J	C
		0	0	4	0	2
Pre-requisite	**Basic English**	**Syllabus version**				
ENG1001		1.2				

Course Objectives:

1. To help the learners attain high level proficiency in all the four language skills.
2. To make the learners familiar with different types of communication.
3. To help the learners understand the barriers to communication.

Expected Course Outcome:

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

1. Familiarize learners with basic and fundamental principles of formal communication.
2. Engage the learners in academic, business, formal and informal communications activities.
3. Strengthen the informal, formal and creative writing skills of the learners.
4. Develop skills to comprehend, analyze and review creative works.
5. Enhance the listening skills of the learners by exposing them to documentaries, speeches etc.

Module:1	Listening	**4 hours**
Formal Conversation		
Activity: Listening and responding to questions		
Module:2	Speaking	**6 hours**
Formal Situations		
Activity: Small talk		
Module:3	Writing	**4 hours**
Paragraph Writing		
Activity: Write a paragraph on your hobby/ interesting incident		
Module:4	Reading	**4 hours**
Sports Articles		
Activity: Reading for general information		
Module:5	Listening	**4 hours**
Film Clippings/ Documentaries		
Activity: Listening for specific information		
Module:6	Speaking	**4 hours**
Short Discussions		
Activity: Speak on issues		

Module:7	Writing	**4 hours**
Letter Writing		
Activity: Enquiry Letters, Complaint Letter		
Module:8	Speaking	**6 hours**
Interview skills		
Activity: Role play interview situations		
Module:9	Writing	**4 hours**
Précis writing		
Activity: Summarize the given passage		
Module:10	Reading	**4 hours**
Science articles		
Activity: Reading for factual information		
Module:11	Listening	**4 hours**
Speeches of renowned personalities		
Activity: Listen and respond to given task		
Module:12	Writing	**4 hours**
Short stories		
Activity: Write the story using given hints		
Module:13	Speaking	**4 hours**
Extempore		
Activity: Short speeches on general topics		
Module:14	**Writing**	**4 hours**
Creative writing		
Activity: Writing an essay on general topics		
	Total Practical hours:	**60 hours**

Text Book(s)

1.	Scanlon, Jaimie, et al. *Q: Skills for success. Listening and Speaking*.2 Oxford University Press, 2015.
2.	Caplan, Nigel A., and Scott Roy Douglas. *Q, Skills for Success: Reading and Writing*.2 Oxford University Press, 2011.

Reference Books

1.	Joan Maclean & Tony Lynch, Study Speaking, Kenneth Anderson, CUP, 2013
2	**John Thill, Courtland L. Bovee, Excellence In Business Communication, 2016, Edition 12, Pearson, ISBN-13: 978-0134388175**
3	Judith F Olson, Writing Skills: Success in 20 Minutes a Day, 2013, Edition 1, Goodwill Publishing House, ISBN-13: 978-8172452452

4	How to Speak and Write Correctly, Joseph Devlin, 2017, Edition 1, CreateSpace Independent Publishing Platform, **ISBN-13:** 978-1974637218			
5.	MeenaAgarwal, English Communication, 2016, Edition 1, ISBN-13: 978-9351676737 Publisher			
Mode of Evaluation: Quizzes, Presentation, Role play, Group Discussion, Assignments, Mini Project				
List of Challenging Experiments (Indicative)				
1.	Video Resume			8 hours
2.	Language learning strategies			6 hours
3.	Movie Review			4 hours
4.	Role-Play			6 hours
5.	Survey			8 hours
6.	Poster Making			6 hours
7.	Mind mapping			4 hours
8.	Transcoding			6 hours
9.	Word building activities			6 hours
10.	Report writing			6 hours
			Total Practical Hours	60 hours
Mode of evaluation: Quizzes, Presentation, Role play, Group Discussion, Assignments, Mini Project				
Recommended by Board of Studies	22-07-2017			
Approved by Academic Council	No. 46th	Date	24-8-2017	

CHY1003	Environmental Studies	L	T	P	J	C
		2	0	0	4	3
Pre-requisite	None	Syllabus version				
		1.1				

Course Objectives:

1. To make students understand and appreciate the unity of life in all its forms and the implications of life style on the environment.
2. To broaden the understanding of global climate changes and the importance of renewable sources of energy.
3. To give students a basic understanding of the major causes of environmental degradation on the planet, with specific reference to Indian situation.
4. To inspire students to find ways in which they can contribute personally and professionally to prevent and rectify environmental problems.

Expected Course Outcome:

Upon Completion of the course, the 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 sound life decisions as well as enter a career in an environmental profession or higher education.

Module:1	Environment and Natural Resources	7 hours

Definition, scope, importance; need for public awareness on natural resources Forest resources – use, exploitation, causes and consequences of deforestation. Water resources – use of surface and subsurface water; dams - effect of drought, water conflicts. Land resources - Land degradation, soil erosion and desertification. Indian Case studies. Food resources – Definition, world food problems, Traditional and modern agriculture and its impacts and remedies.

Module:2	Energy Resources	7 hours

Definition for renewable and non-renewable energy resources. Non-renewable energy resources - oil, Natural gas, Coal, Nuclear energy. Renewable energy - Solar energy, Hydroelectric power, Ocean thermal energy, Wind and geothermal energy. Biomass energy and Bio Gas.

Module:3	Ecosystem and Biodiversity	5 hours

Concept of ecosystem, Structure and functions of an ecosystem, Food chains, food webs. Energy flow in an ecosystem, ecological pyramids and ecological succession. Case studies: Bio magnification of DDT. Biodiversity-Bio-geographical classification of India, hotspots, values of biodiversity. Threats to biodiversity - Case study. Conservation of bio-diversity. GM Crops

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Module:4	Environmental changes and Remediation	6 hours

Air, water, soil, Thermal Pollution: Causes, effects and control measures; Nuclear hazard. Solid

waste Management- Causes, Effects and control measures. Floods, earthquakes, cyclones, tsunami and landslides, Case studies.		
Module:5	**Global Climatic Change and Mitigation**	**5 hours**
Global climate change and greenhouse effect – Kyoto Protocol, Carbon sequestration, Acid rain, Ozone depletion problem – Montreal Protocol.		
Module:6	**Social Issues and the Environment**	**6 hours**
Urban problems related to energy and sustainable development, Water conservation, Rain water harvesting, Wasteland Reclamation. Environment Protection Act - Prevention and control of Pollution of Air and Water. Wildlife protection and Forest Conservation Acts.		
Module:7	**Human Population and the Environment**	**7 hours**
Population growth, variation among nations, population explosion, Family Welfare Programme, Environment, Women and Child Welfare, Human rights, HIV/AIDS, Role of information technology on environment and human health. Discussion on current environmental issues / topics by an Industrial expert or faculty		
Module:8	**Contemporary issues**	**2 hours**
Lecture by Industry Experts		
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	AnubhaKaushik and C.P. Kaushik, Environmental Science and Engineering, 2016, 5th Edition, ISBN: 978-81-224-4013-3, New Age International.
2.	G. Tyler Miller Jrand Scott E. Spoolman, Living in the Environment, 2012. 17th Edition, ISBN-13: 978-0-538-73534-6, Brooks / Cole.
Reference Books	
1.	Environmental Science and Engineering by Anjali Bagad, 2014, 1st Edition, ISBN-10: 9350997088, Technical Publications.
2.	Introduction to Environmental Engineering by Masters, 2015, 3rd Edition, ISBN-10: 9332549761, Pearson Education India.
3.	Basic Environmental Sciences For Undergraduatesby Dr.Tanu Allen, Dr.Richa K. TyagiDr.Sohini Singh, 2014, 1st Edition, ISBN-10: 938375827, Vayu Education of India.

Mode of Evaluation: Internal Assessment (CAT, Quizzes, Digital Assignments) & FAT			
Recommended by Board of Studies	12.8.2015		
Approved by Academic Council	No.47th	Date	24.08.2015

HUM1032	Ethics and Values	L	T	P	J	C
		2	0	0	0	2
Pre-requisite	Nil	Syllabus version				

Course Objectives:

1. To understand and appreciate ethical issues facing an individual, 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
4. Exposes to non-traditional violent and nonviolent crimes that have significant physical, fiscal, and social costs.

Expected Course Outcome:

1. Make better lifestyle choices to increase your health and wellness for life.
2. Ability to follow sound morals and ethical values scrupulously to prove as good citizens
3. Understand how a habit becomes an addiction; its effects and prevention.
4. Understand the negative health impacts of certain unhealthy behaviours.
5. Identify and portray ethical behaviours and values consistent with the health.
6. 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.
7. 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 cybercrimes, addiction to mobile phone usage, video games and social networking websites		
Module:8	**Invited Talk:** Contemporary Issues	**3 hours**
	Total Lecture hours:	**30hours**

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.	Birch, S (2011), "Electoral Malpractice", Oxford University Press, UK
4.	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
5.	Pandey, P. K (2012), "Sexual Harassment and Law in India", Lambert Publishers, Germany

Mode of Evaluation: Quizzes, CAT, Digital assignments, poster/collage making and projects

Recommended by Board of Studies	22-07-2017		
Approved by Academic Council	No. 47th	Date	24-8-2017

ITA3098	Comprehensive Exam	L	T	P	J	C
		0	0	0	0	2
Pre-requisite	Nil	Syllabus version 1.0				

Course Objectives:

1. To re-iterate and explore the basic concepts emphasized in core computing courses.
2. To provide a holistic view about the core and advanced computing principles.
3. To explore the application avenues for the core computational concepts.

Expected Course Outcomes:

1. Demonstrate knowledge of the fundamental requirement of number systems including binary logic system.
2. Demonstrate basic organization and architecture of a digital computer.
3. Develop applications on various data structures using C language.
4. Explore the Database Design constructs using Entity-Relation model.
5. Apply the functionalities of an Operating System as a resource manager, process synchronizer and methods used to implement the different parts of OS.
6. Mastering the concepts of protocols, network interfaces and design/performance issues in local area networks and wide area networks.
7. Understand the concept of various process models, activities for developing computationally intensive software applications.

Module:1	Digital Computer Fundamentals and Computer Architecture	

Number Conversion –Boolean algebra–K-Map–Combinational circuit design–Flip Flops–Counters–Registers –Fundamental of Computer Architecture– Instruction Execution Cycle– Data Representation– Number Systems– Fixed point and Floating point arithmetic operations– Memory Organization– Addressing modes

Module:2	Programming in C and Open Source Programming	

Introduction – Variables – Keywords – Formatted Input/Output – Operators – Conditional Statements – Loops – Arrays – Preprocessors –Functions – Pointers – Structure – Union – Enum – Files & Streams–OSD FOSS license PHP constructs files – E-mailing with PHP Session tracking using PHP-cookies. A MySQL in-built function, DDL, DML commands PHP-MySQL integrated functions. PERL and RUBY variables control structures array pattern matching

Module:3	Data Structure and Database Management Systems	

Abstract data type–analysis of algorithms–Arrays- stack and queue–linked list– Sorting techniques– Binary tree traversals–Graph traversals– shortest path algorithm–Database systems–architecture– Entity-Relationship model– Relational data model– Relational algebra– Relational database design–Normalization- Query Processing and Optimization–Transaction Processing–Database Security

Module:4	Computer Networks	

OSI Model– Network topologies– Circuit Switched–Virtual Circuit– Error detection and correction techniques– Logical Addressing (IPv4, IPv6)– Internet protocols– CSMA–Routing algorithms– TCP and UDP– Congestion control– Application Layer Protocols

Module:5	Software Engineering	
Fundamentals of Software Engineering–Requirement Engineering–Software Design–User Interface Design– Software Testing– Software Reuse		

ITA3099	Capstone Project	L	T	P	J	C
		0	0	0	0	12
Pre-requisite		**Syllabus version**				
		v. **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 with reasonable assumptions and constraints.
2. Perform literature search for acquiring in-depth knowledge in the chosen domain.
3. Develop a suitable solution methodology for the problem.
4. Conduct experiments / Design & Analysis / solution iterations and document the results.
5. Perform error analysis / benchmarking / costing.
6. Synthesize the results and arrive at scientific conclusions / products / solution.
7. 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 5 months duration based on the completion of required number of credits as per the academic regulations.

3. Should be team work.

4. Carried out inside or outside the university, in any relevant industry.

5. Publications in the reputed journals / International Conferences will be an added advantage

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

Recommended by Board of Studies	10.06.2016		
Approved by Academic Council	41st AC	Date	17.06.2016

MAT1012	Statistical Applications	L	T	P	J	C
		2	0	2	0	3
Pre-requisite	None	Syllabus Version				
		1.0				

Course Objectives:

1. This paper provides the meaning and scope of Statistical Applications.
2. This enables the students to understand and use the applications of statistics in the real-time problems.
3. This course seeks the comprehensive knowledge about the data collection, presentation of data, pictorial representation, and measures of central tendency, measures of dispersion, control charts, correlation, regression, time series, probability, estimation and inference.

Expected Course Outcome:

A student will be able to

1. Organize, present and interpret statistical data, both numerically and graphically.
2. Perform regression analysis, and compute and interpret the coefficient of correlation.
3. Use various methods to compute the probabilities of events.
4. Analyse and interpret data using appropriate statistical hypothesis and parametric testing techniques.
5. Apply statistical quality control techniques.
6. Implement SPSS code for statistical data.

Module:1	Introduction to Statistics and Data Collection:	5 hours

Importance of statistics, concepts of statistical population and a sample - Methods of Random and Non - Random Sampling - quantitative and qualitative data - Measurement scales - nominal, ordinal, interval and ratio - Primary and secondary data- Classification and tabulation of data. Diagrammatic and graphical representation of data-Histograms and Frequency Polygons.

Module:2	Describing Business Data:	5 hours

Measures of Central tendency- Mean, median and mode- Measures of Dispersion, Range, Quartile deviation, Mean Deviation, Standard Deviation-The coefficient of Variation.

Module:3	Correlation and Regression Analysis:	4 hours

The Scatter Plot- Correlation-Types-Karl Pearson's Coefficient of Correlation-Spearman's Rank Correlation –Regression lines and coefficients- the coefficient of Determination- Residuals-the standard error of Estimate.

Module:4	Probability:	4 hours

Probability, Random experiments, trial, sample space, events. Approaches to probability - classical, empirical, subjective and axiomatic. Theorems on probabilities of events. Addition rule of probability. Conditional probability, independence of events and multiplication rule of probability. Bayes theorem and its applications.

Module:5	Statistical Control Charts:	5 hours

Statistical Control Charts- Introduction - Types of Control Charts – Setting up a Control Procedure – X bar

(Mean) Chart and R Chart–c Chart–p Chart–Advantages and Limitation of Control Charts.		
Module:6	**Testing of Hypothesis:**	**5 hours**
Testing of Hypothesis – Z- test, Student's t- test, F-test, Chi-square test.		
Module:7	**Contemporary Issues**	**2 hours**
Industry Expert Lecture		
	Total Lecture hours:	**30hours**

Text Book(s)	
1.	David. M. Levin, David. F. Stephen, and Cathryn. A. Szadat, (2013), Statistics for managers using MS-Excel, 7Th Edition, Pearson Education (India)
Reference Books	
1.	S. P. Gupta, 2014, Business Statistics and Statistical Methods, S. Chand Publication, New Delhi.
2.	L. Mayes & Keying, (2005), Probability Statistics for Engineers and Scientists, Pearson Education.
3.	Levin Richard and Rubin David, (2008), 2011-reprint), Statistics For Management, 7th Edition, Pearson Education, Dorling Kindersley.
4.	Andy Field, (2013), Discovering Statistics Using IBM SPSS Statistics, 4th Edition, Sage Publication.

Mode of Evaluation

Digital Assignments, Continuous Assessments, Final Assessment Test

List of Challenging Experiments (Indicative)		
1.	Tabulation and Pictorial representations of Various data types using Excel or SPSS.	2 hours
2.	Calculation of Mean, Median, Mode, location measures, Variance and Box-Plot representations calculation using Excel or SPSS.	2 hours
3.	Plotting scatter plot, Measuring correlation	2 hours
4	Fitting of linear regression	2 hours
5	Fitting of Multiple linear regression	2 hours
6.	Plotting Mean and Range Charts, C chart, using Excel or SPSS.	2 hours
7	Plotting P chart ,np chart and C chart using Excel or SPSS.	2 hours
8	Z-test for means and Proportions-One sample and Two sample tests	2 hours
9	t-test for single mean, difference of means and Proportions	2 hours
10	Test for variance and Contingency (Chi-Square -Cross Tab) Test Excel or SPSS.	2 hours
	Total Laboratory Hours	20 hours

Mode of Evaluation

Weekly Assessments, Final Assessment Test

Recommended by Board of Studies	25-02-2017		
Approved by Academic Council	No. 45th	Date	16-03-2017

STS1011	Introduction to Soft skills	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	**None**	**Syllabus version**				
		2				

Course Objectives:

1. To Identify and develop personal skills to become a more effective team member/leader.
2. To Examine, clarify and apply positive values and ethical principles.
3. To develop habits which promote good physical and mental health.

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. 45	Date	15-06-2017

STS1012	Introduction to Business Communication	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	**None**	**Syllabus version**				
		2				

Course Objectives:

- To provide an overview of Prerequisites to Business Communication.
- To enhance the problem solving skills and improve the basic mathematical skills.
- 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

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

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**
S**trengthening 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, Third Edition, 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. 45	Date	15-06-2017

STS2011	Reasoning Skill Enhancement	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	None	**Syllabus version**				
		2				

Course Objectives:

- To Strength the social network by the effective use of social media and social interactions.
- To Identify own true potential and build a very good personal branding.
- 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, Puzzle test, 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 Encyclopaedia, 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. 45	Date	15-06-2017

STS 2012	Aptitude and Reasoning skills	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	**None**	**Syllabus version**				
		1				

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
4. To develop the self-presentation skills

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 and Probability

Module:3	Verbal Ability	8 hours

Critical Reasoning

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

Vocabulary for placements

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

Spelling correctness

Module:4	Recruitment Essentials	8 hours

Mock interviews

Cracking other kinds of interviews

Skype/ Telephonic interviews

Panel interviews

Stress interviews

Case studies/ situational interview

- Scientific strategies to answer case study and situational interview questions
- Best ways to present cases

Practice on presenting cases and answering situational interviews asked in recruitment rounds.

Module:5	Writing skills for placements	6 hours

Essay writing

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

Writing Company Blogs
Building a blog, Developing brand message, FAQs', Assessing Competition
Email writing etiquette

Module: 6	Adaptability & Time management	7 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 **Time management skills** Prioritization - Time Busters, Procrastination, Scheduling, Multitasking, Monitoring 6. Working under pressure and adhering to deadlines		
Total Lecture hours	**45 hours**	

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

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

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

STS3003	Soft skills for Professional Development	L	T	P	J	C
		3	0	0	0	1
Pre-requisite	None	**Syllabus version**				
		1				

Course Objectives:

1. To enhance the logical reasoning skills of the students and improve the verbal ability of the students.
2. To facilitate the Basic quantitative ability.
3. To enrich the professional requirements in students.

Expected Course Outcome:

1. The Students will be able to perform effectively in social, academic and professional contexts

Module:1	**Numeracy**	**10 hours**

Time, Speed & Distance-Work-Interest calculations- Value of money ,ratio, Proportion-Mixtures & Solution-Progression-Problems on Ages-Numbers- Power cycle- Remainder pattern,-Finding last two unit digits- Pipes and Cisterns- Divisibility rules for unlimited numbers-LCM and HCF-Alligations and Mixtures Introduction to Statistics-Stocks and Shares-discounts-Introduction to Business Mathematics

Module:2	**Logical Reasoning**	**5 hours**

Directions-Analogy-Sequential Input and Output-Syllogisms-Puzzles Complex arrangements-Clocks, Calendars, Cubes-Abductive Reasoning, Deductive Reasoning, Visual Reasoning-Blood Relations, Spatial reasoning

Module:3	**Verbal Reasoning & Vocabulary**	**5 hours**

Critical Reasoning - Para jumbles, General Vocabulary, Business Vocabulary, Collocations - Strategies for vocabulary enhancement, Idiomatic phrases & Phrasal verbs

Module:4	**Business Communication & Grammar**	**5 hours**

Fundamentals of Business Communication - Written Communication- Direct & Indirect Speech-Voice-Tenses: Exceptions to rules in Grammar

Module:5	**Professional networking**	**5 hours**

Creating a network through multiple Channels- Social Media Different Conversation techniques-Capitalizing on one's strength Successful Negotiation - Essential Skills and Strategies-Netiquette

Module:6	**Interview Facing Skills / Resume Writing**	**5 hours**

Structured and Unstructured Interview, Face-Face Interview Techniques to face Video Interviews,

Grooming, Body Language, Dressing Etiquette-Mock Interview- Customizing Resume - Usage of		
Power Verbs, Formatting- One's selling power		
Module:7	**Case Studies**	**5 hours**
Technical/Non-Technical Company specific tests Mock tests		
Module:8	**Organizational Culture**	**5 hours**
Understanding the hierarchy of an Organization- Adapting to the culture of the Work place -		
Meeting the Industry's expectation Workload Management and prioritizing- Team work		
Total Lecture hours	**45 hours**	

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.

Reference Books

1	Brown, Lola (2007) Resume Writing Made Easy. Canada. Prentice Hall.
2	Swan, Michael (2013) Practical English Usage. Oxford. Oxford Publications
3	Cosentino, Marc. P. (2016) Case in point Burgee Press
4	RS Agarwal, R.S. (2013) Quantitative Aptitude. Mumbai Publishers S. Chand

Mode of Evaluation: 3 Assessments - Assignments, Projects, Case studies, Role plays and FAT (Computer Based Test)

Recommended by Board of Studies		08-05-2016	
Date of approval by the Academic Council	No. 45	Date	12-12-2016

ITA1001	Computational Thinking	L	T	P	J	C
		2	2	0	0	3
Pre-requisite	**Nil**			**Syllabus version**		
				1.1		

Course Objectives:

1. To know the correct and efficient ways of solving problems.
2. To learn and analyses algorithm performance.
3. To develop a base for advanced study in Computer Science.

Expected Course Outcomes:

1. Gain the experience in applying computational thinking skills to a variety of real world problems.
2. Develop an algorithm for specific problems.
3. Develop the mathematical foundation to analysis the algorithms.
4. Analyze worst-case running times of algorithms using asymptotic analysis. Analyze the time complexity of various algorithms.
5. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
6. Verify the correctness of algorithms using inductive proofs and invariants.

Module:1	**Introduction**	**4 hours**
The problem solving aspect, Top down design, Implementation of algorithms, Pseudo code, Flowchart.		
Module:2	**Fundamental Algorithms**	**4 hours**
Exchange the values of two variables - Counting - Summation of a se t of number - Factorial computation -Sine Function computation - Generation of the Fibonacci sequence -Reversing the digits of an integer - Base conversion - Character to number conversion. All algorithms to be discussed with flowchart and pseudo code		
Module:3	**Factoring methods**	**4 hours**
Finding the square root of a number – The smallest divisor of an integer - The greatest common Divisor of two integers - Generating prime numbers - Computing the prime factors of an integer - Generation of Pseudo - random numbers - Raising a number to a large power-Computing the n^{th} Fibonacci number		
Module:4	**Recursive Algorithm analysis**	**4 hours**
Overview of algorithmic design, Asymptotic notation and its properties, Growth of Functions, Time complexity.		
Module:5	**Non-recursive Algorithm analysis**	**4 hours**
Recurrence Relations.		
Module:6	**Brute force, divide and conquer**	**4 hours**
Brute-force-Bubble sort, Linear search Divide and conquer- Merge sort and Quick sort, Binary search		
Module:7	**Back tracking and greedy strategy**	**4 hours**
Back tracking – 8 Queens Problem, Greedy strategy – Activity scheduling		
Module:8	**Expert talk on contemporary issues**	**2 hours**

Total Lecture hours:	**30 hours**

Text Book(s)

1	R.G.Dromey, How to solve it by computer, 2011, 1st edition, Pearson Education.

Reference Books

1.	Cormen, Leiserson, Rivest and Stein, "Introduction to Algorithms", 2009, 3rd Edition, MIT Press.
2.	Aho, Hopcroft and ullman, The Design And Analysis of Computer Algorithms, 2009, 4th edition, Pearson Education, New Delhi.

Recommended by Board of Studies	12-08-2017		
Approved by Academic Council	No. 47th	Date	5.10.2017

ITA1002	Digital Computer Fundamentals	L	T	P	J	C
		3	0	2	0	4
Pre-requisite		**Syllabus version**				
None		1.0				

Course Objectives:

1. To understand the basis of computer and its hardware.
2. To impart knowledge on the working of the hardware part of the computer in terms of binary and to design combinational and sequential circuits.
3. To provide an exposure to commercial real time applications / tools / technologies.

Expected Course Outcomes:

1. Demonstrate knowledge of the fundamental requirement of number systems including binary logic system.
2. Develop and understand the working of the Boolean algebra and the operations of the logic gates
3. Analyze the core logical concepts to meet the challenges in implementing the circuits
4. Ability to compute response of simple sequential circuits with Flip-flops, Registers, Counters
5. Understand the basis requirement to design a system including memory, ALU and basis of microprocessor
6. Comprehend the various methods of programming in the digital world.

Module:1	**Computer Basics And Number System**	**6 hours**

Input/output Units:
Description of Computer Input Units, Other Input methods. Computer Output Units-Introduction to Number system and Codes – Converting Numbers from One Base to Another –Different number systems and their conversions (Decimal, Binary, Octal, Hexadecimal), 9's and 10's complement, 1's and 2's complement.

Module:2	**Gate Networks**	**5 hours**

Integrated Circuits: Basic gates (AND, OR, NOT gates) Universal gates (NAND and NOR gates) - other gates (XOR, XNOR gates)..

Module:3	**Boolean algebra and simplification techniques:**	**7 hours**

Boolean Algebra: Boolean identities, Basic laws of Boolean algebra- Properties of Boolean Algebra – Boolean Functions, DeMorgan's theorems, Boolean expressions for gate networks (SOP and POS), simplification of Boolean expression- Canonical and Standard forms -Karnaugh map – Don't care conditions – Tabulation Method.

Module:4	**Combinational Circuit**	**6 hours**

Combinational Logic – Adders- Subtractors (half and full)- Code Converter - Analyzing a Combinational Circuit –Multilevel NAND and NOR Circuits- Parallel binary adders- Decimal Adder- - Decoder,- Encoder,-Multiplexer- De-multiplexer with applications.

Module:5	**sequential circuits and flip flops**	**6 hours**

Flip-Flops - Latches, Edge triggered flip-flops (SR flip-flops, D flip-flops, JK flip-flops), Pulse triggered flipflops(Master slave JK flip-flop.

Module:6	**Sequential Logic Design**	**6 hours**
Registers and Counters – Design of Counters – Registers – Shift Registers – Ripple Counters.		
Module:7	**Design**:	**6 hours**
Memory and Introduction to Microprocessor- Memory Unit –Processor Logic Design – Processor Organization – Bus Organization – Scratch Pad Memory – ALU – Design of ALU – Status Register-classification of memory – Volatile, Non-Volatile, RAM, ROM, EPROM, E^2PROM, Basic Components of a Microprocessor (Introductory ideas)..		
Module:8	**Recent Trends**	**3 hours**
Very large Scale Integrated circuits(VLSI), Field Programmable Gate Arrays(FPGA).		
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Scott Mueller, Upgrading and Repairing PCs, 2015, 22nd Edition, Que Publishing, Pearson Education Inc.
Reference Books	
1.	Alan Clements, Principles of Computer Hardware, Oxford University Press, 2013, 4th Edition.
2.	James K L, Computer Hardware: Installation, Interfacing, Troubleshooting and Maintenance, 2013, Eastern Economy Edition, PHI Learning Press.

List of Challenging Experiments		
1.	Basic logic gates	2 hours
2.	Combinational Circuits	3 hours
3.	Adders and Subtractor	3 hours
4.	Code Convertors	3 hours
5.	Parallel Adder and Magnitude Comparator	3 hours
6.	Decoder and Encoder	3 hours
7.	Multiplexer and Demultiplexer	3 hours
8.	Sequential Circuit and Shift Registers	3 hours
9.	Counters	3 hours
	Total Laboratory Hours	26 hours

Recommended by Board of Studies	12.6.2015		
Approved by Academic Council	No. 37th	Date	16.6.2015

ITA1003	Principles of Accounting	L	T	P	J	C
		3	0	2	0	4
Pre-requisite	**Nil**	**Syllabus version**				
		1.0				

Course Objectives:

1. Introducing the principles of accounting concepts and ethics in business.
2. Using generally accepted accounting principles in recording business transactions and communicate the financial information.
3. Examine the accounting process, transaction analysis, asset and equity accounting, financial statement preparation and analysis.

Expected Course Outcomes:

1. Familiarize with the Generally Accepted Accounting Principles and communicate the financial condition and performance of a business.
2. Determine the financial condition, effectiveness and efficiency of business operations by preparing final accounts.
3. Book keeping the accurate records of revenue and expense to track business finances.
4. Perform Bank reconciliations to match the cash balance of the bank with the balance found on the company's financial records.
5. Provide information about the economic resources of a company and any claims to these resources by other parties.
6. Organize and account all the financial information for easy access and evaluation.
7. Ascertain the insurance claim with regard to the loss of stock due to disaster.

Module:1		**6 hours**
Introduction to Accounting : Meaning - Stakeholders - Advantages and Limitations - Accounting Concepts and Conventions – GAAP .		
Module:2	**Journal-Ledger-Trial Balance**	**6 hours**
Types of accounts- Rules. Preparation of Journal, Ledger and Trial Balance.		
Module:3	**Final Accounts**	**7 hours**
Trading Account- Profit and Loss Account-Balance Sheet Preparation of Final Accounts with simple adjustments.		
Module:4	**Depreciation Accounting**	**6 hours**
Meaning- Straight Line and Written Down value methods- Change of method of Depreciation.		
Module:5	**Single Entry**	**6 hours**
Features-Advantages –Disadvantages- Single entry Vs Double entry- Profit calculation understatement of affairs method.		
Module:6	**Bank Reconciliation Statement**	**6 hours**
Bank Reconciliation Statement-Causes of Disagreement- Preparation of Bank Reconciliation Statement.		

Module:7	**Insurance Claims**	**4 hours**
Concept-Loss of stock-Average Clause-Calculation of insurance claim.		
Module:8	**Expert talk on average due Date: Meaning-Uses-Steps- Calculation of average due date.**	**4 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	R .L. Gupta and V .K Gupta, Financial Accounting, 2012, Sultan Chand and Sons Publishers.
Reference Books	
1.	AnsulenePrinsloo, Accounting: Foundational Principles of Financial Accounting, 2015, AuRet Publishing.
2.	Joanne M. Flood, Interpretation and Application of Generally Accepted Accounting Principles, 2015, Wiley GAAP.

List of Challenging Experiments		
1.	Introduction to accounting package	2 hours
2.	Creation and alteration of company profile(Accounts only)	2 hours
3.	Accounting concepts and procedures in Accounting package	4 hours
4.	Creation of ledgers and multiple ledgers	2 hours
5.	Creation of primary groups and sub groups	2 hours
6.	Recording of sample data(Case study accounts only)	6 hours
7.	Preparation of trading accounts- Preparation of profit and loss account and balance sheet with the adjustments of depreciation	4 hours
8.	Preparation of bank reconciliation statement	4 hours
	Total Laboratory Hours	26 hours

Recommended by Board of Studies	12.06.2015		
Approved by Academic Council	No.39th	Date	16.06.2015

ITA1004	Software Engineering	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	**None**	**Syllabus version**				
		1.0				

Course Objectives:

1. To introduce the fundamental concepts of software engineering process, product and project.
2. To develop appropriate knowledge of requirements specification and design solutions for the given problem.
3. To introduce the different testing strategies and techniques.

Expected Course Outcomes:

1. Demonstrate the basic of software engineering process, ethics and development.
2. Understand the concept of various process models, activities and improvement.
3. Analyze the various aspects of software requirement engineering.
4. Understand the importance of establishing the boundaries of a system and the concept of various models.
5. Understand and analyze the decisions about the system architectural design process.
6. Implement a computer based system to meet the desired needs of the customer with proper understanding of the critical systems development and software testing.

Module:1	**Software Engineering Fundamentals**	**4 hours**

Professional Software development, Software engineering ethics.

Module:2	**Software processes**	**6 hours**

Software process models, Process activities, process improvement, Agile methods, Agile development technique.

Module:3	**Requirements Engineering**	**5 hours**

Functional and non-functional requirements, Requirement engineering processes, Requirements elicitation and Specification, Requirements validation and Change.

Module:4	**System Models**	**7 hours**

Context, Interaction, Structural, Behavioural, Model-driven engineering.

Module:5	**Architectural Design**	**8 hours**

Architectural design decisions, Architectural views - Architectural patterns, Application architectures, Software reuse.

Module:6	**System Dependability and Security**	**7 hours**

Dependability properties - Redundancy and diversity, Dependable processes, Formal methods and system dependability, Security and dependability - Security requirements, Secure systems design.

Module:7	**Software Testing**	**6 hours**

Development testing - Test-driven development, Release testing, User testing.

Module:8	**Experts talk on advance concepts on software engineering.**	**2 hours**

	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Ian Sommerville, "Software Engineering", 2015, Tenth edition, Pearson Education.
Reference Books	
1.	Roger S. Pressman, "Software Engineering", 2015, Eighth edition, McGraw Hill.

Recommended by Board of Studies	12.6.2015		
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ITA1005	Database Management Systems	L	T	P	J	C
		3	0	2	4	5
Pre-requisite	**NIL**	**Syllabus version**				
		1.0				

Course Objectives:

1. To learn Relational Model Concepts.
2. To get an exposure on the design of Relational Database Management Systems.
3. To develop a Database Application using SQL

Expected Course Outcomes:

1. Know the features of DBMS.
2. Understand and Design an Entity relationship diagram for data requirements.
3. Understand the Relational Model, constraints and develop it.
4. Write Relational Algebra Expressions for the system designed.
5. Develop the database designed using SQL.
6. Write queries for the developed Database.
7. Redesign the Relational Model using normal forms.

Module:1	**Introduction**	**6 hours**
Database, DBMS, Advantages, Components of DBMS, Architecture.		
Module:2	**Data Modeling**	**6 hours**
Introduction, Entity relationship model: entities and entity sets, relationships - Constraints - E.R Diagrams.		
Module:3	**Relational Model**	**5 hours**
Characteristics, constraints, violations, ER to Relational mapping.		
Module:4	**Relational Algebra**	**8 hours**
Fundamental relational algebra operations- select, project, join, set operation, join, division and aggregate.		
Module:5	**Structured Query Language**	**5 hours**
Data types, operators, SQL functions-numeric, string, date, insert, delete, update commands, simple set		
Module:6	**Complex SQL**	**8 hours**
Nested queries-join, group by, order by, Top N Queries and Views		
Module:7	**Normalization**	**5 hours**
Informal guidelines, Functional Dependency Normal forms-1NF, 2NF and 3NF		
Module:8	Expert talks on recent trends- Advanced Database Systems	**2 hours**

	Total Lecture hours:	**45 hours**
Text Book(s)		
1.	RamezElmasri&B.Navathe: Fundamentals of database systems, 2014, 7th edition, Addison Wesley.	
Reference Books		
1.	Abraham Silberschatz, S. Sudarshan, Henry F. Korth: Database System Concepts, 2011, 6th Edition, Tata McGraw - Hill Education.	
2.	S.K.Singh, Database Systems: Concepts, Design & Applications, 2011, 2nd edition, Pearson education.	
3.	Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 2003, 3rd Edition, McGraw Hill.	
List of Challenging Experiments		
	Instruction: Students are advised to use the concepts like Data Normalization, Link between table by means of foreign keys and other relevant data base concepts for developing databases for the following problems. The implementation of each problem should have necessary input screen, Menu –driven query processing and pleasing reports. Necessary validations must be done after developing the database. 1. Library information processing. 2. Students mark sheet processing. 3. Telephone directory maintenance. 4. Gas booking and delivering system. 5. Electricity Bill Processing. 6. Bank Transact ions. 7. Payroll processing. 8. Personal Information System. 9. Quest ion Database and Conducting quiz. 10. Hotel Information Systems	6 hours
1.	STUDENT RECORD KEEPING SYSTEM DATABASE PROJECT Design goals: a student f i le that contains the information about student, a stream file, a marks file, a fee file, concession/scholarship etc you can check simple version of this project Student Database Management System	4 hours
2.	ONLINE RETAIL APPLICATION DATABASE PROJECT A customer can register to purchase an item. The customer will provide bank account number and bank name (can have multiple account number). After registration each customer will have a Unique customer id, user id and password. Customer can purchase one or more item in different Quantities. The items can of different classes based upon their prices. Based on the	4 hours

	quantity, price of the item and discount (if any) on the purchased items, the bill will be generated. A bank Account is required to settle the bill. The items can be ordered to one or more suppliers	
3.	RAILWAY SYSTEM DATABASE PROJECT A railway system, which needs to model the following: a. Stations b. Tracks, connecting stat ions. You can assume for simplicity that only one track exists between any two stations. All the tracks put together form a graph. c. Trains, with an ID and a name d. Train schedules recording what time a train passes through each station on its route.	4 hours
4.	HOSPITAL MANAGEMENT SYSTEM DATABASE PROJECT A patient will have unique Patient ID. Full descript ion about the patient about personal detail and phone number, and then Disease and what treatment is going on. Doctor will handle patients; One doctor can Treat more than 1 patient. Also each doctor will have unique ID. Doctor and Patients will be related. Patients can be admitted in hospital. So different room numbers will be there, also rooms for Operation Theaters and ICU. There are some nurses and ward boys for the maintenance of hospital and for patient take care. Based upon the number of days and treatment bill will be generated.	4 hours
5	LIBRARY MANAGEMENT SYSTEM DATABASE PROJECT A student and faculty can issue books. Different limits for number of books a student and teacher can issue. Also the number of days will be different in case of students and teachers for issue any book. Each book will have different ID. Also each book of same name and same author (but number of copies) will have different ID. Entry of al l the book will be done, who issue that book and when and also duration. Detail of Fine (when book not returned at time) is al so stored.	4 hours
	Total Laboratory Hours	26 hours

Recommended by Board of Studies	12-6-2015		
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ITA1006	Computer Networks	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	**Nil**	**Syllabus version**				
		1.0				

Course Objectives:

1. Familiarize with the basic taxonomy and terminology of the computer networking area.
2. To explore and understandOSI Reference Model.
3. To provide an exposure about the recent developments in the area of networking

Expected Course Outcomes:

1. The terminology and concepts of the OSI reference model and the TCP - I Preference model.
2. Master the concepts of protocols, network interfaces and design/performance issues in local area networks and wide area networks.
3. Be familiar with wireless networking concepts and identify the drawbacks of existing protocols and will be able to propose new protocols.
4. Analyze the requirements of the organization and select appropriate networking technology and architecture.
5. Evaluate and contrast requirements for different network platforms to establish appropriate strategies for development and deployment.
6. Identify and analyze user requirements so as to utilize them in selecting, implementing, evaluating and administrating computer networks.

Module:1	**Introduction**	**6 hours**

Data Communications – Networks – Internet Structure – Protocols and Standards – Network Model, Layered Tasks – OSI Model – Line Configuration Topology –Transmission Mode – Classification of Network – OSI Model – Layers of OSI Model – TCP/IP Protocol suite

Module:2	**Physical Layer**	**6 hours**

Analog signals – Digital signals – Digital Transmission – Analog Transmission – Multiplexing – Transmission Media – Guided and Unguided Media – Switching – Circuit Switched – Datagram – Virtual Circuit

Module:3	**Data Link Layer**	**6 hours**

Error Correction and Detection – Hamming Code – CRC – Checksum – Data Link Control – Flow and Error Control - Protocols – Noisy and Noiseless Channels – HDLC – Point to Point Protocol – Random Access – CSMA – Controlled Access – Channelization – FDMA – TDMA – CDMA

Module:4	**Network Layer**	**6 hours**

Logical Addressing (IPv4, IPv6) – Internet Protocol – Internetworking – Address Mapping – ARP – RARP

Module:5	**Routing**	**6 hours**

Delivery – Forwarding – Unicast Routing Protocols – Distance Vector Routing, Link State Routing, Path Vector Routing – Multicast Routing Protocols

Module:6	**Transport Layer**	**6 hours**

Responsibilities of Transport Layer – Multiplexing – Demultiplexing – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of Service

Module:7	**Application Layer**	**6 hours**
Domain Name Space (DNS) – TELNET – E-mail – FTP – HTTP – Network Management System – SNMP		
Module:8	**Contemporary issues:**	**3 hours**
Recent Development – Trends and Issues		
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Behrouz A Forouzan, Data Communication and Networking, 2013, Fifth edition, TMH.
Reference Books	
1.	William Stallings, Data and Computer Communication, 2014, Sixth Edition, Pearson Education.
2.	Andrew S. Tanenbaum, Computer Networks, 2012, Fifth Edition, Prentice Hall.
3.	Larry L. Peterson, Bruce S. Davie, Computer Networks: A System Approach, 2012, Fifth Edition

Recommended by Board of Studies	04.12.2015		
Approved by Academic Council	No:39th	Date	17-12-2015

ITA1007	Web Development	L	T	P	J	C
		3	0	2	4	5
Pre-requisite	**None**	**Syllabus version**				
		1.0				

Course Objectives:

1. Students will gain the theoretical skills and practical experience required for entry into web design and development careers.
2. Students will be able to use a variety of the latest technologies to create responsive websites.
3. Students will learn to develop, host and maintain a responsive website.

Expected Course Outcomes:

1. Implement an appropriate planning strategy for developing websites.
2. Describes the strengths and weaknesses of the client-server internet approaches to web design and implementation of the same.
3. Create and manipulate web media objects using HTML5 and CSS.
4. Create a webpage and use scripting languages to transfer data and add interactive components to other web pages.
5. Create a webpage and modify the web structure using the DOM model and utilize graphic design to enhance web pages.
6. Develop a responsive website that works in the cross-platform environment and also a host and maintain that website in the real-time environment.
7. Develop and implement solutions to problems encountered in all phases of the design process.

Module:1	**Web Design Principles:**	**5 hours**

Brief History of Internet – WWW – Why create a Website – Web Standards – Basic Principles involved in developing a website – Planning Process – Five golden rules for website designing – Design Concept

Module:2	**Introduction to HTML**	**6 hours**

Structure of an HTML document - Basic Tags –Working with Text, List, Tables and Frames - Linking document, Image and Multimedia – Forms and Controls.

Module:3	**Cascading Style Sheets:**	**8 hours**

Introduction – Creating Style Sheet – CSS Properties – CSS Styling : Background, Text Format, Controlling Fonts – Working with block elements and Objects – Working with Lists and Tables – CSS Id and Class – Box Model : Border, Padding & Margin Properties – CSS Advanced: Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo Class, Navigation Bar, Image Sprites, Attribute Sector – CSS Color – Creating Page Layout and Design

Module:4	**Java Script**	**7 hours**

Introduction to Java script - Advantage of Java script Java script Syntax – Data type - Variable - Array - Operator and Expression - Looping Constructor - Function - Dialog box.

Module:5	**Event Handling:**	**6 hours**
Java script document object model - Introduction - Object in HTML - Event Handling - Window Object.		
Module:6	**Document Object Model**	**6 hours**
Document object - Browser Object - Form Object - Navigator object Screen object - Build in Object - User defined object - Cookies.		
Module:7	**Website Design and Management**	**5 hours**
Site Planning –Site navigation- Responsive Web Designing – Validating a Website		
Module:8	**Industrial Expert Talk**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)

1.	Josh Hill, HTML5 and CSS3 in Simple Steps, 2011, Pearson.
2.	David Flanagan, Javascript: The definitive Guide, 2011, 6th Edition, Oreilly Media.
3.	Joel Sklar, Principle of Web Design, 2014, 5th Edition, Cengage Learning.

Reference Books

1.	Alexis Goldstein, Louis Lazaris, Estelle Way, HTML5 and CSS3 for the Real World, 2015, SitePoint Pty Ltd.
2.	Jon Duckett, Beginning HTML, XHTML, CSS and Javascript, 2011, Wiley India.

List of Challenging Experiments

1.	Design a website for a product with the following design requirements. • Solid gray banner along the top of the browser window • company logo • product image • A text-based navigation menu • Links to each of the site's web documents • A content area • A heading that identifies page content • A paragraph for displaying content • A copyright notice	6 hours
2.	Design a Maths Quiz Page using HTML and CSS. • The page will present the visitors with instructions for taking a 10-question math quiz along with the quiz questions itself. • Answers to each question are provided at the bottom of the web page. The visitors can jump back and forth between	9 hours

	questions and answers by clicking on individual questions and answers. • Specifically, every question is individually linked to its corresponding answer at the bottom of the page and every answer is linked back to its corresponding question. • Improve the web page navigation by adding an extra link at the top and bottom of the document, which when clicked jumps the user from the top to the bottom of the web page and vice versa. • Expand the text that provides the user with instructions, explaining the number of questions that must be answered in order to pass the quiz. • Decorate the web page by experimenting with the rules located in its internal style sheet, assigning different font colors, font types, and sizes.	
3.	Develop a word decoder challenge game using HTML, CSS and Javascript. Present the player with a set of scrambled word & hint and challenge him to unscramble them. For each attempt randomly select a word ,refrsh the browser window dynamically and display the scrambled word in red. Once the player thinks the word has been properly decoded, he clicks on the Check Answer button to see the results. If the answer is correct, the player is notified via a success message displayed in a popup dialog window or display a failure message.	11 hours
	Total Laboratory Hours	26 hours

Recommended by Board of Studies	12.6.2015		
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ITA2001	Programming in C	L	T	P	J	C
		3	0	2	0	4
Pre-requisite	**ITA1001**	**Syllabus version**				
		1.0				

Course Objectives:

1. To develop algorithms in response to problem scenario.
2. To analyze and structure programs.
3. To apply learnt concepts and develop file handling.

Expected Course Outcomes:

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

1. Develops the basic concepts and terminology of programming in general.
2. Develops the use of the C programming language to implement various algorithms
3. Able to enhance their analyzing and problem solving skills and use the same for writing programs in C
4. Handle functions with various processing.
5. Analyze various approaches for different types of File operations.
6. Practice all the concepts of C language and apply on to a specific problem domain.

Module:1	**Introduction**	**6 hours**
Identifiers - Keywords - Data Types - Access Modifiers – Data Type Conversions - Operators: Precedence and Associativity, Expression, Statement and types of statements.		
Module:2	**Control structures**	**6 hours**
Decision making structures: If, If-else, Nested If-else, Switch; Loop Control structures: While, Do-while, for, Nested for loop; Other statements: break, continue, goto, exit.		
Module:3	**Arrays**:	**6 hours**
Arrays - One Dimensional Arrays – Two Dimensional Arrays – Multi Dimensional Arrays		
Module:4	**Strings**	**6 hours**
Handling of Character Strings - String - Handling Functions – Table of Strings - enum - typedef		
Module:5	**Functions**	**7 hours**
Functions: User Defined Functions - Need for User Defined Functions - Category of Functions - Nesting of Functions - Recursion - Functions with Arrays – Storage Classes - Macros and Pre-processors.		
Module:6	**Structures**:	**6 hours**
Structures - Array of Structures – Arrays within Structures – Structures within Structures - Structures and Functions - Size of Structures		
Module:7	**Files**	**6 hours**
Module:8	**Expert Talk**	**2 hours**
Expert Talk on to solve the real time application with help of c language with demo		
	Total Lecture hours:	**45 hours**

Text Book(s)

1. E. Balagurusamy, Programming in ANSI C,2011, Fifth Edition.Tata McGraw Hill.

Reference Books

1. B.S. Gottfried,Programming With C, Schaum's Outline Series, 2015, 3rd Edition Tata McGraw Hill.

List of Challenging Experiments		
1.	Sorting of numbers and strings using Bubble sort,Selection sort.	3 hours
2.	Linear Search and Binary Search.	4 hours
3.	Pascal's Triangle	3 hours
4.	Creating database for web page addresses and related operations. Use pointers	4 hours
5.	Creating database for telephone numbers and related operations. Use file concepts	4 hours
6.	Invoice using file.	4 hours
7.	Electricity bill using file	4 hours
	Total Laboratory Hours	26 hours

Recommended by Board of Studies	12-6-2015		
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ITA2002	Software Testing	L	T	P	J	C
		3	0	2	0	4
Pre-requisite	ITA1002	Syllabus version				
		1.0				

Course Objectives:

1. To provide an understanding in the software testing fundamentals including the different types of testing.
2. To present the knowledge about software testing background such as the overview of the bug and its effect in a project.
3. To explore different testing tools familiar with open source tools.

Expected Course Outcomes:

1. Articulate the problem by following the Software Testing Life Cycle.
2. Examine the reason for bugs and analyze the principles in software testing to prevent and remove the bug.
3. Exhibit various test processes for continuous quality improvement.
4. Analyze and implement various test processes for improving the quality.
5. Manage the various test process.
6. Use practical knowledge and ways to test software understanding the trade-offs between testing techniques.
7. Practice the various latest trends & technique involved in testing the software.

Module:1	Testing Perspective	5 hours

Test Cases – Specification Based Testing, Code Based Testing, Fault Taxonomies, Levels of Testing.

Module:2	Unit Testing	6 hours

Boundary Value Testing – Robust Boundary value Testing, Worst-Case Boundary Value Testing, Special Value Testing, Random Testing, Equivalence Class Testing, Decision Table–Based Testing

Module:3	Path and Data Flow Testing	6 hours

Program Graphs, DD-Paths, Test Coverage Metrics, Basic Path Testing, Data-Flow Testing, Slice Based Testing, Program Slicing Tools.

Module:4	Testing Models	6 hours

Life Cycle–Based Testing - Waterfall Testing, Iterative Life Cycles, Agile Testing, Agile Model–Driven Development, Testing Based on Models, Appropriate Models, Commercial Tool Support for Model-Based Testing.

Module:5	Integration and System Testing	6 hours

Decomposition-Based Integration, Call Graph–Based Integration, Path-Based Integration, System Testing - Threads, Model-Based Threads, Use Case–Based Threads, Supplemental Approaches to System Testing, Nonfunctional System Testing.

Module:6	Software Complexity	7 hours

Unit-Level Complexity - Cyclomatic Complexity , Computational Complexity, Integration-Level Complexity, Object-Oriented Complexity, System-Level Complexity

Module:7	**Testing for Systems of Systems**	**7 hours**
Characteristics of Systems of Systems, Software Engineering for Systems of Systems, Communication Primitives for Systems of Systems, Effect of Systems of Systems Levels on Prompts, Exploratory Testing, Test-Driven Development, Evaluating Test Cases		
Module:8	**Contemporary issues:**	**2 hours**
Trends in Software Testing – Handled by Industry Experts		
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Paul C. Jorgensen, Software Testing: A Craftsman's Approach, 2013, Fourth Edition, CRC Press, Auerbach Publications.
Reference Books	
1.	Bernard Homes, Fundamentals of Software Testing, 2012, First edition, Wiley Publication.
2.	Andreas Spillner, Tilo Linz, Hans Schaefer, Software Testing Foundations, 2014, Fourth edition, Rocky Nook Publication.
3.	Sandeep Desai and SrivastavaAbhishek, Software Testing: A Practical Approach, 2012, First edition, PHI Learning Publication.

List of Challenging Experiments		
1.	Design the test case using manual testing	4 hours
2.	Design suitable test cases using Black box testing perspective and report the status of the bugs	8 hours
3.	Design suitable test cases for White Box testing perspective and test your program.	6 hours
4.	Designing test cases using J Unit testing tool	5 hours
5.	Usage of load testing tools	3 hours
	Total Laboratory Hours	26 hours

Recommended by Board of Studies	12-6-2015		
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ITA3001	Object Oriented Programming	L	T	P	J	C
		3	0	2	4	5
Pre-requisite	**ITA2001**	**Syllabus version**				
		1.0				

Course Objectives:

1. Understand object oriented programming and C++ concepts.
2. Improve problem solving skills by analyzing.
3. Develop an understanding to develop algorithms in response to problem scenario which leads to well-organized block-structured easily readable programs.

Expected Course Outcomes:

1. Understand the structured and object oriented paradigm with concepts of streams, classes, functions, data and objects.
2. Design a standard algorithms to solve a given real time problems.
3. Understand the features of C++ supporting object oriented programming.
4. Understand how to apply the major object-oriented concepts to implement object oriented programs in C++, encapsulation, inheritance, polymorphism, describe the concept of function overloading, operator overloading, and virtual functions.
5. Understand and classify the inheritance with the understanding of early and late binding, usage of exception handling.
6. Demonstrate the use of various OOPs concepts with the help of programs.
7. Understand advanced features of C++ specifically stream I/O, and templates.

Module:1	**Overview**	**5 hours**

Introduction to Problem Solving, Algorithm Development & Program Design -Why Object-Oriented Programming

Module:2	**Object-oriented design & structure**	**5 hours**

Object Oriented fundamentals- Structured versus object-oriented development, elements of object oriented programming

Module:3	**Basic concepts**	**6 hours**

Concepts of class, object, encapsulation, Inheritance, polymorphism, Dynamic Binding, structure of C++ program

Module:4	**Classes**	**7 hours**

Working with classes- Classes and Objects, accessing class members, defining member functions, inline functions, data hiding, class member accessibility, constructors, parameterized constructors, constructor overloading, copy constructor, “this” pointer, friend classes and friend functions.

Module:5	**Polymorphism**	**7 hours**

Overloading-Function overloading, operator overloading- arithmetic operators, concatenation of strings, comparison operators, Generic programming with templates-Function templates, class templates.

Module:6	**Inheritance**	**7 hours**

Inheritance - Base class and derived class relationship, derived class declaration, Types of inheritance, constructors in derived class, and destructors in derived class, abstract classes, virtual base classes and virtual functions.

Module:7	**Files**	**6 hours**

I/O Streams, Formations I/O with Class Functions and Manipulators, File I/O, Exception handling.

Module:8	**Contemporary issues:**	**2 hours**
Expert Talk on the features of Object Oriented Programming to solve real world problems-A short demo.		
	Total Lecture hours:	**45 hours**

Text Book

1.	E.Balagurusamy, Object Oriented Programming with C++, 2013, Sixth Edition, Tata McGrawHill.

Reference Books

1.	Venugopal K R and RajkumarBuyya, Mastering C++, 2013, Second edition, McGraw Hill.
2.	Bjarnestroustrup, The C++ programming Language, 2013, Fourth Edition, Addison Wesley.
3.	Herbert Schildt, C++, The Complete Reference, 2010, Fifth Edition, Tata McGraw Hill.

List of Projects

The student should design any one below project by applying the OOPs concept

1. Shopping Management System
2. Library Management System
3. Inventory Management System
4. Banking Management System
5. Airline Reservation System
6. Railway Reservation System

List of Challenging Experiments		
1.	Using Constructor write a C++ program for simple banking system.	2 hours
2.	Using Friend Function write a C++ program for addition and subtraction of two complex numbers.	2 hours
3.	Using function overloading write a C++ program to find the volume of cube, cylinder, cone and sphere.	2 hours
4.	Using Operator overloading write a C++ program for class STRING and overload the operator + and = = to concatenate two strings length.	3 hours
5.	Using inheritance write an interactive program to model different relationships.	3 hours
6.	Design a Virtual base class for the employee information system.	3 hours
7.	Implement a program using pure virtual function for calculating area and volume for the circle and cylinder.	3 hours
8.	Write a C++ program that uses function template to determine the square of an integer, a float and a double.	3 hours
9.	Write a C++ program to read and print Employee details using Files.	2 hours
10.	Write a C++ program to copy the contents of one text file into another file.	3 hours
	Total Laboratory Hours	26 hours

Recommended by Board of Studies	12-6-2015		
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ITA3002	Data Structures	L	T	P	J	C
		3	0	2	0	4
Pre-requisite	ITA2001	Syllabus version				
		1.0				

Course Objectives:

1. To explore the basic knowledge of data structure used in computer systems.
2. To impart knowledge about linear and non-linear data structures.
3. To provide an exposure to find an appropriate algorithm for solving real-world problems.

Expected Course Outcomes:

1. Demonstrate knowledge of the fundamental operations and concepts related to data structures.
2. Analyze the stack and queues concepts and their usage in a real application.
3. Develop various real time applications using linked list concepts.
4. Apply important methods in sorting to real scenarios.
5. Develop an optimal solution using tree concepts.
6. Develop applications targeted for finding the shortest path using graph-based algorithms.
7. Deploy the appropriate data structures, algorithms and realization to solve simple to complex real-world issues.

Module:1	Introduction	5 hours

Data structures – Types of Data structures –Data structure operations – Abstract data type- Analysis of algorithms – Amortized Analysis

Module:2	Arrays	5 hours

Introduction – Characteristics of Arrays – One-dimensional Arrays – Operation with Arrays – Two-dimensional Arrays – Multi-dimensional Arrays

Module:3	Stacks & Queues	6 hours

Stack – Definitions – Concepts – Operations on Stacks – Infix, postfix & prefix conversions - evaluations of expressions using stack - Applications of stacks – Representation of Queue – Insertion and Deletion Operation – Applications of Queue.

Module:4	Lists	6 hours

Lists – Linked List – Singly linked list – doubly linked list – Circular linked list –Representation of Stacks using linked lists – Representation of Queues using linked lists– Applications of Linked list.

Module:5	Sorting	7 hours

Bubble sort - Insertion sort – Selection sort – Quick sort – Merge sort – Radix sort – Heap sort

Module:6	Trees	7 hours

Trees – Binary Trees – Operations on Binary Trees –Traversal of a Binary Tree – Threaded Binary Tree - Binary Search Trees (BST) – Inserting and Deleting in a BST

Module:7	Graphs	7 hours

Graphs – Representation of graph – Traversal in Graph – Spanning Trees - Prim's and Kruskal's

algorithm – Dijkstra's algorithm for shortest path problem.			
Module:8	**Contemporary issues:**		**2 hours**
Expert talk on Advanced Data Structure algorithms and its applications			
	Total Lecture hours:	**45 hours**	

Text Book(s)	
1.	Ashok N. Kamthane, Introduction to Data Structures in C, 2012, Dorling Kindersley.
Reference Books	
1.	T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, 2012, PHI Learning Private Limited.
2.	Clifford A. Shaffer, Data Structures and Algorithm Analysis in C++, 2012, Dover Publications.

List of Challenging Experiments (Indicative)		
1.	Array based implementing of Stack and queue	2 hours
2.	Linked list implementations and problems related to linked list such as concatenation etc.,	2 hours
3.	Evaluation of Expressions	2 hours
4.	Sorting: Insertion sort Merge sort Quick sort Selection sort Heap sort Shell sort	12 hours
5.	Searching: Linear search Binary search	4 hours
6	Binary Tree Traversals	2 hours
7	Graph Traversals	2 hours
	Total Laboratory Hours	26 hours

Recommended by Board of Studies	12-6-2015		
Approved by Academic Council	No:37th	Date	16-6-2015

ITA3006	Programming in Java	L	T	P	J	C
		3	0	2	4	5
Pre-requisite	**ITA3001**	**Syllabus version**				
		1.0				

Course Objectives:

1. To understand the core language features of Java and its Application Programming Interfaces (API)
2. To build applications using the set of powerful java features.
3. To explore and publish a useful real time application.

Expected Course Outcomes:

1. Gain insight into JVM architecture and Java Programming Fundamentals.
2. Develop the knowledge in programming concepts such as data types, Arrays and Control structures.
3. Acquire key skills to apply the major object-oriented concepts to implement object oriented programs in Java using classes and constructors.
4. Design an application involving inheritance and abstract classes.
5. Design and implement Java Applications for real world problems using packages and handle exceptions.
6. Design and built multi-threaded Java Applications.
7. Enhancing the programming skills using additional knowledge in I/O streams.
8. Develop, test, debug and publish real time applications, by taking full advantage of the capabilities of the Java language.

Module:1	**Introduction**	**6 hours**

History and Evolution of Java - Features of Java - Object Oriented Concepts – Bytecode - Lexical Issues - Data Types – Variables- Type Conversion and Casting

Module:2	**Arrays**	**6 hours**

Operators - Arithmetic Operators - Bitwise - Relational Operators - Assignment Operator - The conditional Operator - Operator Precedence- Control Statements – Arrays.

Module:3	**Methods**	**6 hours**

Classes - Objects - Constructors - Overloading method - Static and fixed methods - Inner Classes - String Class.

Module:4	**Inheritance**	**6 hours**

Overriding methods - Using super-Abstract class - this keyword – finalize() method – Garbage Collection.

Module:5	**Packages**	**6 hours**

Packages - Access Protection - Importing Packages - Interfaces - Exception Handling - Throw and Throws.

Module:6	**Threads**	**6 hours**

The Java Thread Model- Creating a Thread and Multiple Threads - Thread Priorities- Synchronization--Inter thread Communication - Deadlock - Suspending, Resuming and stopping threads - Multithreading.

Module:7	**I/O Streams**	**6 hours**

I/O Streams - File Streams - Applets - String Objects - String Buffer - Char Array.		
Module:8	**Expert talks**	**3 hours**
Expert talks on Java based Web Application Development Tools		
	Total Lecture hours:	**45 hours**
Text Book(s)		
1.	E.Balagurusamy, Programming with Java: A Primer, 2014, 5th Edition, Tata McGraw Hill.	
Reference Books		
1.	Herbert Schildt, JAVA 2: The Complete Reference, 2011, 8thEdition, McGraw Hill.	
List of Challenging Experiments		
1.	Write a Java program to create a class called Student having data members Regno, Name, Course being studied and current CGPA. Include constructor to initialize objects. Create array of objects with at least 10 students and find 8-pointers.	3 hours
2.	Write a method that finds the number of occurrences of a specified character in the string using the following header: **public static int**count(String str, **char** a). For example, **count("Welcome", 'e')** returns **2**. Write a test program that prompts the user to enter a string followed by a character and displays the number of occurrences of the character in the string.	3 hours
3.	Write a Java program to create a class called Person data members name, age and aadhar number. Also, include methods to accept data. Derive a class **Employee** with the data member – empid and department of working. Include method to accept data for data members. Derive another Class **Teacher** from Employee with the data members designation and salary. Demonstrate Teacher class.	4 hours
4.	Write an abstract class special with an abstract method double Process (double P,double R). Create a subclass Discount and implement the Process() method with the following formula: *net=P-P*R/100.* Return the Process() method with the following formula: *total=P+P*R/100.* Return the total.	3 hours
5.	Create a package called pack1. Add two classes Sum and Difference (calculate the sum and difference of two numbers) to it. Create a subpackage called subpack1. Add two classes Product and Quotient (calculate the product and quotient of two numbers) to it. Write a program to read values from the user and perform the arithmetic operations by using the package classes.	2 hours
6.	Within the package named ―primespackage‖, define a class Primes which includes a method checkForPrime() for checking whether the given number is prime or not. Define another class named TwinPrimes outside of this package which will display all the pairs of prime numbers whose difference	2 hours

	is 2.(Eg, within the range 1 to 10, all possible twin prime numbers are (3,5), (5,7)). The TwinPrime class should make use of the checkForPrime() method in the Primes class	
7.	Implement a program with the following: (a). A function to read two double type numbers from keyboard. (b). A function to calculate the division of these two numbers. (c). A try block to throw an exception when a wrong type of data is keyed in. (d). A try block to detect and throw an exception if the condition ―divide-by-zero‖ occurs. (e). Appropriate catch block to handle the exceptions thrown.	4 hours
8.	Draw a String (―VIT UNIVERSITY‖) in Applet window and move the String from top to bottom of the window continuously-use Applet class	5 hours
	Total Laboratory Hours	26 hours

Recommended by Board of Studies	12-6-2015		
Approved by Academic Council	No. 37th	Date	16-6-2015

ITA3007	Open Source Programming	L	T	P	J	C
		3	0	2	0	4
Pre-requisite	ITA3001	Syllabus version				
		1.1				

Course Objectives:

1. To explore open source software licenses, open source project structure.
2. To analyze model requirements and constraints for the purpose of designing and implementing software systems using open source tools.
3. To provide an exposure to develop various real time applications using Perl and Python.

Expected Course Outcomes:

1. Gather information about Free and Open Source Software projects from software releases and from sites on the internet.
2. Build and modify one or more Free and Open Source Software packages.
3. Develop the usage of version control system and to interface with version control systems used by development communities.
4. Contribute software to interact with Free and Open Source Software development projects.
5. Analyze requirements of software systems for the purpose of determining the suitability of implementing in Perl or Python.
6. Design and implement Perl and Python software solutions that accommodate specified requirements and constraints, based on analysis or modelling or requirements specification.
7. Ensuring high-quality and frequent releases of code to open source communities.

Module:1	Open Source philosophy	5 hours

History – OSD-Compliance – Open Source vs Closed Source – Copyright vsCopyleft – Open Source vs Free Software – FOSS, GNU. Important FOSS Licenses (Apache,BSD,GPL, LGPL), copyrights and copy lefts Patents Economics of FOSS : Zero Marginal Cost, Income-generation opportunities, Problems with traditional commercial software, Internationalization

Module:2	Development Methodologies	8 hours

PHP – variables, operations- constants- control structures arrays- functions- classes – handling files. E-mailing with PHP – sending an email – multipart message – storing images – getting confirmation- Session tracking using PHP-cookies.

Module:3	Open Source Database MySQL	8 hours

Introduction – Setting up account –Starting, terminating and writing your own SQL programs - Record selection Technology-Working with strings- –Date and Time – Sorting Query Results – Generating Summary – Working with metadata – Using sequences –MySQL and Web.

Module:4	Open Source Tools	5 hours

Joomla-components-themes-template-webpage design.

Module:5	Open Source software in Internet 1	5 hours

Perl overview – Perl parsing rules – Variables and Data – Statements and Control structures – Subroutines-Packages- and Modules- Working with Files –Data Manipulation.

Module:6	**Open Source software in Internet-2**	**8 hours**
Intro to Python Data types-data structures- Subroutines-Python-files-object oriented programming using Python.		
Module:7	**Open Source software in Internet-3**	**4 hours**
Introduction to RUBY –variables-control constructs-module-array-functions		
Module:8	**Expert talk on contemporary issues**	**2 hours**
Expert talk on recent trends in open source programming		
	Total Lecture hours:	**45 hours**

Text Book(s)

1. Larry Ullman, PHP and MySQL for Dynamic Web Sites: Visual QuickPort Guide, 2011, 4th Edition, Peachpit Press.
2. Dr. Martin Jones, Python for complete beginners, 2015, First edition, Create Space Independent Publishing Platform.

Reference Books

1. Eric Tiggeler, Joomla 2.5: Beginner's Guide, 2012, Packt Publishing Limited.

List of Challenging Experiments

1.	Implement on-line quiz by populating a web-page with questions from any specialization(multiple choice questions)	4 hours
2	Write a PHP script to implement anagram word magic game. Design a webpage with two text fields of a HTML form. The game should trigger when the user click the submit button.	4 hours
3	Design a web-page containing text field and submit button. Name the textfield as "details". When a submit button is clicked, “submit.php” is called. The submit.php checks data obtained from "details" text field against an array. If the data is a VIT registration number, then it displays the information about the specified student within <pre> tag. If the data obtained from the details field is course name then details about all the students of a course is displayed in a table. If data obtained from the "details" text field is not found then it displays "Information Unavailable". 15MIS001 AmanB.Tech Chennai 15 MIS002 AjithB.TechBanglore 15 MIS001 SujoyM.Tech Mumbai 15 MIS003 DikshaM.Tech Chennai 14 MIS0034 Aravind BCA Nagpur 12 MIS0034 Ashlesh BCA Coimbatore	4 hours

4	Write a PHP Script that validates form containing five text fields that receives Reg.no,Name, mail id, mobile number and CGPA a) The Reg.no text field should accept only VIT BCA registration numbers. b) The Name text field should be only alphabets. The Name is given is Title Case(First letter Upper Case).The only special character allowed is a space separating first name and last name c) The VIT email id text field should end with @vit.ac.in. The user name before @ should start with an alphabet and can contain only one special character "." (Period) as a part of the name. Eg site_vellore@vit.ac.in d) The mobile number should start with country code and then the number .The country code given within brackets. Eg (91) 9443418870 e) The CGPA should be three digits maximum and one digit minimum. Eg 9 , 10 , 9.44 , 9.2 ,6.3,8.99 The function that validates the text fields of the form are called on a click with a submit button placed in the same form as the text fields. (Note: This exercises has to be implement by using string manipulation functions and regular expression built in functions)	4 hours
5.	Design a web-page to collect information about a student and store the data using PHP-MySQL in built functions. (Note: Perform Deletion, Search ,View operations)	5 hours
6.	Design and implement a shopping cart application using Joomla and Drupal.	5 hours
Total Laboratory Hours		26 hours

Recommended by Board of Studies	12.8.2017		
Approved by Academic Council	No. 47th	Date	5.10.2017

ITA3008	Operating Systems	L	T	P	J	C
		3	0	2	0	4
Pre-requisite	ITA3002	Syllabus version				
		1.0				

Course Objectives:

1. To learn the mechanisms of operating system to handle processes and threads and their communication.
2. To understand the process and the way by which processes are synchronized and scheduled.
3. To understand different approaches to memory management.

Expected Course Outcomes:

1. Able to explore the fundamental components of operating system by analyzing operating-system structure, kernel data structures and system calls.
2. Familiarize with process management and various policies for scheduling, Inter Process Communication (IPC) and the role of Operating System in IPC.
3. Apply the functionalities of an Operating System as a resource manager, process synchronizer and methods used to implement the different parts of OS.
4. Able to handle solution towards deadlock prevention and detection in operating system environment.
5. Apply and use the system calls for memory management concepts and the file system operations.
6. Recognize and explain operating system methods to manage Virtual Memory concepts.
7. Understand and analyze the operating system's access methods of mass storage structures.
8. Study the need for special purpose operating system with the advent of new emerging technologies.

Module:1	Operating system basics	6 hours

Introduction, Computer-System Organization, Computer-System Architecture, Operating-System Structure, Kernel Data Structures, System calls, Computing Environments, Open-Source Operating Systems.

Module:2	Process management	6 hours

Processes, Process Scheduling algorithms, Inter process Communication, Examples of IPC Systems, Threads, Multi core Programming, Multithreading Models, Thread Libraries, thread issues.

Module:3	Process Synchronization	7 hours

Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization.

Module:4	Deadlocks	6 hours

System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock

Module:5	**Memory management**	**7 hours**
Swapping, Contiguous Memory Allocation, Paging, Segmentation, Intel 32 and 64-bit Architectures, ARM Architecture.		
Module:6	**Virtual-Memory Management**	**5 hours**
Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing, Allocating Kernel Memory.		
Module:7	**Storage management**	**6 hours**
Overview of Mass-Storage, Structure, Disk Structure, Disk Scheduling, File System, Access Methods.		
Module:8	**Contemporary issues**	**2 hours**
Recent Trends in Operating systems – Handled by Industry Experts		
	Total Lecture hours:	**45 hours**

Text Book(s)

1. A. Silberschatz, P.B. Galvin & G. Gagne, Operating system concepts, 2013, 9th Edition, John Wiley, Edition.
2. W. Stallings, Operating Systems: Internals and Design Principles, 2012, 7th Edition, PHI.

Reference Books

1. Andrew S. Tanenbaum, Modern operating system, 2014, 4th Edition, Pearson.

List of Challenging Experiments (Indicative)

1.	Introduction Unix Commands	3 hours
2.	Basic Shell Scripts	3 hours
3.	Process Creation and execution	3 hours
4.	CPU Scheduling Algorithms • FCFS, SJF, PRIORITY, Round Robin	4 hours
5.	Write an algorithm to synchronize the agent and the smokers using semaphore.	3 hours
6.	Producer–Consumer problem with Bounded Buffer	4 hours
7.	Dining–Philosopher Problem	3 hours
8.	Write an algorithm for synchronization between reader processes and write processes using semaphore.	3 hours
	Total Laboratory Hours	26 hours

Recommended by Board of Studies	12-6-2015		
Approved by Academic Council	No. 37th	Date	16-6-2015

MAT1013	Discrete Mathematics for Computer Science	L	T	P	J	C
		3	2	0	0	4
Pre-requisite	Nil	Syllabus Version				
		V1.0				

Course Objectives(CoB): CO: 1, 2, 3

The course is aimed at

[1] Motivating the learners for understanding the fundamental concepts in discrete mathematics.

[2] Acquiring the required knowledge for computer science such as sets, proof techniques, functions, relations, counting principles, combinatorics, mathematical logics, Boolean algebra and graph theoretical approaches with applications.

[3] Implementing the learned discrete mathematical ideas in realistic projects of computer science, theoretical computer skills, computer algorithms, networks and data structures.

Course Outcome(CO): CO: 1, 2, 3, 4, 5

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

[1]. Know the basic concepts, properties and operations of sets, relations & functions; and also analyse the proof techniques by the mathematical induction.
[2]. Apply the basic principles of counting, permutations and combinations for solving various practical problems.
[3]. Recognize the Mathematical logic through the truth tables, normal forms and predicate calculus.
[4]. Understand the notions of Boolean algebra and its minimization techniques.
[5]. Learn graph theory, shortest path algorithms, concepts of trees and minimum spanning tree algorithms; and also implement the learned techniques to realistic problems.

Module:1	Set Theory	5 hours

Sets and Elements – Subsets – Venn Diagrams – Set Operations – Algebra of Sets – Duality – Finite Sets – Counting Principle – Classes of Sets – Power Sets – Partitions – Mathematical Induction.

Module:2	Relations and Functions	8 hours

Relations – Operations on Relations – Equivalence Relation – Partitions and Equivalence Classes – Functions – One-One and Onto Functions – Special Type of Functions – Invertible Functions – Compositions of Functions – Recursively Defined Functions

Module:3	Techniques of Counting	6 hours

Basic Counting Principles – Permutations – Combinations – Pigeonhole Principle – Inclusion-Exclusion Principle.

Module:4	Logic	6 hours

Propositions and Logical Operations – Truth Tables – Equivalence – Implications – Laws of Logic –Normal Forms – Predicates and Quantifiers

Module:5	Boolean Algebra	5 hours

Basic Definitions – Truth Tables – Boolean Functions – Representation and Minimization of Boolean Functions

Module:6	Graphs	7 hours

Basic Concepts of Graph Theory – Matrix Representation of Graphs – Graph Isomorphism – Connectivity – Eulerian and Hamiltonian Paths – Shortest Path Problems

Module:7	**Trees**	**6 hours**
Introduction to Trees – Application of Trees – Tree Traversals – Spanning Trees – Minimum Spanning Trees.		
Module:8	**Contemporary Issues**	**2 hours**
Industrial Expert Lectures		
	Total Lecture hours:	**45 hours**
Tutorial	A minimum of 5 problems to be worked out by students in every Tutorial class Another 5 problems per Tutorial Class to be given for practice. Mode: Individual Exercises / Team Exercises / Online Quizzes / Online Discussion Forums.	**30 hours**

Text Book(s)	
1.	Discrete Mathematics and its Applications, Kenneth H. Rosen, 8th Edition, Tata McGraw Hill, 2019.
Reference Books	
1.	Discrete Mathematical Structures with Applications to Computer Science, J.P. Trembley and R. Manohar, Tata McGraw Hill, 35th Reprint, 2017
2.	Discrete Mathematical Structures, Kolman, R.C. Busby and S.C. Ross, 6th Edition, Pearson, 2018
3.	Discrete Mathematics, Richard Johnsonbaugh, 8th Edition, Prentice Hall, 2019.
4.	Elements of Discrete Mathematics – A Computer Oriented Approach, C.L. Liu, D. Mohapatra, Tata McGraw Hill, Special Indian Edition, 2017.
5.	Discrete Mathematics, S. Lipschutz and M. Lipson, 6th Edition, McGraw Hill Education, 2017.

Mode of Evaluation			
Digital Assignments, Quizzes, Continuous Assessment Tests (CATs) and Final Assessment Test (FAT).			
Recommended by Board of Studies	03-06-2019		
Approved by Academic Council	No. 55th	Date	13-06-2019

ITA1008	M-Commerce	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	**Nil**	**Syllabus version**				
		1.0				

Course Objectives:

1. Preparing students for employment and Self-employment opportunities in E-Commerce and M-Commerce fields.
2. Providing adequate knowledge and understanding about M-Commerce Practices, environment and Operations to the students.
3. Developing students for next generation M-commerce to work in mobile information services.

Expected Course Outcomes:

1. Understand the concept of e-Commerce environment, technology and infrastructure in reinforcements of the business.
2. Describe the opportunities and challenges offered by M-Commerce and to incubate new businesses.
3. Identify ethical issues related to Mobile communication.
4. Develop a mobile network over TCP/IP and WAP architecture.
5. Understand the various payment and security systems in M-commerce
6. Develop an understanding on how internet can help business growth and Mobile information services (messaging).

Module:1	**Introduction**	**6 hours**
The e-commerce environment - The e-commerce marketplace -Focus on portals, Location of trading in the marketplace - Commercial arrangement for transactions - Focus on auctions		
Module:2	**Business models**	**6 hours**
Business models for e-commerce - Revenue models - Focus on internet start-up companies – the dot-com - E-commerce versus E-business		
Module:3	**Introduction M– Commerce**	**6 hours**
Introduction, Forces behind the M-commerce, Special about M-commerce, M-commerce value chain.		
Module:4	**Mobile Communication**	**6 hours**
Introduction, Mobile communication a quick primer, Transition towards 3G		
Module:5	**Mobile Internet**	**6 hours**
Introduction, TCP/IP on mobile network, Over view of WAP architecture		
Module:6	**Mobile security and Payment**	**7 hours**
Introduction, Role of cryptography, Digital signatures, certificate authorities, mobile payment.		
Module:7	**M-commerce services today and tomorrow**	**6 hours**
Mobile portals, Mobile information services, Mobile banking and trading, Mobile entertainment, Next generation M- commerce		
Module:8	**Expert talks on Contemporary issues**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)

1. Dave Chaffey, E-Business and E-Commerce Management, 2009, Pearson Education,Third

	Edition.
Reference Books	
.	1. Brian E. Mennecke, Troy J. Strader, Idea Group Inc.,Mobile Commerce: Technology, Theory and Applications , 2003, IRM press. 2. P. J. Louis M-Commerce Crash Course, February 2001,McGraw- Hill Companies 3. Paul May Mobile Commerce: Opportunities, Applications, and Technologies of Wireless Business, March 2001, Cambridge University Press. 4. Michael P. Papazoglou, Peter M.A. Ribbers ,E-business organizational and Technical foundation, 2009,Wiley, India 5. Dr.Pandey,SaurabhShukla E-commerce and Mobile commerce Technologies by, 2011. Sultan Chand.

Recommended by Board of Studies	12-6-2015		
Approved by Academic Council	No:37th	Date	16-6-2015

ITA1009	Decision Support System	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	**Nil**	**Syllabus version**				
		1.0				

Course Objectives:

1. To explore the concepts and theories associated with decision support systems and their related applications and opportunities.
2. To impart knowledge about different concepts associated with the decision theory and modeling techniques for business decisions.
3. To demonstrate the evolving management issues during the development and application of decision support systems.

Expected Course Outcomes:

1. Demonstrate knowledge of the fundamental elements and concepts related to decision support systems.
2. Analyze the system design issues to meet the challenges in implementing decision support systems.
3. Develop applications targeted for modelling management and business performance.
4. Apply the important characteristic of decision support system for business modeling.
5. Design decision support system using various data mining techniques.
6. Develop artificial intelligence or expert system applications targeted for business intelligence and understand the knowledge management systems.

Module:1	**Introduction**	**5 hours**

Decision Support Systems and Business Intelligence, Decision Making, Systems, Modeling, and Support: Decision Support Systems Concepts, Methodologies, and Technologies: An Overview

Module:2	**Building Information System**	**5 hours**

System Analysis and design-Systems Development Cycle, Prototyping. Evolution of Information Systems-TPS,OAS,MIS,DSS,EIS,ES

Module:3	**Model Management**	**6 hours**

Modeling and Analysis, Business Performance Management, Collaborative Computer-Supported Technologies and Group Support Systems, Knowledge Management.

Module:4	**Decision Making System**	**5 hours**

Introduction and Definitions, Simons Decision Making Models, How Decisions are supported, DSS Configuration, DSS Characteristics and Capabilities.

Module:5	**Database organization and Structure**	**8 hours**

Data warehousing, OLAP: data access and mining, querying and analysis, data visualization and multidimensionality, intelligent database and data mining, Support systems

Module:6	**Intelligent Support Systems**	**6 hours**

AI & Expert Systems – Knowledge based Systems –Knowledge Acquisition , Representation & Reasoning, Advanced intelligence system –Intelligence System over internet

Module:7	**Knowledge Management System**	**7 hours**

Definition and types of Knowledge, Framework for Knowledge Management. Knowledge Presentation Techniques: Rules, Frames, Semantic Networks

Module:8	**Expert talks on Contemporary issues**	**3 hours**

	Total Lecture hours:		**45 hours**
Text Book(s)			
1.	Efrain Turban and Jay E. Aronson,Decision Support Systems and Intelligent Systems, 2008, Eight Edition, Prentice-Hall.		
Reference Books			
1.	Ramaswamy, Marketing Management 2013, 5th Edition, Tata McGraw-Hill Education.		
Recommended by Board of Studies	12-6-2015		
Approved by Academic Council	No:37th	Date	16-6-2015

ITA1010	Linux/Unix Programming	L	T	P	J	C
		3	0	2	0	4
Pre-requisite	**Nil**	**Syllabus version**				
		1.0				

Course Objectives:

1. To understand and make effective use of Linux utilities and Shell scripting language (bash) to solve Problems.
2. To write Shell programming to automate the shell commands.
3. To develop the skills necessary to write systems programs related to file system and managing process creation.
4. To learn various powerful text editors in Unix/Linux.

Expected Course Outcomes:

1. Develop a deeper understanding of operating systems, their functions and services.
2. Understanding the basic set of commands and utilities in Linux/UNIX systems.
3. Learn the Linux/UNIX library functions and system calls.
4. Understand the effective uses of UNIX utilities, and scripting languages.
5. Effectively use Text editors for shell programs and Shell Scripts.
6. Developing projects using C and C++ in Linux/Unix environment.
7. Describe the work with UNIX utilities and to develop shell scripts.
8. Provide practical familiarity with UNIX and Linux hosts and the rich set of tools they provide to power users, operating systems specialists, network engineers and programmers.

Module:1	**The UNIX Environment**	**5 hours**

The operating system, The UNIX operating system, knowing your system , The UNIX Architecture, features of UNIX, locating commands, internal and external commands, command structure, understanding the man documentation

Module:2	**Getting familiar with Unix commands**	**7 hours**

Cal, date, echo, printf, bc, script, Email basics, mailx, passwd, who, uname, tty, sty. **The process**: Process basics, **ps**: Process status, mechanism of process creation, internal and external commands, running jobs in background, process states and Zombies, **nice**, killing processes with signals, job control, **cron, time**.

Module:3	**File System and its attributes**	**6 hours**

Listing file attributes, directory attributes, file owner ship, file permissions, directory permissions, changing file ownership, file system and Inodes, hard links, symbolic links, locating files, modification and access time

Module:4	**The VI editor**	**5 hours**
Module:5	**Filters using Regular expressions**	**7 hours**

The sample database, Paginating Files, head, tail, cut, paste, sort, uniq, tr, grep, Basic regular expressions, Extended Regular expressions, Stream editor, Line addressing, Using multiple instructions

Module:6	**Shell Script**	**6 hours**

Basic types of statements in a shell script, How do you execute a shell script, Examples of simple scripts, Working with script variables, including command-line arguments, Command substitution, Expressions involving variables, Other forms of input to shell variables or commands in a script,

Flow-of-control statements		
Module:7	**Advanced shell programming**	**6 hours**
Shells and Sub-shells, ( ) and { }: Sub-shell or current shell?, export, Running a script in the Current shell, String Handling, Shell Functions		
Module:8	Expert talks on encryption and SSH(secure socket shell) Tools	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	SumitabhaDas, Your UNIX/LINUX: The Ultimate Guide , Edition 2012,Tata McGraw Hill .
Reference Books	
1.	**Paul Love, Joe Merlino, Craig Zimmerman, Jeremy C. Reed, Paul Weinstein.** Beginning Unix, 2015, Wiley Publisher.
2.	**Andrew Mallett**-Mastering Linux Shell Scripting, 2015, PACKT Publisher.

List of Challenging Experiments		
1.	Working with unix commands	2 hours
2.	Working with vi editor	2 hours
3.	Creating document in vi editor	2 hours
4.	Practicing –How to compile and run C or C++ programs	3 hours
5.	Shell programs Basics	2 hours
6.	Shell programs using decision statements, loops, positional variables	3 hours
7.	Shell programs using arrays and strings	4 hours
8.	Shell program applying UNIX commands	2 hours
9.	Shell program with functions	3 hours
10.	Shell program for file operations	3 hours
	Total Laboratory Hours	26 hours

Recommended by Board of Studies	12-6-2015		
Approved by Academic Council	No:37th	Date	16-6-2015

ITA2003	Computer Architecture	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	**ITA1002**	**Syllabus version**				
		1.0				

Course Objectives:

1. To understand the basics of organization and architecture of digital computer
2. To learn techniques for different data transfer.
3. To apply design issues in the development of processor or other components.

Expected Course Outcomes:

1. Demonstrate basic organization and architecture of a digital computer.
2. Implement assembly language program for the various task involved in real-time environment.
3. Perform computer arithmetic operations on integer and real numbers.
4. Categorize the function of each element of a memory hierarchy.
5. Experiment the control unit operations and visualize the instruction level parallelism.
6. Compare the different methods used for computer I/O mechanisms.

Module:1	**Basic Model of a Computer**	**6 hours**

Computer components–computer function–cycles–fetch & execute cycles–example of program execution.

Module:2	**CPU Organization**	**6 hours**

Fundamentals– user and supervisor modes–CPU operation–instruction set–data representation – basic format – (word length. Tags, error detection & correction)

Module:3	**Signed Numbers**	**6 hours**

Exception conditions–floating point numbers(basic formats, normalization, & biasing, standards) – Instruction set

Module:4	**Floating Point Arithmetic**	**7 hours**

Adder, Subtractor, overflow, carry look ahead adder)–multiplication–(two's compliment arithmetic)- division by repeated multiplication – ALU design – (combinational and sequential ALU).

Module:5	**Random Access Memory**	**7 hours**

Serial Access Memories (Access Methods, Memory Organization, Magnetic Surface Recording, Magnetic Disk Memories – Cache – Associative Memory-Structure versus Performance.

Module:6	**Memory Technology**	**5 hours**

Memory Device Characteristics–(Memory Types, Performance & Cost, Access Modes, Memory Retention)

Module:7	**Addressing Modes**	**6 hours**

Relative Addressing–Instruction Type– (Completeness) – Programming Considerations – (Assembly language)-Concepts of subroutine and subroutine call-Use of stack for handling subroutine call and return

Module:8	**Experts talk on** Emerging technologies in embedded systems	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Sarah Harris, David Harris-Digital Design and Computer Architecture, 2015, ARM Edition.
Reference Books	
1.	**Linda Null, Julia Lobur-** The Essentials of Computer Organization and Architecture, 2014, 4th Edition.
2.	John P.Hayes, Computer Architecture and Organization, 2012, Tata McGraw-Hill Edition.
3.	M.Morris Mano, Computer System Architecture,2008,Third Edition Pearson.

Recommended by Board of Studies	12-6-2015		
Approved by Academic Council	No:37th	Date	16-6-2015

ITA2004	Fundamentals of Data Analytics	L	T	P	J	C
		3	0	2	0	4
Pre-requisite	ITA1005	Syllabus version				
		1.0				

Course Objectives:

1. Learn fundamental statistical concepts that are widely applicable in data analytics through course modules and solving business cases.
2. Different strategies are presented including sampling to make classical analytics tools amenable for big datasets, analytics tools that can be applied in the Finance and Investment, Measure for Interpretation, Forecasting Techniques, etc.
3. Describe the purpose and uses of data analytics in the real-world.

Expected Course Outcomes:

1. Demonstrate meaningful patterns in the data.
2. Identify the need of data analytics for a domain.
3. Graphically interpret the data on the various models.
4. Identify and Implement the analytic algorithms.
5. Handle large scale analytics projects from various domains.
6. Develop an intelligent decision support system.
7. Contextually integrate and correlate large amounts of information automatic ally to gain faster insights.

Module:1	Introduction	6 hours

Key Concepts, Ways of looking Data, Fractions, percentages and proportions, Index Numbers, Notation, Probability, Counting Techniques

Module:2	Finance and Investment	5 hours

Interest-Annuities-Investment analysis, Inflation, Interest rate problems in disguise-Exchange Rates.

Module:3	Measure For Interpretation	6 hours

Descriptive Measures for Interpretation and Analysis: Distributions, Normal Distributions, Tables, Charts

Module:4	Forecasting Techniques	5 hours

Time Series, Trends, Seasonal Adjustment, Cycles, Residuals, Cause and Effect, Forecast Monitoring and Review

Module:5	Sampling	6 hours

Estimating Statistics and Parameters, Confidence, Non-parametric Measures, Hypothesis Testing

Module:6	Incorporating Judgments into Decisions	7 hours

Uncertainty and risk, Decision trees, Perfect Information, The Expected information of Sample Information.

Module:7	Decision Making In Action	7 hours

Game Strategy, Queuing, Stock Control, Markov Chains, Project Management.

Module:8	**Contemporary issues**	**3 hours**
Expert Talk on Stock Market Prediction		
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	The Economist, The Economist Numbers Guide: The Essentials of Business Numeracy, 2014, 6th Edition, PublicAffairs.
Reference Books	
1.	VigneshPrajapati, Big data analytics with R and Hadoop, 2013, Packt Publishing Ltd.

List of Challenging Experiments		
1.	Create a data frame that stores the product number and the current stock value. The function dim() returns the dimensions (a vector that has the number of rows, then number of columns) of data frames and matrices. Use this function to find the number of rows in the data frames.	3 hours
2.	For the data frame created in Q.No.1 extract the following a. Use the function mean(), sum(), median() and range() b. Find how many product names starts with the character 'a' c. Display the details of the product "XYZ"	4 hours
3.	Fit the data in the data frame with product vs stock value trying both untransformed and logarithmic scales.	3 hours
4.	Investigate the use of function unclass () with a factor argument. Execute the code and give comments on the results. gender <- factor(c(rep("female", 91), rep("male", 92))) > table(gender) > gender <- factor(gender, levels=c("male", "female")) > table(gender) > gender <- factor(gender, levels=c("Male", "female")) # Note the mistake > # The level was "male", not "Male" > table(gender) >rm(gender)	3 hours
5.	(a) Create a for loop that, given a numeric vector, prints out one number per line, with its square and cube alongside. (b) Show how to use a while loop to achieve the same result.	6 hours

	(c) Show how to achieve the same result without the use of an explicit loop.	
6	Execute the code that illustrate the use of paste(): > paste("Leo", "the", "lion") > paste("a", "b") > paste("a", "b", sep="") > paste(1:5) > paste(1:5, collapse="") What are the respective effects of the parameters sep and collapse?	3 hours
7	Create a function that calculates the mean and standard deviation of a numeric vector. Modify the function so that: (a) the default is to use rnorm() to generate 20 random normal numbers, and return the standard deviation; (b) if there are missing values, the mean and standard deviation are calculated for the remaining values.	4 hours
	Total Laboratory Hours	26 hours

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Approved by Academic Council	No:37th	Date	16-6-2015

ITA2005	Computer Graphics	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	ITA1002	Syllabus version				
		1.0				

Course Objectives:

1. To explore the comprehensive introduction to computer graphics.
2. To provide an understanding of mapping from a world coordinates to device coordinates, clipping, and projections.
3. To offer an exposure to the various computer graphics applications / tools / technologies.

Expected Course Outcomes:

1. Demonstrate the knowledge of the fundamental concepts of computer graphics techniques.
2. Design and problem solving skills with application to computer graphics.
3. Understand core architectural concepts of typical graphics pipeline.
4. Implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling and clipping techniques.
5. Provide the knowledge of display systems and interactive control of 3D computer graphics applications.
6. Design an application with the various principles of computer graphics.

Module:1	Introduction and Overview of Graphical Systems	5 hours

Video Display Devices - Raster Scan Systems - Input Devices - Hard Copy Devices – Graphics Software

Module:2	Output Primitives	7 hours

Line drawing algorithms: Direct method-DDA- Bresenham's line drawing algorithm-Midpoint line drawing algorithm Circle Drawing Algorithms: Basic representation of circle-Bresenham's Circle generating algorithm-Midpoint circle generating algorithm-Filling algorithms: Flood fill method-boundary fill method-Attributes of output primitives.

Module:3	2D Transformations and 2D Viewing	7 hours

Two-Dimensional Transformation –2D viewing transformation-clipping- Window-view port mapping.

Module:4	3DTransformations and 3D Viewing	6 hours

3D Concepts- 3D Transformations - 3D Viewing-Introduction to modeling- Solid Modeling – Surface Modeling – Wireframe Modeling.

Module:5	User Interface	6 hours

User dialogue – Input of Graphical Date - Input Functions - Input Device Parameters – Picture Construction Techniques.

Module:6	Visible-Surface Detections	6 hours

Visible-Surface Detection Back-Face Detection – Depth-Buffer Method – A Buffer Method-Scan Line Method – Painter's Algorithm.

Module:7	**Coloring Models**	**6 hours**
Properties of lighting-Intuitive models: RGB model CMYK model-XYZ model-YIQ model-HSV-HSI-HSB models.		
Module:8	**Contemporary issues:**	**2 hours**
Expert talk on Applications of computer graphics: Graphics software tools-case studies.		
	Total Lecture hours:	**45 hours**

Text Book	
1.	D. Hearn and M.P. Baker, Computer Graphics with Open GL, 2011, Fourth edition, Pearson Education.

Reference Books	
1.	Pakhira and Malay K, Computer graphics multimedia and animation, 2010, Second Edition, PHl Learning Private Limited.
2.	Amarendra N Sinha and Arun D Udai, Computer Graphics, 2010, Second Edition- McGraw Hill.

Recommended by Board of Studies	12-6-2015		
Approved by Academic Council	No:37th	Date	16-6-2015

ITA2006	Multimedia Systems	L	T	P	J	C
		3	0	2	0	4
Pre-requisite	**ITA1002**	**Syllabus version**				
		1.0				

Course Objectives:

1. To provide the foundation knowledge of multimedia systems.
2. To impart knowledge about various representations of multimedia data.
3. To understand the characteristics of different multimedia tools and techniques.

Expected Course Outcomes:

1. Demonstrate knowledge of the fundamental elements and concepts related to multimedia systems.
2. Learn the authoring tools and user interfaces to meet the challenges in working with various multimedia systems.
3. Animate the multimedia data considering the recent software used in multimedia applications.
4. Apply the concepts learned in recording and editing to support audio and digital movie tools.
5. Provide solutions for designing and producing multimedia projects.
6. Develop the applications towards special effects for audio and video designing.
7. Evaluate more advanced and future multimedia systems.

Module:1	**Introduction**	**9 hours**

Multimedia: Brief outline about Multimedia, features, uses, applications, multimedia software tools, Text: Introduction about Fonts and Faces - Using Text in Multimedia – various techniques used in Text and Design Tools - Hypermedia and Hypertext.

Module:2	**Images**	**6 hours**

Images: Making Still Images – Colour - Images File Formats. Photoshop: Introduction, Retouching-Restoring-Filtering- Masks- Effects – Layers. Layers, filters, Types of Authoring Tools - Card-and-Page-Based Authoring Tools - Icon Based Authoring Tools - Time-Based Authoring Tools.

Module:3	**Animation**	**6 hours**

Flash: Introduction – Symbols – Timeline – Layers. The Power of Motion - Principles of Animation - Making Animations, making of post cards and brochures, 3-D Modeling and Animation Tools.

Module:4	**Sound**	**6 hours**

Sound: brief outline about sound, adding sound to multimedia animations– action-Scripts. System sounds, making midi audio, digital audio file formats, midi versus digital audio - adding sound to multimedia project.

Module:5	**Sound Recording**	**4 hours**

Introduction to Sound forge net, recording and editing in Sony sound forge net		
Module:6	**Video**	**6 hours**
Video: using video - how video works - short note on analog video - digital video - obtaining video clips – shooting and editing video. Video and Digital Movie Tools.		
Module:7	**Multimedia Production Design**	**6 hours**
Making of multimedia project, Stages of multimedia, Types of multimedia software, multimedia skills, planning and costing designing and producing of Multimedia.		
Module:8	**Special Effects for audio and video designing**	**2 hours**
Handled by Industry Experts		
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Tay Vaughan - Multimedia: Making it Work, 2011, Eight Edition, Tata McGraw-Hill Edition
Reference Books	
1.	Ralf Steinmetz, KlaraNahrstedt, Multimedia Systems, 2013, Springer Science & Business Media.
2.	Andy Bull, Multimedia Journalism: A Practical Guide, 2015, 2 edition revised, Routledge.

List of Challenging Experiments		
	Flash Professional	
1.	Study of Tools and User Interface components in Macromedia Flash	2 hours
2.	Tweening a. Create an animation to represent the growing moon using shape tweening b. Create the animation of a moving car using motion tweening c. Create an animation to indicate a ball bouncing on steps using Guide Layer	3 hours
3.	Animation a. Simulate movement of a cloud using Layer by Layer animation b. Draw the fan blades and give proper animation using Frame by Frame animation	3 hours
4.	Display the text “VIT UNIVERSITY” given its background using text masking.	2 hours
5.	Display the background (choose any image) through your name using image masking.	2 hours
6	Action script using buttons	3 hours

	a. Controlling of various scenes using buttons b. Creation of Flash movie using buttons	
	Photoshop Professional	
1.	Converting black and white image to color image.	2 hours
2.	Repairing a damaged image.	2 hours
3.	Manipulation of images using layers	2 hours
4.	Manipulation of images using filters	2 hours
5.	Manipulation of images using various effects	3 hours
Total Laboratory Hours		26 hours

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ITA2007	Data Communication And Networking	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	**ITA1002**	**Syllabus version**				
		1.0				

Course Objectives:

1. To learn the principles of computer networks with a top-down approach including 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 Outcomes:

1. Demonstrate knowledge of the fundamental of data communication and Networks.
2. Analyze the physical layer transmission medium concepts to meet the challenges in implementing computer networks.
3. Examine the applications of Medium Access control Protocol in LAN standards and its switching methods in Networks.
4. Identify and analyze the data link layer error and flow control issues in computer networks.
5. Provide solutions such as reliability, scalability and robustness by routing algorithm and congestion control in networks.
6. Analyze, design, and implement the networks by using transport and application layer protocols.

Module:1	**Introduction**	**8 hours**

Network, Protocols & standards and standards organisations - Line Configuration Topology - Transmission mode - Classification of Network - OSI Model - Layers of OSI Model-TCP/IP Protocol Suit.

Module:2	**Physical Layer and Media**	**9 hours**

Data and Signals, Analog and Digital, Digital Signals, Transmission Impairment, Data Rate Limits, Performance, Multiplexing, Spread Spectrum.

Module:3	**Physical Layer and Media**	**6 hours**

Circuit-Switched Networks, Datagram Networks, Virtual-Circuit Networks, Structure of a Switch.

Module:4	**Data Link Layer**	**5 hours**

Error detection and correction Types of error- Parity check-Checksum-CRC – Framing-flow Control and Error control –CSMA-CSMA/CD-CSMA/CA- LAN - Ethernet IEEE 802.3 – Bridges

Module:5	**Network Layer**	**5 hours**

Internetworking-IP addressing methods –Internet Protocol(IPv4,IPv6)-Address mapping-Address ResolutionProtocol – ReverseaddressresolutionProtocol-Routing

Module:6	**Transport Layer**	**5 hours**

Process-to-Process Delivery, UDP, TCP Congestion Control.

Module:7	**Application Layer**	**5 hours**
DNS, Telnet, FTP, SNMP.		
Module:8	**Expert talk on contemporary issues**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Behrouz and Forouzan, Data Communication and Networking, 2012, 5th Edition, McGraw-Hill.
Reference Books	
1.	Larry L. Peterson, Bruce S. Davie ,Computer networks: A Systems Approach, 2012, 5th Edition, Elsevier Inc.

Recommended by Board of Studies	12-6-2015		
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ITA2008	Data Warehousing and Data Mining	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	ITA1005	Syllabus version				
		1.0				

Course Objectives:

1. Understand various data mining functionalities.
2. Understand the dimensional modeling technique for designing a data warehouse.
3. To study the methodology of engineering legacy databases for data warehousing and data mining to derive business rules for decision support systems.

Expected Course Outcomes:

1. Demonstrate knowledge of the fundamental concepts of data mining and knowledge discovery process.
2. Understand and analyze different types of data their attributes, incomplete data, data pre-processing concepts.
3. Understand the applications of data warehousing, architecture design and the implementation issues.
4. Differentiate and design OLAP and OLTP systems.
5. Analyze the general information system by applying association rule mining algorithms.
6. Develop different types of classification and regression techniques on information system to support decision making system.
7. Perform the various cluster analysis using different methods.
8. Apply the various data mining and data warehousing techniques to analyze real world system.

Module:1	Introduction to Data Mining	6 hours

Data Mining – Introduction to Data Mining–The knowledge discovery process-knowledge discovery process models – Pattern Evaluation Measures – Data Mining System Types

Module:2	High dimensionality Data	7 hours

Introduction about data, attributes of data, dataset, storage, issue concerning the amount and quality of data, high dimensionality Data, dynamic data, imprecise data, incomplete data, redundant data, missing values ,noise

Module:3	Introduction to Data Warehousing	6 hours

Characteristics of a Data Warehouse – Data warehouse architecture –data warehouse implementation-form data warehousing to data mining-data mart

Module:4	Online Analytical Processing	6 hours

Introduction – OLTP vs. OLAP systems – Data Modeling: Star Schema for Multidimensional View - Snow Flake Schema for Multidimensional View

Module:5	Mining frequent patterns	6 hours

Introduction to frequent item set, closed item set – Association Rules Fundamentals –frequent pattern mining- Apriori Algorithm ,mining various kinds of association rules, mining quantitative

association rules – Association Rules Generation		
Module:6	**Classification and prediction Analysis**	**6 hours**
Data Classification Fundamentals – Decision Tree Model Based Classifiers, rule based classification, rule quality measures, rule analysis. prediction techniques: linear and non- linear regression techniques		
Module:7	**Data Clustering Techniques**	**6 hours**
Introduction to Data Clustering – Types of data in Cluster analysis, partitioning methods, hierarchical methods.		
Module:8	**Contemporary issues**	**2 hours**
Expert talk on data mining tools.		
	Total Lecture hours:	**45 hours**

Text Book(s)

1.	J. Han and M. Kamber, Data Mining: Concepts and Techniques, 2011, Third Edition, Morgan Kaufman.

Reference Books

	1) GalitShmueli, Peter C. Bruce, Nitin R. Patel, "Data Mining for Business Analytics: Concepts, Techniques, and Applications in XLMiner", 2015, 3rd Edition, Wiley India Publications. 2) H. Witten and E. Frank, Data Mining: Practical Machine Learning Tools and Techniques, 2011, Third Edition, Morgan Kaufmann. 3) G. K. Gupta, Introduction to Data Mining with Case Studies, 2014, Easter Economy Edition, Prentice Hall of India.

Recommended by Board of Studies	12-6-2015		
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ITA2009	Cryptography	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	**ITA1006**	**Syllabus version**				
		1.0				

Course Objectives:

1. To explore the principles and practices of cryptography and network security.
2. To impart knowledge about cryptography, network-based security threats and vulnerabilities.
3. To provide an exposure to practical solutions related to system and network security.

Expected Course Outcomes:

1. Deploy the knowledge of fundamental related to cryptography.
2. Analyze and apply various security models and standards.
3. Design security protocols and mechanisms for the provision of security services needed for secure networked applications.
4. Apply the security techniques and technologies in solving real-life security problems in practical systems.
5. Design the security protocols and functions using different mechanism.
6. Develop applications targeted for message authentication codes using different security protocols and techniques.

Module:1	**Introduction to Cryptography**	**6 hours**

The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, Fundamental Security Design Principles , Attack Surfaces and Attack Trees , A model for Internetwork Security.

Module:2	**Symmetric Ciphers**	**5 hours**

Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography, The Data Encryption Standard

Module:3	**Advanced Encryption Standard**	**6 hours**

Finite Fields - Groups, Rings, Fields, Finite Fields of the Form GF(p), GF(2n). AES - AES Structure, AES Transformation Function

Module:4	**Block Cipher Operation**	**9 hours**

Multiple Encryption and Triple DES, XTS-AES Mode for Block-Oriented Storage Devices, Format-Preserving Encryption. Random Bit Generation and Stream Ciphers - Principles of Pseudorandom Number Generation, Pseudorandom Number Generators, Pseudorandom Number Generation using a Block Cipher

Module:5	**Asymmetric Ciphers**	**6 hours**

Principles of Public-Key Cryptosystems, The RSA Algorithm, Other Public-Key Cryptosystems - Diffie–Hellman Key Exchange, Elgamal Cryptographic System, Elliptic Curve Cryptography

Module:6	**Cryptographic Hash Functions**	**5 hours**
Applications of Cryptographic Hash Functions, Two Simple Hash Functions, Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithm (SHA), SHA-3		
Module:7	**Message Authentication Codes**	**6 hours**
Requirements, Functions, Security of MACs, MACs Based on Hash Functions: HMAC, DAA and CMAC, CCM and GCM, Key Wrapping, PRNG based on Hash and MAC Function		
Module:8	**Expert Talk on Recent Trends**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)

1.	William Stallings, Cryptography and Network Security,2013, 6th Edition, Pearson Education.

Reference Books

1.	BehrouzA, Ferouzan, Cryptography and Network Security, 2007,Tata McGraw Hill.
2.	Charlie Kaufman, Radia Perlman and Mike Speciner, Network Security, 2002, Prentice Hall of India.

Recommended by Board of Studies	12-6-2015		
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ITA2010	User Experience Design	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	ITA1007	Syllabus version				
		1.0				

Course Objectives:

1. To focus on the models and practices needed to build a good user Interface.
2. To develop skills in the use and application of specific methods in user experience design.
3. To design and model the user interface for various wearable devices.

Expected Course Outcomes:

1. Understand the methodology and concepts for creating an UX design.
2. Learn the practices and principles for a good UX Design.
3. Apply the appropriate models, Taxonomy and Change requirements for an effective design.
4. Apply the UX tools for Business and Enterprise applications.
5. Design Models for user interface using UX form components.
6. Design user interface for various real time wearable devices by applying the UX approaches.
7. Implement the concepts of UX interface design for a real time application and document the step by step process.

Module:1	Introduction	7 hours

Data driven design, Design Thinking, Creative UX – Essential Mindset for Creativity, The six conditions for creativity, Applying creativity to UX Design

Module:2	Good UX Design	6 hours

Good Design , Principles of Good Design, Design Exercise

Module:3	Foundations of good IA	6 hours

Foundational IA, The Four Cs of IA, Navigation, Mental Models, Taxonomy, Designing for Change

Module:4	Principles of UX Design	6 hours

Patterns in UX Design, Problems with UX, Enterprise UX, Business of UX, UX Tools

Module:5	UX forms	8 hours

UX Form Designing - Form Projects - Designing Words, Design and Flow

Module:6	Designing for Wearables - I	5 hours

Design Follows Technology, Activity Trackers, Smart Watches

Module:7	**Designing for Wearables - II**	**5 hours**
Wearable cameras, Service Design, Embodiment and Perception, Prototyping.		
Module:8	**Expert talk on recent trends**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)

1. Scott Faranello, Practical UX Design, 2016,PACKT Publishing.
2. Jessica Enders, Designing UX: Forms Aspects of UX, 2016, SitePointLimited.
3. Scott Sullivan, Designing for Wearables: Effective UX for Current and Future Devices, 2016, First Edition, OReilly.

Reference Books

1. David Platt, The Joy of UX: User Experience and Interactive Design for Developers, 2016, Addison-Wesley Professional.
2. Brad Nunnally, David Farkas,UX Research: Practical Techniques for Designing Better Products,2016, OReilly.

Recommended by Board of Studies	12-6-2015		
Approved by Academic Council	No:37th	Date	16-6-2015

ITA2011	Mobile Application Development	L	T	P	J	C
		3	0	2	4	5
Pre-requisite	**ITA1007**	**Syllabus version**				
		1.0				

Course Objectives:

1. Understanding the Android fundamentals and the development environment.
2. Building applications with user interface components and enhance the mobile application with the set of powerful android features.
3. Customizing the mobile application resources for a variety of handset configurations.
4. Explore and publish an Android application for the world in different publishing avenues.

Expected Course Outcomes:

1. Gain insight into android fundamentals and development tools.
2. Develop a new Android project with added custom layouts and shared preferences.
3. Acquire key skills for developing Android applications, using various controls, the types of navigation mechanisms available and add options menu to the activity screen.
4. Learn to build application with the most useful controls and to style them and handle input events from the user.
5. Enhance the user experience of a mobile application through location-based services, social & network support.
6. Test, improve and organize Android application for different countries using internationalization strategies.
7. Verify, debug, export the application package and prepare the mobile application for publication.
8. Develop, test, debug and publish mobile applications, by taking full advantage of the capabilities of the android framework.

Module:1	**Introduction**	**5 hours**
Android Fundamentals-Getting Started with Android, Mastering the Android Development Tools		
Module:2	**Android Applications**	**9 hours**
Building Android Applications, Installing Eclipse IDE and Android SDK, Configuring Development Hardware, Managing Application Resources, Configuring the Android Manifest File, Designing an Application Framework.		
Module:3	**Building an Application Framework**	**7 hours**
Implementing an Animated Splash Screen, Implementing the Main Menu Screen, Developing the Help and Scores Screens.		
Module:4	**Building Forms**	**7 hours**
Building Forms to Collect User Input, Using Dialogs to Collect User Input, Adding Application Logic.		
Module:5	**Android Features**	**6 hours**
Working with Images and the Camera, Adding Support for Location-Based Services, Adding Network Support, Adding Social Features.		

Module:6	**Internationalizing and Testing Android App**	**4 hours**
Internationalizing Your Application, Developing for Different Devices, Testing Android Application.		
Module:7	**Publishing Android Application**	**5 hours**
Getting Ready to Publish, Publishing on the Android Market.		
Module:8	**Contemporary issues**	**2 hours**
Expert talks on Integrating Android Apps with NoSQL Databases		
	Total Lecture hours:	**45 hours**

Text Book(s)

1. Lauren Darcey, Shane Conder Teach Yourself Android Application Development in 24 Hours, 2014, Third edition,Sams Publishing.

Reference Books

1. Wei-Meng Lee, Beginning Android 4 Application Development, 2012, 1st Edition, John Wiley & Sons.
2. Reto Meier, Professional Android 4 Application Development,2012, Third Edition, Wrox.

List of Challenging Experiments		
1.	Write an android app to get the current location using GPS.	4 hours
2.	Write an android program to display stationary items in the Main Activity with the check box. Select the items and generate the bill. Include VAT as a toggle button, to calculate the bill. For members/ Non-members use radio button and give 2% discount on bill amount	4 hours
3.	Create a SQLite database that contains EMPLOYEE table. The EMPLOYEE table contains the Emp.no, Name and Basic Salary. Do the following operations on clicking the respective button. Add – Insert a new record. Delete – Delete the record with the given Emp. No. VIEW - To display the details of the employee for the given number. Calculate gross salary and display it	4 hours
4.	Write an Android app to give Notification Course Registration form for multiple student registration using Fragments	3 hours
5.	Write an Android app to pass information in bundles and reply the result back to the same page	4 hours
6.	Date Picker Dialog: Illustrate the DatePickerDialog application as described here. On launch of Emulator, it will display following Screen (1). Now you can see that the date has already been set at the bottom label. Now we will change the date through DatePickerDialog by pressing the Set Date button. On pressing the button following Screen (2) would appear. Now set the	4 hours

	required date, and after setting the date, press the Done button. This dialog will disappear and your newly set date will start showing at the Screen (3).	
7.	Time Picker Dialog: Illustrate the TimePickerDialog application as described here. On launch of Emulator, it will display following Screen (1). Now you can see that the time has already been set of the TimePicker widget. And the current time is also showing at the bottom label. Now we will change the time and press the save button. As you can see in the Screen(2), that the time has been updated after pressing the save button.	3 hours
	Total Laboratory Hours	26 hours

Recommended by Board of Studies	12-6-2015		
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ITA2012	Cloud Computing	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**ITA1007**	**Syllabus version**				
		1.0				

Course Objectives:

1. To understand the working concept of cloud computing.
2. To familiarize themselves with the lead players in cloud.
3. To appreciate the emergence of cloud as the next generation computing paradigm.

Expected Course Outcomes:

1. Analyze the various cloud models, standards and features of cloud.
2. Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
3. Analyze and design the various types of virtualization for computation in cloud.
4. Identify the architecture, infrastructure and delivery models of inter cloud computing.
5. Analyze the core issues of cloud computing such as security, privacy and interoperability.
6. Analyze the business requirements of cloud models and services.

Module:1	**Cloud Computing Basics**	**4 hours**

Cloud Computing Overview- Applications – Intranets and the cloud – Why Cloud Computing Matters – Benefits – Limitations – Companies in the Cloud Today – Cloud Services-Evolution of Cloud Computing –System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture -IaaS – On-demand Provisioning – Elasticity in Cloud.

Module:2	**Virtualization**	**5 hours**

Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Desktop Virtualization – Server Virtualization.

Module:3	**Cloud Infrastructure**	**4 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:4	**Cloud Computing Technology**	**8 hours**

Hardware and Infrastructure – Clients – Security- Network – Services – Accessing the Cloud - Platforms – Web Applications – Web APIs –Web Browsers –Cloud Storage –Overview – Cloud Storage Providers –Standards – Application – Client –Infrastructure – Service.

Module:5	**Cloud Application Development**	**8 hours**

Google – Microsoft – Intuit Quick Base – Cast Iron Cloud – Bungee Connect – Local clouds and Thin Clients – Virtualization – Server Solutions – Thin Clients.

Module:6	**Cloud Computing at Work**	**7 hours**

Software as a service – Overview – Driving Forces – Company offerings – Industries-– Software

plus Services – Overview - Mobile Device Integration –Providers –Microsoft Online.		
Module:7	**Migrating To The Cloud**	**7 hours**
Cloud Services for Individuals – Cloud services aimed at the mid-market –Enterprise Class Cloud Offerings – Migration		
Module:8	**Future directions**	**2 hours**
Cloud Domain and scope of work-Cloud as PaaS, SaaS-Cloud Computing Programming Introduction-Trends and market of cloud.		
	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, 2012, Morgan Kaufmann Publishers.
2. Velte T. Antony, Velte J. Toby andElsen Peter Robert, Cloud Computing: A Practical Approach, 2010, Tata McGraw- Hill.
3. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, 2012, Morgan Kaufmann Publishers.

Reference Books

1. Katarina Stanoevska-Slabeva, Thomas Wozniak, SantiRistol, Grid and Cloud Computing – A Business Perspective on Technology and Applications, 2010, Springer.
2. Miller Michael, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, 2010, Que Publishing.

Recommended by Board of Studies	12-6-2015		
Approved by Academic Council	No:37th	Date	16-6-2015

ITA3003	Software Project Management	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	**ITA2002**	**Syllabus version**				
		1.0				

Course Objectives:

1. To inculcate the team working capability to complete the tasks in the defined schedule and cost.
2. To imbibe the software project management concepts to utilize in the real world.
3. To facilitate an updated study of software project management with respect to contemporary developments in the field.

Expected Course Outcomes:

1. Enthusiastically participate or successfully manage a software development project by applying project management concepts.
2. Implement project management knowledge, processes, lifecycle and the embodied concepts, tools and techniques in order to achieve project success.
3. Utilize technology tools for communication, collaboration, information management, and decision support.
4. Apply project management practices to the launch of new programs, initiatives, products, services, and events relative to the needs of stakeholders.
5. Manage the scope, cost, timing, and quality of the project, at all times focused on project success as defined by project stakeholders.
6. Identify and develop project goals, constraints, deliverables, performance criteria, control needs, and resource requirements in consultation with stakeholders.

Module:1	**Introduction**	**5 hours**
Software Project Management – Software Project vs. other Projects, Stakeholders, Management Control, Requirements Specification.		

Module:2	**Project Evaluation**	**6 hours**
Overview of Project Planning – Step wise planning. Strategic Assessment, Technical Assessment, Cost Benefit Analysis, Cash Flow Forecasting, Cost Benefit Evaluation Techniques. Selection of Appropriate Project Approach– Choosing Technologies, Technical Plan, Methodologies.		

Module:3	**Software Effort Estimation**	**6 hours**
Basics, Effort Estimation Techniques, Expert Judgment, Albrecht function point analysis, Function Points Mark II, Object Points, and COCOMO.		

Module:4	**Activity Planning**	**6 hours**
Objectives, Project Schedules, Projects and Activities, Sequencing and Scheduling Activities, Network Planning Models, Dummy Activities, Adding Time Dimension. Forward Pass, Backward Pass, Activity Float		

Module:5	**Risk Management**	**7 hours**
Risk Management - Nature Of Risk, Management Of Risk, Risk Identification, Risk Analysis, Risk Evaluation, Reducing The Risks, Evaluating The Risks, Calculating Z Values		
Module:6	**Resource Management**	**6 hours**
Resource Allocation–Nature Of Resources, Identifying Resource Requirements, Scheduling Resources, Creating Critical Paths		
Module:7	**Monitoring And Control**	**6 hours**
Collecting The Data – Visualizing Progress – Cost Monitoring – Prioritizing Monitoring-Change Control.		
Module:8	Managing People And Organizing Teams Handled by Industry Experts	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)

1.	Bob Hughes, Mike cotterell, "Software Project Management", 2011, Fifth Edition, Tata McGraw Hill.

Reference Books

1Practical Software Project Estimation: A Toolkit for Estimating Software Development Effort & Duration,2010. Peter Hill, International Software Benchmarking Standards Group.

Recommended by Board of Studies		12-6-2015	
Approved by Academic Council	No:37th	Date	16-6-2015

ITA3004	Scripting Languages	L	T	P	J	C
		3	0	2	0	4
Pre-requisite	**ITA2001**	**Syllabus version**				
		1.1				

Course Objectives:

1. To apply knowledge of scripting language effectively to new situations and learn from the experience.
2. To conceive basics of regular expressions, text processing, client- and server-level scripting and GUI programming.
3. To provide an exposure to develop various front end applications and connect with back end database.
4. Effectively analyze the requirements and apply knowledge to develop the applications

Expected Course Outcomes:

1. Analyze and model requirements and constraints for the purpose of designing and implementing software systems in HTML and CSS.
2. Analyze the requirements of software systems for the purpose of determining the suitability of implementing in HTML.
3. Evaluate and compare designs of various responsive web pages on the basis of specific requirements and constraints.
4. Design and implement AJAX and JSON solutions that accommodate specified requirements and constraints, based on analysis or modelling or requirements specification.
5. Analyze problems and synthesis suitable solutions to real world problems using JSON.
6. Analyze problems and synthesis suitable solutions to real world problems using ASP.
7. Apply knowledge of the strengths and weaknesses of scripting languages to develop real time applications.
8. Apply knowledge to work with challenging experiments using HTML, CSS, ASP, AJAX and JSON

Module:1	**HTML5**	**6 hours**
Introduction, New Elements, Semantics, HTML Canvas, SVG, Media, Google Maps.		
Module:2	**HTML Media and APIs**	**6 hours**
HTML Video, audio, Plug-ins, YouTube, Geo Location, Drag/Drop, Web Storage, Session Storage, Web Workers, Server Sent Events		
Module:3	**CSS Responsive**	**6 hours**
Viewport, Grid View, Media Queries, Images, Videos, Frameworks, Templates		
Module:4	**JS AJAX**	**6 hours**
Introduction, XML Http, Request, Response, XML file, Applications		
Module:5	**JS JSON**	**5 hours**
Introduction, Syntax, JSON vs XML, Data Types, Objects, Arrays, Parse, Stringify.		

Module:6	**Active Server Pages**	**7 hours**
Introduction, Variables, Procedures, Conditionals, Looping, Forms, Cookies, Session, Application, File System, Text Stream, File, Folder.		
Module:7	**ASP Advanced**	**7 hours**
ASP VB Functions, Response, Request, Server, Error, Dictionary, ADO Connect, Record Set, Display, Query, Sort, Add, Update, Delete.		
Module:8	**Expert talk on contemporary issues**	**2 hours**
Industrial Expert Talk		
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Craig Grannell, Victor Sumner, Dionysios, The Essential Guide to HTML5 and CSS3 Web Design, 2012, First edition, Springer.
2.	John Pollock, JavaScript: A Beginner's Guide,2013, Fourth Edition, McGraw-Hill.
3.	G. Andrew Duthie, Matthew MacDonald. A, ASP.NET in a Nutshell, 2012,2nd Edition A Desktop Quick Reference", O' Reilly.
Reference Books	
1.	Elisabeth Robson, Eric Freeman, Head First HTML and CSS,2012,Second Edition, O'Reilly Publisher.

List of Challenging Experiments		
1.	HTML 5: Design a html page using SVG to display different shapes like a) Rectangle b) Polygon c) Rounded rectangle d) Circle	2 hours
2.	Design a html page to play video of a city with controls and auto play. The html page should also provide a) geolocation coordinates of the city b) Handle geolocation errors c) get geolocation with a map d) get geolocation and watch the position	2 hours
3.	Design a html page with drag and drop facility and a store a counter for one session	2 hours
4.	CSS Responsive: a) When the screen (browser window) gets smaller than 768px, each column should have a width of 100%. a) If the browser window is smaller than 500px, the background color will change to light blue. b) Use a media query to add a breakpoint at 768px.	4 hours
5.	JS JSON	5 hours

	a) Write a JavaScript program to parse JSON on an array b) Write a JavaScript program to access nested JSON arrays. c) Write a JavaScript program to stringify dates and functions d) Write a JavaScript program to create a HTML table based on JSON data e) Write a JavaScript program to create a HTML drop down list based on JSON data. f) Write a program for Online Quiz using JavaScript.	
6.	JS AJAX a) Design an AJAX application to view a XML cd catalog b) Design an AJAX application to display XML data in an HTML table **c)** Design an AJAX application to show XML data inside an HTML div element.	5 hours
7.	ASP a) Design a ASP page for obtaining student details with various form elements like (i) Student Regno (text box) (ii) Gender (Radio buttons) (iii) Identification proof (Check box) Ex:passport, Aadahar, driving license Pass the information from client to server using query string and create a cookie for the information sent. b) Design a ASP page with username, password and create a session for the user in ASP. Store the information in a file and return the total number of bytes written in the file. c) Design a ASP page using text stream object and perform the following (i) Read only a part of a text file (ii) Skip a part of text file (iii) Skip a line of text file (iv) Return current line-number in a text file (v) Get column number of the current character in a text file. d) Design a ASP page which contains list of people names and their mobile numbers stored in a dictionary. Perform the following (i). Check whether a specified key exist? (ii). Return an array of all items	6 hours

	(iii). Return an array of all keys (iv). Return the value of an item (v). Set a key (vi). Return the number of key/item pairs. e) Design a ASP page with ADO connectivity to display records in an HTML table. Assume the database consist of employee name, designation, years of experience and department. (i) Display records where department starts with "a" (ii) Sort the records on a specified field name ascending	
	Total Laboratory Hours	26 hours

Recommended by Board of Studies	12.8.2017		
Approved by Academic Council	No. 47th	Date	5.10.2017

ITA3005	Computer Hardware	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	**ITA2003**				**Syllabus version**	
						1.0

Course Objectives:

1. To configure, evaluate and select hardware platforms for the implementation and execution of computer applications, services and systems.
2. To design and build centralized and distributed computer systems/architectures based on hardware, software and network components.
3. To understand and evaluate computer structures and architecture, as well as the basic components that make them up.

Expected Course Outcomes:

1. Demonstrate knowledge of the fundamental evolution of Process, Specifications of computers and its various components and applications.
2. Demonstrate knowledge of the Motherboards, I/O Buses and Interfaces ports Keyboard Interface.
3. Demonstrate knowledge of the BIOS and Memory Standards Hard disk and Storage Media.
4. Apply the various methods in Video and Audio Hardware Power Supplies techniques.
5. Demonstrate knowledge of the PC Diagnostics, Testing, and Maintenance operating process maintenance tools.
6. Develop knowledge of troubleshooting and updating the system.

Module:1		**6 hours**

Processor Evolution and Specifications: 16-Bit to 64-Bit Architecture Evolution - Processor Specifications, Features, Manufacturing, Socket and Slot types, Intel Core Processors, AMD Processors, Processor Cooling and Upgrades.

Module:2		**7 hours**

Motherboards, I/O Buses and Interfaces: Motherboard Form Factors, Seventh/Eighth-Generation Chipsets, Third-Party chipsets, Super I/O Chips, Processor Bus, Types of I/O buses, Serial Ports, Parallel Ports, USB , IEEE 1394, Keyboard Interface, DMA Channels

Module:3		**7 hours**

BIOS and Memory Standards: Motherboard ROM BIOS, Upgrading the BIOS, Preboot Environment, Unified Extensible Firmware Interface, BIOS Setup, Memory: Speed and Performance, Modules, Banks, Installing and Troubleshooting Memory

Module:4		**6 hours**

Hard disk and Storage Media: ATA Standards, PATA, SATA, ATAPI, PATA/SATA RAID, HDD: Operation, Components and Features, Flash Memory Devices, Solid-State Drives, USB Flash Drives, Optical Storage, Cloud-Based Storage.

Module:5		**6 hours**

Video and Audio Hardware: Display adapters and Monitors, Video Display Interface, 3D Graphics Accelerators, LED, LCD, Touch screen, Plasma display, DLP Projectors, DirectX and Audio

Hardware features		
Module:6		**5 hours**
Power Supplies: Power Connectors, Power Factor correction, Power-Use Calculations, Power Savings, Advanced Configuration Power Interface, Power Supply Recommendations, Power-Protection Systems, Real-Time Clock, CMOS Battery		
Module:7		**5 hours**
PC Diagnostics, Testing, and Maintenance: POST, Operating System Diagnostics, Boot Process, PC maintenance tools, Preventive Maintenance, Troubleshooting Techniques		
Module:8		**3 hours**
Expert talk on Building, Upgrading and Troubleshooting Systems.		
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Scott Mueller, Upgrading and Repairing PCs, Que Publishing,2015, 22nd Edition, Pearson Education Inc.
Reference Books	
1	Alan Clements, Principles of Computer Hardware, 2013, 4th Edition, Oxford University Press.
2	James K L, Computer Hardware: Installation, Interfacing, Troubleshooting and Maintenance, 2013, Eastern Economy Edition, PHI Learning Press.

Recommended by Board of Studies	12-6-2015		
Approved by Academic Council	No:37th	Date	16-6-2015

ITA3009	Internet of Things	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	ITA3001	Syllabus version				
		1.0				

Course Objectives:

1. To introduce the fundamentals of IoT.
2. To give insight into the application areas of IoT.
3. To understand the IoT protocols.

Expected Course Outcomes:

1. Familiarize the fundamentals of Internet of Things.
2. Understand the various techniques included in Communications done through internet.
3. Understand State of the Art – Internet of Things.
4. Develop a system classify Real World IoT Design Constraints, Industrial Automation in IoT.
5. Understand how to make sensor data available on the Internet.
6. Apply the concept of Internet of Things in the real world scenarios.

Module:1	Network Essentials for IoT	6 hours

Internet of Things(IoT) Overview, Internet Communications, IP Addresses, MAC Addresses, TCP and UDP Ports, Application layer Protocols.

Module:2	Introduction to IoT	7 hours

Defining Internet of Things(IoT), Pillars of IoT: M2M, RFID, WSN and SCADA

Module:3	IoT Strategy	6 hours

Device, Connect and Manage(DCM) Strategy, Communication Middlewares for IoT

Module:4	Protocol Standardization	4 hours

IoT Protocol Standardization, Unified Data Standards

Module:5	Web of Things (WoT)	8 hours

Introducing Web of Things(WoT), WoTvsIoT, Platform Middlewares, Unified Multitier WoT Architecture, WoT Portals and Business Intelligence.

Module:6	Cloud of Things (CoT)	6 hours

Cloud Computing Basic, IoT and Cloud Computing, Mobile Cloud Computing, Cloud of Things Architecture

Module:7	IoT Applications	5 hours

Intelligent Transport Systems, Smart Grid, Smart Buildings

Module:8	Contemporary issues	3 hours

Expert talks on recent trends in IoT Tools

	Total Lecture hours:		**45 hours**
Text Book(s)			
1.	Honbo Zhou, The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, 2012		
Reference Books			
1.	Adrian McEwen, Hakim Cassimally, Designing the Internet of Things, 2013, First Edition,Wiley Publications,		
2.	ArshdeepBahga, Vijay Madisetti, Internet of Things: A Hands-on Approach, 2015, First Edition, Universities Press.		
Recommended by Board of Studies		12-6-2015	
Approved by Academic Council		No. 37th	Date 16-6-2015

ITA3010	Object OrientedAnalysis and Design	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	**ITA1004, ITA3001**	**Syllabus version**				
		1.0				

Course Objectives:

1. Transform Use Cases into Object Oriented software Realizations through OO Analysis and OO Design.
2. Document your requirements, analysis, and design models in the Unified Modelling Language (UML) notation.
3. Apply techniques of state machines and design patterns to your designs.

Expected Course Outcomes:

1. Practically apply knowledge software engineering methods, such as object-oriented analysis and design methods with a clear emphasis on UML.
2. Develop working ability and grasping attitude to design and conduct object-oriented analysis and design experiments using UML, as well as to analyze and evaluate their models.
3. Analyze and design software systems, components to meet desired needs.
4. Develop an ability to form and work on multi-disciplinary teams that are able to perform multiple-faceted tasks from domain analysis and understanding to design and develop software systems based on object-oriented thinking
5. Develop an ability to identify, formulate and solve software development problems: software requirements, specification (problem space), software design, and implementation (solution space).
6. Show an ability to use the graphical UML representation using software tools.

Module:1	**Introduction**	**6 hours**

Two Orthogonal View of Software-Object Oriented System Development Methodology-Objects-Attributes-Objects- Objects Are Grouped in Classes-Object Behavior and Methods- Objects Respond to Messages-Encapsulation and Information Hiding.

Module:2	**Objects Basics**	**4 hours**

Inheritance-Multiple Inheritance - Polymorphism - Object Relationships and Associations-Consumer-Producer Association-Aggregations and Object Containment

Module:3	**Object Oriented System Development Life Cycle**	**7 hours**

Introduction-Software Development Process-Building High Quality Software-Object-Oriented Systems Development: A Use case Driven Approach-Reusability.

Module:4	**Object Oriented Methodologies**	**7 hours**

RumbaughModeling Technique–Booch Methodology-Jacobson-Patterns-Frameworks-Unified Approach.

Module:5	**Unified Modeling Language**	**8 hours**
Static and Dynamic Models – UML Class Diagram – Use-Case Diagram – UML Dynamic Modeling – UML Extensibility		
Module:6	**Object Oriented Design Process and Design Axioms**	**5 hours**
Object Oriented Design Process-Design Axioms-Corollaries-Design Patterns		
Module:7	**Designing Classes**	**5 hours**
Introduction-Designing Classes-The Process-Class protected Visibility-Designing Well-Defined Public, Private and Protected Protocols-Designing Classes-Refining Attributes-Designing Methods and Protocols.		
Module:8	**Contemporary issues**	**3 hours**
Industry expert on have to give lecture on object oriented approach followed in the industry to develop software application.		
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Ali Bahrami, Object Oriented Systems Development,2008, McGraw Hill.
Reference Books	
1.	Grady Booch, Robert A Maksimchuk, Michael W Engel, Object – Oriented Analysis and Design with Applications, 2007, Third Edition, Pearson Education.
2.	Grady Booch, James Rumbaugh and Ivar Jacobson, The Unified Modeling Languages User Guide,2004, Addison Wesley.

Recommended by Board of Studies	12-6-2015		
Approved by Academic Council	No:37th	Date	16-6-2015

ITA3011	Network Administration	L	T	P	J	C
		3	0	2	0	4
Pre-requisite	**ITA3008**	**Syllabus version**				
		1.0				

Course Objectives:

1. To describe and execute network administrator duties and utilities.
2. To impart knowledge about to implement server organization, user rights, user addition, maintenance of security and user accounting.
3. To provide an exposure to Install and configure networking services for intranet and Internet domains.

Expected Course Outcomes:

1. Demonstrate knowledge of the fundamental of workstations servers Install, configure and manage enterprise systems/networks, including hardware/software.
2. Demonstrate knowledge to implement and administer desktop and server operating systems (client/server), switching and routing devices.
3. Demonstrate knowledge of the various models of network and system administration.
4. Demonstrate knowledge of creating user/group accounts and configure server roles, integrating operating system.
5. Apply various methods in fault tolerance propagation-Networks and system performance tuning.
6. Apply the important methods in providing and monitoring service of email storage backup.
7. Demonstrate knowledge of management practice for technical and non-technical managers.

Module:1		**5 hours**

Foundation elements: Workstations-servers-services-data centers-networks-namespaces-security policy

Module:2		**6 hours**

Change processes: Debugging-change management-server upgrades-service conversions-Centralization and decentralization

Module:3		**6 hours**

Administration components: System components-networked communities-host management-user management

Module:4		**7 hours**

Models of network and system administration: Information models and directory services-System infrastructure organization -Network administration models-Network management technologies-Creating infrastructure -system maintenance models -Integrating multiple OSs

Module:5		**6 hours**

Diagnostics, fault and change management: Fault tolerance and propagation-Networks and small worlds-Faults-Cause trees-Probabilistic fault trees-System performance tuning

Module:6		**6 hours**
Providing services: Service monitoring-Email services-print services-data storage-Backup and restore-remote access service-web services		
Module:7		**6 hours**
Management practices: Organizational structures-Technical managers-non technical managers-Perception and visibility		
Module:8		**3 hours**
Experts talk on Network administration tools		
Total Lecture hours:		**45 hours**

Text Book(s)	
1.	Christina J. Hogan. Strata R. Chalup, The Practice of *System and Network Administration*, 2012, 2nd Edition.

Reference Books	
1	Christopher Negus, Linux Bible,2010, WILEX INDIA.
2	Mark Burgees,Principles of network administration,2004, second edition.

Recommended by Board of Studies	12-6-2015		
Approved by Academic Council	No:37th	Date	16-6-2015

MGT1014	Supply Chain Management	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	**Nil**	**Syllabus version**				
		v.1.0				

Course Objectives: To develop the ability to

1. Provide the overview of Supply Chain concepts.
2. Coverage of supply chain and networkmodels.
3. Evaluation methods comparison of transportation modaloptions.

Expected Course Outcome: On the completion of this course the student will be ableto:

1. Understand Supply Chain processes.
2. Ability to identify the drivers of supply chain and logistics.
3. Differentiate different network models and influencingfactors.
4. Comprehend transport modals and performanceindicators.
5. Understand impacts of uncertainties in Supply Chaininventories.

Module:1	Introduction	6 Hours

Understanding the supply chain-What is a supply chain-historical perspective-Objective of a supplychain-Theimportanceofsupplychaindecisions,Decisionphasesinasupplychain-processview of a supply chains.

Module:2	Supply Chain Performance	6 Hours

Competitive and supply chain strategies -achieving strategic fit - expanding strategic Scope - obstacles to achieving strategic fit. Supply chain drivers and metrics - impellers of supply chain - drivers of supply chain-drivers of supply chain performance - framework for structuring drivers.

Module:3	Designing the Supply Chain Network	6 Hours

The role of distribution in the supply chain- factor s influencing distribution network design- design opt ions for a distribution network - distribution networks in practice – the role of network design in the supply chain – factors influences network design decisions - framework for network design decision.

Module:4	Planning Demand and Supply	6 Hours

The role of forecasting in a supply chain-characteristics of forecasts –components of forecasts andforecasts methods -basic approach to demand forecasting- time series forecasting methods

Module:5	Planning & Managing Inventories in a Supply Chain	6 Hours

The role of cycle inventory in a supply chain-estimating cycle inventory- related costs in practice- economies of scale to exploit fixed costs -economies of scale to exploit quantity discounts.

Module:6	**Managing uncertainty in a supply chain**	**6 Hours**
Safety inventory- the role of safety inventory in a supply chain determining appropriate level of safety inventory- impact of supply uncertainty on safety inventory- impact of aggregation on safety inventory.		
Module:7	**Designing and Planning Transportation Networks**	**6 Hours**
Transportation in a supply chain- the role of Transportation in a supply chain-mode of Transportation and their performance characteristics – Transportation infrastructure and polices - design opt ions for a Transportation network- trade-offs in Transportation design- tailored Transportation		
Module:8	**Contemporary issues:**	**3 Hours**
	Total Lecture	**45 hours**

Text Book(s)	
1.	Supply Chain Management – Strategy, Planning and Operation by Sunil Chopra and Peter Meindl Pearson / PHI, 4th Edition , 2010
Reference Books	
1.	Supply Chain Management by Jan at Shah Pears on Publication2008.

Mode of Evaluation: CAT / Assignment / Quiz / FAT / Project / Seminar

Recommended by Board of Studies	08-06-2015		
Approved by Academic Council	37th	Date	16-06-2015