

UNIVERSITY OF MUMBAI



Bachelor of Engineering

Information Technology (Second Year – Sem.VII & VIII)

Revised course (REV- 2012)

From Academic Year 2015 -16

Under

FACULTY OF TECHNOLOGY

(As per Semester Based Credit and Grading System)

From Dean's Desk:

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited. In line with this Faculty of Technology of University of Mumbai has taken a lead in incorporating philosophy of outcome based education in the process of curriculum development.

Faculty of Technology, University of Mumbai, in one of its meeting unanimously resolved that, each Board of Studies shall prepare some Program Educational Objectives (PEO's) and give freedom to affiliated Institutes to add few (PEO's) and course objectives and course outcomes to be clearly defined for each course, so that all faculty members in affiliated institutes understand the depth and approach of course to be taught, which will enhance learner's learning process. It was also resolved that, maximum senior faculty from colleges and experts from industry to be involved while revising the curriculum. I am happy to state that, each Board of studies has adhered to the resolutions passed by Faculty of Technology, and developed curriculum accordingly. In addition to outcome based education, semester based credit and grading system is also introduced to ensure quality of engineering education.

Semester based Credit and grading system enables a much-required shift in focus from teacher-centric to learner-centric education since the workload estimated is based on the investment of time in learning and not in teaching. It also focuses on continuous evaluation which will enhance the quality of education. University of Mumbai has taken a lead in implementing the system through its affiliated Institutes and Faculty of Technology has devised a transparent credit assignment policy and adopted ten points scale to grade learner's performance. Credit assignment for courses is based on 15 weeks teaching learning process, however content of courses is to be taught in 12-13 weeks and remaining 3-2 weeks to be utilized for revision, guest lectures, coverage of content beyond syllabus etc.

Credit and grading based system was implemented for First Year of Engineering from the academic year 2012-2013. Subsequently this system will be carried forward for Second Year Engineering in the academic year 2013-2014, for Third Year and Final Year Engineering in the academic years 2014-2015 and 2015-2016 respectively.

Dr. S. K. Ukarande
Dean,
Faculty of Technology,
Member - Management Council, Senate, Academic Council
University of Mumbai, Mumbai

Preamble

The engineering education in India in general is expanding in manifolds. Now, the challenge is to ensure its quality to the stakeholders along with the expansion. To meet this challenge, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education and reflects the fact that in achieving recognition, the institution or program of study is committed and open to external review to meet certain minimum specified standards. The major emphasis of this accreditation process is to measure the outcomes of the program that is being accredited. Program outcomes are essentially a range of skills and knowledge that a student will have at the time of graduation from the program. In line with this Faculty of Technology of University of Mumbai has taken a lead in incorporating philosophy of outcome based education in the process of curriculum development.

I, as Chairman, Board of Studies in Information Technology of University of Mumbai, happy to state here that, Program Educational Objectives were finalized in a meeting where more than 30 members from different Institutes were attended, who were either Heads or their representatives of Information Technology Department. The Program Educational Objectives finalized for undergraduate program in Information Technology are listed below;

1. To prepare Learner's with a sound foundation in the basics of engineering fundamentals.
2. To prepare Learner's to use effectively modern programming tools to solve real life problems.
3. To prepare Learner's for successful career in Indian and Multinational Organisations and to excel in Postgraduate studies
4. To encourage and motivate Learner's for entrepreneurship.
5. To inculcate professional and ethical attitude, good leadership qualities and commitment to social responsibilities in Learners.
6. To encourage Learner to use best practices and implement technologies to enhance information security and enable compliance, ensuring confidentiality, information integrity, and availability.

In addition to Program Educational Objectives, for each course of undergraduate program, objectives and expected outcomes from learner's point of view are also included in the curriculum to support the philosophy of outcome based education. I believe strongly that small step taken in right direction will definitely help in providing quality education to the stake holders.

Dr. J. W. Bakal
Chairman, Board of Studies in Information Technology,

B.E. Engineering (Semester VII)
Revised course for Information Technology
Academic Year 2015 -16 (REV- 2012)

Course Code	Course Name	Teaching Scheme (hrs/week)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	TW/Prac	Tut.	Total
BEITC701	Software Project Management	4			4			4
BEITC702	Cloud Computing	3			3			3
BEITC703	Intelligent System	4			4			4
BEITC704	Wireless Technology	4			4			4
BEITC705	Elective - I	4			4			4
BEITL701	Software Project Management		2			1		1
BEITL702	Cloud Computing		2			1		1
BEITL703	Intelligent System		2			1		1
BEITL704	Wireless Technology		2			1		1
BEITT705	Elective - I		2			1		1
BEITP706	Project-I		*			3		3
	Total	19	10		19	08		27

***Work load of the teacher in semester VII is equivalent to 6 hrs/week.**

Elective –I (Semester VII)	
BEITC7051	Image Processing
BEITC7052	Software Architecture
BEITC7053	E-Commerce & E-Business
BEITC7054	Multimedia Systems
BEITC7055	Usability Engineering
BEITC7056	Ubiquitous Computing

Examination Scheme

Course Code	Course Name	Theory					Term work	Pract/ Oral	Total
		Internal Assessment			End sem exam	Exam duration (in Hrs)			
		TEST 1	TEST 2	AVG.					
BEITC701	Software Project Management	20	20	20	80	3	25	25	150
BEITC702	Cloud Computing	20	20	20	80	3	25	25	150
BEITC703	Intelligent System	20	20	20	80	3	25	25	150
BEITC704	Wireless Technology	20	20	20	80	3	25	25	150
BEITC705	Elective - I	20	20	20	80	3	25	25	150
BEITP706	Project-I						25	25	050
	Total	100	100	100	400	15	150	150	800

Course Code	Course Name	Teaching Scheme (hrs/week)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical/Oral	Tutorial	Total
BEITC701	Software Project Management	04	02	---	04	01	---	05

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
BEITC701	Software Project Management	20	20	20	80	25	---	25	150

Course Objectives:

This course will help students to identify key areas of concern over Project Life Cycle (PLC) and use of project management principles across all the phases of PLC. The course will also help student to make them understand the importance and necessity of project plan and how it is helpful to project manager in monitoring and controlling the various aspects of the project such as schedule, budget, etc. The course will make them understand the importance of team and how to work as a team member, share best project management practices.

Course Outcomes:

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

- Articulate similarities and differences between IT projects and other types of projects.
- Justify an IT project by establishing a business case
- Develop a project charter
- Develop a work breakdown structure for an IT project

- Estimate resources (time, cost, human being, etc.)
- Establish task inter-dependencies
- Construct and analyze a network diagram
- Identify IT project risks and develop risk mitigation strategies
- Ensure the quality of the project using various standards
- Demonstrate Team work and team spirit and how to overcome the conflicts

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours
1	An overview of IT Project Management	Introduction, the state of IT project management, context of project management, need of project management, project goals, project life cycle and IT development, information technology project methodology (ITPM), project feasibility, request for proposal (RFP), the business case, project selection and approval, project contracting, PMBOK.	4
2	Project Integration Management	Introduction, project management process, project integration management, the project charter, project planning framework, the contents of a project plan, the planning process.	4
3	Project Scope Management	Introduction, scope planning, project scope definition, project scope verification, scope change control, the Work Breakdown Structure (WBS), the linear responsibility chart.	4
4	Project Time Management	Introduction, developing the project schedule, Scheduling Charts, logic diagrams and network (AOA, AON), critical path, calendar scheduling and time based network, management schedule reserve, PDM network, PERT, CPM, Resource loading, resource leveling, allocating scarce resources to projects and several projects, Goldratt's critical chain.	10
5	Project Cost Management	Cost estimating, Cost escalation, Cost estimating and system development cycle, Cost estimating process, Elements of budgets and estimates, Project cost accounting and MIS, Budgeting using cost accounts, Cost schedules and forecasts.	4

6	Project Quality Management	Introduction, Quality tools and philosophies, quality systems, the IT project quality plan.	3
7	Project Human Resource Management	Introduction, organization and project planning, the project team, multidisciplinary teams, the project environment, project leadership, ethics in projects, multicultural projects, Role of project manager, IT governance and the project office. Introduction to change, the nature of change, the change management plan, dealing with resistance and conflicts.	5
8	Project Communication Management	Introduction, monitoring and controlling the project, the project communications plan, project metric, project control, designing the control system, the plan-monitor-control cycle, data collection and reporting, reporting performance and progress, information distribution.	4
9	Project Risk Management	Basic concepts, Identification, Assessment, Response planning, Management.	4
10	Project Procurement Management	Introduction, project procurement management, outsourcing.	3
11	The Implementation Plan and Project Closure	Introduction, project implementation, administrative closure, project evaluation, project audit.	3

Text Books:

1. Jack T. Marchewka, Information Technology Project Management, 4th edition, Wiley India, 2009.
2. John M. Nicholas, Project Management for Business and Technology, 3rd edition, Pearson Education.

References:

1. E-Book - Project Management Body of Knowledge (PMBOK).
2. Claudia M. Baca, Patti M. Jansen, PMP: Project Management Professional Workbook, Sybex Publication.
3. S. J. Mantel, J. R. Meredith and etal., Project Management 1st edition, Wiley India, 2009.
4. Joel Henry, Software Project Management, A real-world guide to success, Pearson Education, 2008.
5. Gido and Clements, Successful Project Management, 2nd edition, Thomson Learning

6. Hughes and Cornell, Software Project Management, 3rd edition, Tata McGraw Hill
7. Joseph Phillips, IT Project Management, end edition, Tata McGraw Hill
8. Robert K. Wyzocki, Effective Project Management, 5th edition, Wiley
9. Brown, K.A. Project Management, McGraw Hill, 2002.
10. Dinsmore, P. C. (Ed.), The AMA Handbook of Project Management. AMACOM, 1993.

Term work:

Term work shall consist of at least 10 experiments covering all topics of the syllabus. Distribution of marks for term work shall be as follows:

1. Attendance (Theory and Practical): 05 Marks
2. Laboratory work (Experiments and Journal): 15 Marks
3. Assignments: 5 Marks

The final certification and acceptance of TW ensures the satisfactory performance of laboratory Work and Minimum Passing in the term work.

Suggested Practical List:

In practical, a group of maximum **three** students should be formed. Each group is supposed to complete all lab experiments (given below) on the case study given by the subject teacher. In lab experiments, students can use the tools like MsWord to prepare document whereas MsProject for preparing WBS, N/w diagram, PERT, CPM, performance analysis of the project, etc.

1. Project and System's Management
2. Feasibility study
3. Project Proposal
4. Project Planning
5. Activity Planning
6. Analyzing the project network diagram
7. Cost estimation and budgeting
8. Risk management
9. Performance analysis of project
10. Project evaluation and closure

Theory Examination:

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus.
- Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

Course Code	Course Name	Teaching Scheme (hrs/week)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical/Oral	Tutorial	Total
BEITC702	Cloud Computing	04	02	---	04	01	---	05

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Avg. of 2 Tests					
BEIT C702	Cloud Computing	20	20	20	80	25	---	25	150

Course Objectives:

This course will help the students to get familiar with cloud computing fundamentals, architecture, services, implementation and deployment techniques etc.

Course Outcomes:

After completion of the course the learner should be able to:

1. Differentiate different computing techniques.
2. Compare various cloud computing providers/ Software.
3. Handle Open Source Cloud Implementation and Administration.
4. Understand risks involved in cloud computing.

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours
1.	Introduction to Cloud Computing	<ul style="list-style-type: none"> - Introduction – Component of CC – Comparing CC with Virtualization, Grids, Utility Computing, client-server model, P-to-P Computing – Impact of CC on Business – Key Drivers for Cloud Computing - Cloud computing Service delivery model - Cloud Types – Private, Public and Hybrid, when to avoid public cloud, Cloud API 	2
2.	Virtualization	<ul style="list-style-type: none"> - Introduction & benefit of Virtualization – Implementation Levels of Virtualization- VMM Design Requirements and Providers – Virtualization at OS level – Middleware support for Virtualization – Virtualization structure/tools and mechanisms: Hypervisor and Xen Architecture, Binary Translation with full Virtualization, Para Virtualization with Compiler Support – - Virtualization for CPU, Memory and I/O Devices, Hardware support for Virtualization in intel x86 processor – CPU Virtualization – Memory Virtualization and I/O Virtualization – Virtualization in Multicore processors 	4
3.	Cloud computing Services	XaaS, IaaS, PaaS- Leveraging PaaS for Productivity- Languages for PaaS- DBaaS(Database as a services) – SaaS (Software as a service) – Comparison of various cloud computing providers/ Softwares.	4
4.	Cloud Computing and Business Value	Key Business Drivers for CC- Cloud computing and out sourcing – Types of Scalability – Security issues in Cloud Computing- time to Market Benefits- Distribution over Internet – Three levels of Business value from Cloud computing.	4
5.	Open Source Cloud Implementation and Administration	Eucalyptus and Open Stack Architecture Features – Components – Various mode of operations – Installation and configuration process of both open source – Cloud Administration and Management Task – Creating User Interface (Web Interface) of Private cloud.	6

6.	Cloud Deployment Techniques	Factors for Successful Cloud Deployment – Network Requirements – Potential Problem areas in a cloud Network and their Mitigation – Cloud Network Topologies – Automation and Self-service feature in a cloud –cloud performance.	4
7.	Security	Security for Virtualization Platform – Host security for SaaS, PaaS and IaaS – Data Security – Data Security Concerns – Data Confidentiality and Encryption – Data Availability – Data Integrity – Cloud Storage Gateways – Cloud Firewall	4
8.	Architecture for Cloud Application	Cloud Application requirements- Architecture for traditional Vs Cloud Applications- Multi-tier Application Architecture- SOA for Cloud applications – Resource oriented SOA – Method –oriented SOA and Event Driven SOA – Parallelization within Cloud Applications – Leveraging In-memory Operations for Cloud Application	4
9	Cloud Programming	Programming Support for Google Apps engine: GFS, Big Tables, Googles NO SQL System, Chubby, Google Distibuted Lock Service, Programming Support for Amazon EC2: Amazon S3, EBS and Simple DB etc.	4
10	Adoption and Use of Cloud	Adoption of Public cloud by SMBs- Public Cloud Adoption phase for SMBs- Vendor liability and Management Adoption process of Public clouds by Enterprises – Managed Private clouds Migrating Application to the cloud – Impact of Shared Resources and Multi-Tenancy on cloud Applications – Phases during Migration an Application to An IaaS Cloud	4
11	Risks of Cloud Computing and Related Costs	Risk Assessment and Management – Risk of Vendor Lock-in – Risk of Loss of control over IT services- Risk of Poor Provisioning – Risk of Multi-tenant environment – Risk failure of cloud provider – SLA risk –security, malware and Internet Attacks – Risk with Application Licensing.	2
12	AAA Administration for Clouds	AAA model – SSO for Clouds – Authentication management and Authorization management in clouds – Accounting for Resource utilization.	2

13	Security as a service	What can security as service offer- Benefits for Security as a service – Issues with Security as a Service- Identity Management as a Service	2
14	Mobile Cloud Computing	Introduction, Defination, Architecture, Benefits, challenges in mobile and at cloud shield	2

Text Books:

1. Cloud Computing Principles and Paradigms, Rajkumar Buyya Wiley
2. Distributed and Cloud Computing, Kai Hwang, Mk Publication
3. Cloud computing Black Book Dreamtech Publication

References:

1. Using Google Apps engine O'reilly Publication
2. Programming Amazon EC2, O'reilly Publication
3. Cloud security, Ronald L. Wiley Publication
4. Cloud computing Dr. Kumar Saurabh, wily Publication
5. Virtualization for Dummies, Wiley Publication

Term work:

Suggested Practical List (If Any):

1. Implementation of Private cloud using Eucalyptus or Open stake
 - Working with KVM to create VM
 - Installation and configuration of Private cloud
 - Bundling and uploading images on a cloud
 - Creating web based UI to launch VM
 - Working with Volumes – Attached to the VM
2. Programming using Google Apps engine and Pythone

Theory Examination:

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus.
- Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

Course Code	Course Name	Teaching Scheme (hrs/week)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical/Oral	Tutorial	Total
BEITC703	Intelligent System	04	02	---	04	01	---	05

Course Code	Course Name	Examination Scheme								
		Theory Marks					Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam					
		Test 1	Test 2	Avg. of 2 Tests						
BEITC703	Intelligent System	20	20	20	80	25	---	25	150	

Course Objectives:

1. To introduce the students' with different issues involved in trying to define and simulate intelligence.
2. To familiarize the students' with specific, well known Artificial Intelligence methods, algorithms and knowledge representation schemes.
3. To introduce students' different techniques which will help them build simple intelligent systems based on AI/IA concepts.

Course Outcomes:

1. Students will develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents.
2. Students will be able to choose an appropriate problem-solving method and knowledge-representation scheme.
3. Students will develop an ability to analyze and formalize the problem (as a state space, graph, etc.) and select the appropriate search method.
4. Students will be able to develop/demonstrate/ build simple intelligent systems or classical toy problems using different AI techniques.

DETAILED SYLLABUS

Module	Detailed Content	Hours
1	Introduction: Introduction to AI, AI Problems and AI techniques, Solving problems by searching, Problem Formulation.	04
2	Intelligent Agents: Structure of Intelligent agents, Types of Agents, Agent Environments PEAS representation for an Agent.	03
3	Uninformed Search Techniques: DFS, BFS, Uniform cost search, Depth Limited Search, Iterative Deepening, Bidirectional search, Comparing Different Techniques.	04
4	Informed Search Methods: Heuristic functions, Hill Climbing, Simulated Annealing, Best First Search, A*, IDA*, SMA*, Crypto-Arithmetic Problem, Backtracking for CSP, Performance Evaluation.	08
6	Adversarial Search: Game Playing, Min-Max Search, Alpha Beta Pruning.	03
7	Knowledge and Reasoning: A Knowledge Based Agent, WUMPUS WORLD Environment, Propositional Logic, First Order Predicate Logic, Forward and Backward Chaining, Resolution. , Introduction to PROLOG.	08
8	Planning: Introduction to Planning, Planning with State Space Search, Partial Ordered planning, Hierarchical Planning, Conditional Planning, Planning with Operators.	04
9	Uncertain Knowledge and Reasoning: Uncertainly, Representing Knowledge in an Uncertain Domain, Conditional Probability, Joint Probability, Bays theorem, Belief Networks, Simple Inference in Belief Networks.	06
10	Learning: Learning from Observation, General Model of Learning Agents, Inductive Learning, Learning Decision Trees, Rote Learning, Learning by Advice, Learning in Problem Solving, Explanation based Learning	05
11	Expert Systems: Representing and using Domain Knowledge, Expert System-shell, Explanation, Knowledge Acquisition	03

Text Books:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 2nd Edition, Pearson Education.
2. Elaine Rich, Kevin Knight, Shivshankar B Nair, Artificial Intelligence, McGraw Hill, 3rd Edition.
3. Elaine Rich, Kevin Knight, Artificial Intelligence, Tata McGraw Hill, 2nd Edition.

Reference Books:

1. George Luger, .AI-Structures and Strategies for Complex Problem Solving., 4/e, 2002, Pearson Education.
2. Nils J. Nilsson, Principles of Artificial Intelligence, Narosa Publication.
3. Patrick H. Winston, Artificial Intelligence, 3rd edition, Pearson Education.
4. Deepak Khemani, A First Course in Artificial Intelligence, McGraw Hill Publication

Term work:

Term Work shall consist of at least 8 practical and 2 assignments based on the list given below:

Suggested Practical:

1. Implementing Water jug problem using 1. BFS. , 2. DFS (Un-Informed Search)
2. Implementing 8 puzzle problem with Heuristic function using Hill Climbing. (Informed Search)
3. Implementing 8 puzzle problem with Heuristic function – Best First Search (Informed Search)
4. Implementing 8 Queen Problem with Heuristic function (Informed Search)
5. Implementing Tic-Tac-Toe problem to demonstrate Min – Max and Alpha Beta Pruning. (Adversarial Search)
6. Implementing WUMPUS world problem. (Knowledge and Reasoning)
7. Introduction to PROLOG – solving Basic problems like Factorial, Fibonacci series, Implementing User Defined String functions etc. (PROLOG)
8. Implementing Family Information System (PROLOG)
9. Implementing Mini Expert system. (PROLOG)

(Note: List of experiments is not limited with the above list , teacher can choose different set of experiments but care should be taken to explore variety of topics.)

Term Work: 25 Marks (total marks) = 15 Marks (Experiment) + 5 Marks (Assignment) + 5Marks (Attendance (theory + practical))

Oral examination is to be conducted based on the complete syllabus.

Theory Examination:

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
3. Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
4. Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

Course Code	Course Name	Teaching Scheme (hrs/week)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical/Oral	Tutorial	Total
BE ITC704	Wireless Technology	04	02	---	04	01	---	05

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Avg. of 2 Tests					
BEITC 704	Wireless Technology	20	20	20	80	25	---	25	150

Course Objectives:

Get acquainted with modern wireless communication networks. Evolution of cellular networks, to understand basic framework of various protocols and standards used to develop wireless personal and wide area networks

Course Outcomes:

1. Understand the new trends in mobile/wireless communications networks
2. Understand the characteristics of mobile/wireless communication channels
3. Understand the multiple radio access techniques
4. Understand the multiuser detection techniques
5. Understand various wireless networks and their technologies
6. Understand need of securities and economies in wireless systems

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours
1	Fundamentals of wireless Communication	<ul style="list-style-type: none"> • Fundamentals of Wireless Communication Advantages, Limitations and Applications • Wireless Media • Infrared Modulation Techniques • DSSS And FHSS • Multiple access technique: TDMA,CDMA, FDMA, CSMA,OFDMA [fundamentals] • Frequency Spectrum • Radio and Infrared Frequency Spectrum 	08
2	Wireless technology	<ul style="list-style-type: none"> • The cellular concepts: Frequency Reuse, Channel assignment strategies, Handoff strategies Interference and System Capacity [Design problems] • Evolution of cellular networks 1G, 2G,3G,4G •GSM: System Architecture, Radio Subsystem, Channel Types, GSM frame structure • CDMA: Architecture, Frequency and channel specifications, forward and Reverse CDMA Channels. 	10
3	Wire less in local loop (WLL)	User requirements of WLL systems, WLL system architecture, MMDS, LMDS, WLL subscriber terminal, WLL interface to the PSTN	04
4	Wire less local area networks (WLAN)	Introduction, WLAN Equipment, WLAN topologies and Technologies, IEEE 802.11 WLAN : Architecture, Physical Layer, Data Link Layer , MAC Layer, Security Latest developments of IEEE 802.11 standards	08
5	Wireless personal area networks (WPAN)	<p>Introduction ,WPAN technologies and Protocols,</p> <p>Bluetooth (802.15.1)[Protocol stack and network connection establishment, security aspects]</p> <p>HR –WPAN (UWB) (IEEE 802.15.3)</p> <p>LR-WPAN (IEEE 802.15.4) Zigbee [Stack architecture, components , Network Topologies , Applications]</p> <p>Wireless Sensor networks [Network model and protocol stack ,</p>	08

		routing algorithms, Applications]	
6	Wireless metropolitan area networks	IEEE 802.16 [Protocol Architecture], IEEE 802.16a [Wimax] Wimax and LTE /3GPP comparison	04
7	Security issues in Wireless Systems	The need, attacks , security services, wired equivalent privacy protocol(WEP), Mobile IP, VPN [PPTP, L2TP, IPSec]	03
8	Economies of Wireless Network	Economic Benefits, Economics of Wireless industry Wireless data forecast, charging issues	03

Text Books:

1. Modern wireless communication systems: by Simon Haykin, Michael Moher, adapted by David Koilpillai ; Pearson (Indian edition 2011)
2. Wireless Networks: by Nicopolitidia, M S Obaidat, GI Papadimitriou; Wiley India (student edition 2010)
3. Wireless communications: by T L Singal; Tata McGraw Hill Education private Ltd.(edition 2011)

References:

1. Wireless and Mobile Networks: Dr. Sunilkumar S. Manvi & Mahabaleshwar S. Kakkasageri
2. Wireless Communications and Networking: by Vijay K. Garg
3. Wireless Communications: by Theodore S. Rappaport

Term work: Students are asked to perform lab sessions using Ns-2 Simulator and Matlab platform.

Assignments should be given based on syllabus.

Theory Examination:

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
3. Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
4. Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

Course Code	Course Name	Teaching Scheme (hrs/week)	Credits Assigned
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		Theory	Pract.	Tut.	Theory	TW/Pract	Tut.	Total
BEITC7051	Image Processing	04	02	---	04	01	---	05

Course Code	CourseName	Examination Scheme						Total	
		Theory Marks				TW	Pract.		Oral
		Internal Assessment			End Semester Exam				
BEITC7051	Image Processing	Test 1	Test 2	Average of Test1 & Test2		End Semester Exam			
		20	20	20	80	25	---	25	150

Course Pre-requisite: As images are two dimensional signals, the single dimensional Digital Signal Processing fundamentals are part of the prerequisite study.

Objective: One picture is worth thousand words. A course in digital image processing teaches how such visual information can be used in various applications. This course will introduce the basic ideas and techniques used for processing images and their popular applications.

The objectives of this course are:

- To cover the basic theory and algorithms that are widely used in digital image processing,
- To expose students to current technologies and issues that are specific to image processing systems
- To develop skills in using computers to process images.

Outcome: Students should demonstrate the ability:

- To understand the fundamental concepts of a digital image processing system,
- To make extensive use of these concepts in implementing processing techniques such as noise removal, enhancement, compression for efficient storage and transmission, object extraction, representation and description for recognition or building computer vision, etc.

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	Weightage of marks
0	Introductions to Signal Processing Only as a prerequisite for Image Processing. Hence not part of theory exam.	Analog, discrete and digital signals, 1D, 2-D signals with examples. Discrete time signals: sequences, Discrete time systems LTI systems and their properties. Convolution and Correlation- need, methods and examples	04	0%
1	Introduction to digital image processing	Introduction: Definition of digital image, generation of digital image, steps in digital image processing, 2D sampling, spatial and tonal resolutions, pixel connectivity, elements of digital image processing systems	05	10%
2	Image enhancement in the spatial domain	Point operations, histogram processing, spatial filtering: smoothing, sharpening, median, highboost	07	20%
3	Two Dimensional Discrete Fourier Transform	Introduction to image in frequency domain, Concept of basis images, two dimensional D.F.T. and its properties, two dimensional F.F.T. Filtering in the frequency domain: smoothening, sharpening and homomorphic filtering.	06	15%
4	Image segmentation	Detection of discontinuities, edge linking and boundary detection, Hough transform, thresholding, region oriented segmentation.	06	10%
5	Image representation and description	Boundary descriptors: shape number, Fourier descriptor, statistical moments; regional descriptors	06	10%
6	Image data compression	Image data redundancies: coding, inter-pixel, psychovisual; Fundamentals of lossless compression : Arithmetic coding, Huffman coding, LZW coding, RLE, Bit plane coding, predictive coding Lossy compression : JPEG, Subband coding, Vector quantization, Image compression standard, Fidelity criteria	06	15%
7	Image morphology	Morphological operation : Dilation erosion, Opening & Closing, Hit or Miss Transform, Basic Morphological Algorithms	04	10%

8	Applications of image processing	Case Study on the following applications: Digital watermarking, Biometric authentication (face, finger print, signature recognition), Vehicle number plate detection and recognition, Content Based Image Retrieval, Text Compression.	04	10%
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Text Books:

1. Gonzalez & Woods, Digital Image Processing, Pearson Education, Third Edition.
2. W. Pratt, Digital Image Processing, Wiley Publication, Fourth Edition, 2013.

Reference Books:

1. J. G. Proakis and D. G. Manolakis, Digital Signal processing Principals, Algorithms and Applications, PHI publications, Third edition,
2. Milan Sonka , Digital Image Processing and Computer Vision, Thomson publication, Second Edition.2007.
3. A.K. Jain, Fundamentals of Image processing, Prentice Hall of India Publication, 1995
4. Gonzalez & Woods, Digital Image Processing using MATLAB, Pearson Education
5. S.Jayaraman, S Esakkirajan and T Veerakumar, Digital Image Processing ,McGraw Hill Education (India) Private Limited, New Delhi, 2009.
6. S.Sridhar, Digital Image Processing ,Oxford University Press, New Delhi, 2011.

Term work:

At least 08 experiments covering entire syllabus must be performed during the semester and it should be presented in the practical record. Term work assessment must be based on the overall performance of the student with every practical graded from time to time. The grades should be converted into marks as per the Credit and Grading System manual and should be added and averaged. Due weightage should be given for the student's attendance.

Internal Assessment (IA):

Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the tests shall be considered as final IA marks

Suggested Practical List:

A minimum of 8 experiments from the suggested list must be performed. The DSP experiments (experiment 1 and 2) are the prerequisites.

1. Write a MATLAB program or C++ program for generating the following discrete time signals:
 - a. Exponential signal
 - b. Unit step and unit ramp signals
 - c. Sinusoidal signal
 - d. Composite signal with minimum 3 sinusoids added
2. Write a MATLAB program to demonstrate convolution and correlation operations with different examples of discrete time sequences.
3. Write a program for the following point processing operations and compare the results with MATLAB built in functions
 - a. Image negative
 - b. Gray level slicing with or without background
 - c. Power law transformations
 - d. Bit plane slicing
 - e. Histogram equalization
4. Write a program for image enhancement and compare the results with MATLAB built in functions.
 - a. Smoothing
 - b. Sharpening
 - c. High boost filtering
5. Write a program for image noise removal and analyze the results using,
 - a. Averaging
 - b. Median filter
6. Write a MATLAB program for 2D Discrete Fourier Transform and Inverse transform using built in functions.
7. Write a MATLAB PROGRAM for Transform domain processing using low pass and high pass filters and analyze the results for the following (any one):
 - a. Ideal filter
 - b. Butterworth filter
 - c. Gaussian filter
8. Write a MATLAB PROGRAM for edge detection in 2 directions and compare the results with built in functions for the following operators (any one):
 - a. Robert operator
 - b. Prewitt operator
 - c. Sobel operator
9. Write a MATLAB PROGRAM to compress the image using any one of the following lossless image compression techniques:
 - a. Huffman
 - b. RLE
 - c. LZW
10. Write a MATLAB PROGRAM to compress the image using any one of the following

lossy image compression techniques:

- a. JPEG
 - b. IGS
 - c. Predictive coding
11. Write a MATLAB PROGRAM to perform the following basic and derived morphological operations:
- a. Dilation
 - b. Erosion
 - c. Opening
 - d. Closing
 - e. Boundary Detection
12. Write a MATLAB PROGRAM to represent / describe the image using any one of the following:
- a. Chain code / shape number
 - b. Moments
 - c. Fourier descriptors
 - d. Euler number

Theory Examination:

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
3. Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
4. Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

Course Code	Course Name	Teaching Scheme (hrs/week)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical /Oral	Tutorial	Total
BEITC7052	Software Architecture							
		04	02	---	04	01	---	05

Course Code	Course Name	Examination Scheme								
		Theory Marks					Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam					
		Test 1	Test 2	Avg. of 2 Test s						
BEITC7052	Software Architecture	20	20	20	80	25	---	25	150	

Course Objectives:

- To provide students with a strong foundation in developing large, practical software-intensive applications.
- To train students with sound technical exposure to the concepts, principles, methods and best practices in software architecture.
- To develop the ability among students to learn the details of modeling techniques, design, implementation, deployment, and system adaptation.
- To enable students to choose the right tool for the job at hand and document design rationale.
- To prepare students to gain experiences with examples in design pattern application and case studies in software architecture.

Course Outcomes:

At the end of the course, students should be able to:

1. Argue the importance and role of software architecture.
2. Recognize major software architectural styles, design patterns, and frameworks.
3. Design software architecture for large scale software systems.
4. Describe various documentation approaches and architectural description languages.
5. Apply architectural patterns to quickly generate architectural alternatives and choose between them.

Prerequisites:

This course builds on the study of Object Oriented Software Engineering. We assume fluency with Object Oriented Languages and UML

DETAILED SYLLABUS:

Sr. No	Module	Detailed Content	Hours
1	1	Basic Concepts 1.1 Concepts of Software Architecture 1.2 Models. 1.3 Processes. 1.4 Stakeholders.	03
2	2	Designing Architectures 2.1 The Design Process. 2.2 Architectural Conception. 2.3 Refined Experience in Action: Styles and Architectural Patterns. 2.4 Architectural Conception in Absence of Experience. 2.5 Putting it all Together: Design Processes Revisited	05
3	3	Connectors 3.1 Connectors in Action: A Motivating Example. 3.2 Connector Foundations. 3.3 Connector Roles. 3.4 Connector Types and Their Variation Dimensions. 3.5 Example Connectors. 3.6 Using the connector Framework	06
4	4	Modeling 4.1 Modeling Concepts. 4.2 Ambiguity, Accuracy, and Precision. 4.3 Complex Modeling: Mixed Content and Multiple Views. 4.4 Evaluating Modeling Techniques. 4.5 Specific Modeling Techniques: Generic Techniques, Domain and Style specific ADLs, Extendable ADLs.	04
5	5	Visualization 5.1 Visualization Concepts. 5.2 Common issues in Visualization. 5.3 Visualization Techniques: Textual Visualization, UML, xADL.	04
6	6	Analysis 6.1 Analysis Goals. 6.2 Scope of Analysis.	06

		6.3 Architectural Concern being Analyzed. 6.4 Level of Formality of Architectural Models. 6.5 Type of Analysis. 6.6 Analysis Techniques.	
7	7	Implementation and Deployment 6.1 Concepts. 6.2 Existing Frameworks. 6.3 Software Architecture and Deployment. 6.4 Software Architecture and Mobility.	04
8	8	Applied Architectures and Styles 8.1 Distributed and Networked Architectures. 8.2 Architectures for Network-Based Applications. 8.3 Decentralized Architectures. 8.4 Service-Oriented Architectures and Web Services.	08
9	9	Designing for Non-Functional Properties 9.1 Efficiency. 9.2 Complexity. 9.3 Scalability and Heterogeneity. 9.4 Adaptability. 9.5 Dependability.	04
10	10	Documentation 10.1 Uses of Architectural Documentation. 10.2 Views 10.3 Choosing the Relevant Views 10.4 Documenting a View 10.5 Documentation across Views	04

Text Books:

1. Richard N. Taylor, Nenad Medvidovic, Eric M. Dashofy, "Software Architecture: Foundations, Theory, and Practice", Wiley Publications.
2. Len Bass, Paul Clements, Rick Kazman, "Software Architecture in Practice", Pearson

References:

1. M. Shaw, "Software Architecture Perspectives on an Emerging Discipline", Prentice Hall.

Term work: Term work should be based on the Lab experiments and assignments.

Suggested Practical List:

1. Modeling using xADL
2. Analysis – Case study
3. Visualization using xADL
4. Integrate software components using a middleware
5. Use middleware to implement connectors
6. Wrapper to connect two applications with different architectures
7. Creating web service
8. Architecture for any specific domain

Theory Examination:

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus.
- Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

Course Code	Course Name	Teaching Scheme (Hrs./Week)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical/Oral	Tutorial	Total
BEITC7053	E-Commerce and E-Business	04	02	---	04	01	---	05

Course Code	Course Name	Examination Scheme								
		Theory Marks					Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam					
		Test 1	Test 2	Avg. of 2 Tests						
BEITC7053	E-Commerce and E-Business	20	20	20	80	25	---	25	150	

Course Objectives:

- To understand technical aspect of E-commerce and E-Business
- To describe the process of E-commerce and E-business
- To understand Infrastructure design issues of E-commerce

Course Outcomes:

Graduates will be able to design and conduct experiments, as well as analyze and interpret the technological, user, network requirements for developing the various modules of e commerce/business site, will be able to apply the knowledge gained and modern engineering tools in their application domain.

Pre requisites:

Internet Technologies, Database concepts, Internet Security, Middleware technologies, web services

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours
1	E – commerce :- Introduction to E commerce	Definition of e com , different types of e com , Examples of e com E commerce trade cycle , Advantages and disadvantages of ecom , Traditional commerce Vs E commerce	2
2	Overview of Hardware and software technologies for E com	Client side programming (Dream weaver , Front page) , Server side programming (PHP) , Database connectivity , session tracking , middleware technologies from e com perspective and security aspects wrt to e commerce, integration of web services	8
3	Payment System for e commerce	Traditional payment model , Characteristics of payment system, SET Protocol for credit card payment, E-cash, E-check, smart cards	8
4	E – Marketing Strategies	Value chain , Working of e – market , Transactions at e – market , Strategies for marketing for selling on the web – Advertising supported , advertising subscription mixed model , fee for transaction model Sales and Promotions Strategies for Purchasing and support activities	8
5	E business :- Introduction to e business	Definition of e business , Characteristics , elements of e business , e business roles , Impact of e business , challenges of e business , difference between e business , e commerce	4
6	Developing e business models	E- business structure , Evolution of e –business and its stages , E – business models , Characteristics of Internet based software and e business solutions	3
7	E-business strategies	Strategic planning process, SCM , CRM , ERP , procurement	7
8	Design and development of	a) Building an e commerce website. :- SDLC , system design , Issues involved in designing a	8

	an business website	website , Prerequisites required for designing in – house website, steps involved in web site development , e-business and web site development solutions , security issues involved and analysing website traffic --- Case study b) Analysis and design – (Workflow management, process modelling , data modelling) , UI design , use case design , information architecture , security concerns	
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Text Books:

1. E-Commerce Fundamentals and application (Henry Chan) Wiley publication
2. Electronics Commerce (Gary Schneider) Thomson Course technology
3. E – Business , Parag Kulkarni , Sunita Jahirabadkar, Pradip Chande , Oxford Higher Education , Oxford University Press
4. E –business and E – commerce Management , Dave Chaffey , Pearson , 3rd edition
5. E commerce by Laudon

References:

1. E- Commerce Strategies, Technology and applications (David Whitley) Tata McGrawHill
2. Introduction to E-commerce Elias Awad

Term work:

Term work should include at least 8 experiments.

Journal must include at least 2 assignments.

Term work: - 25 marks (total) = 15 marks (experiments) + 5 marks (Assignments) + 5 marks (attendance – theory + Practical).

Oral exam will be based on the above syllabus.

Suggested Practical List (If Any):

Exp 1: All experiments should be part of final e-commerce / e business portal development

1. Home page design
2. Form validation (Ajax enabled)
3. Catalog design and Search techniques (Web mining , and Ajax enabled)
4. Access control mechanism (session management)
5. Payment systems
6. Security features
7. Creating Web Site to integrate web Services
8. Server side using Web Services

Exp 2: Case study of M commerce, bit coins, Google app engine, and other current e com / e business technologies

Theory Examination:

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
3. Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
4. Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

Course Code	Course Name	Teaching Scheme Hrs./Week			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical/ Oral	Tutorial	Total
BEITC7054	Multimedia Systems	04	02	---	04	01	---	05

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Avg. of 2 Tests					
BEITC7054	Multimedia Systems	20	20	20	80	25	---	25	150

Course Objectives:

- To understand technical aspect of Multimedia Systems
- To understand and evaluate the process of development of Multimedia Systems
- To understand the framework and standards available for different Multimedia applications

Course Outcomes:

Students will be able to understand the relevance and underlying infrastructure of multimedia systems. The purpose of this course is to make the students capable to apply their multimedia knowledge to understand the current requirements of multimedia products. The standards and frameworks introduced will help the students develop the multimedia systems as per industry standards

Pre requisites:

Interactive I/O devices, Networking, basic concepts communication devices, Standards & frameworks

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours
1	Introduction to Multimedia	What is multimedia, Hypermedia, Multimedia tools, Multimedia Authoring & its Tools, VERML, File Formats.	2
2	Color in Images & Video	Colour Models for Images & Videos, Video Signals, Digital Video, MIDI, Quantization, Transmission of Audio	4
3	Compression Algorithms	Lossless Compression , Introduction, Basics, RLC , VLC, lossless Image Compression, Lossy Compression, introduction, Distortion, Rate Distortion Theory, Quantization	4
4	Image Compression Standards	JPEG standards, JPEG 2000 standards, JPEG –LS standards, Bi-Level Image Compression Standards	4
5	Video Compression Techniques	Introduction, Motion Compensation ,Motion vectors, H.261 & H.263, MPEG-1 & MPEG-2, MPEG-4, MPEG-7, MPEG-21	5
6	Audio Compression	ADPCM, Vocoders, Psychoacoustics, MPEG audio.	3
7	Multimedia Network Applications	Quality of Multimedia Data transmission, Multimedia over IP, Multimedia over ATM, Media on Demand, Multimedia over Wireless Network	6
8	Multimedia Data bases	Design and Architecture of Multimedia Data base, Types, Organization, Medias Abstraction, Query Language.	7
9	Frame Work for Multimedia Standards	Introduction, Standard Activates, Standard to build a news Global Information Infrastructure, Standardization process on Multimedia Communication, ITU-I Mediacom 2004 Framework, ISO/MPEG -21 Framework, IETF Multimedia Internet Standards.	6

10	Application layer:	Introduction, ITU applications, MPEG Application , Digital Broadcasting Applications, Universal multimedia access.	7
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Text Books:

- 1) Fundamentals of Multimedia by Ze-Nian Li & Mark.S.Drew
- 2) Introduction to Multimedia Communication, Application, Middleware, Networking by K.R.Roa, Zoran S,Bojkovic & Dragorad A. Milovanovic.

References:

Multimedia systems by Thakker

Term work:

Term work should include at least 8 experiments.

Journal must include at least 2 assignments.

Term work :- 25 marks (total) = 15 marks (experiments) + 5 marks (Assignments) + 5 marks (attendance – theory + Practical).

Oral exam will be based on the above syllabus.

Suggested Practical List (if any):

- 1) Creating sample movies/ animations in flash.
- 2) Designing a multimedia application / multimedia authoring system.
- 3) Design a web application using dream viewer & fireworks
- 4) Construction of website using pictures, video, audio
- 5) Design a game application in flash
- 6) Record speech & perform compression & decompression
- 7) Case study on all file formats related to multimedia system
- 8) Case study on different authoring tools
- 9) Different levels of control in slide show presentation

Theory Examination:

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
3. Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
4. Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

Course Code	Course Name	Teaching Scheme (Hrs./Week)		Credits Assigned				
		Theory	Practical	Tutorial	Theory	Practical/Oral	Tutorial	Total
BEITC7055	Usability Engineering	04	02	---	04	01	---	05

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Avg. of 2 Tests					
BEITC7055	Usability Engineering	20	20	20	80	25	---	25	150

Course Objectives:

Is to provide concrete advice and methods that can be systematically employed to ensure a high degree of usability in the final user interface.

Course Outcomes:

Students will be able to create useful usable and used interface.

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours
1	1	Introduction Cost Savings, Usability Now, Usability Slogans, Discount Usability Engineering, Recipe For Action, Usability and Other Considerations, Definition of Usability, Example: Measuring the Usability of Icons, Usability Trade-Offs, Categories of Users and Individual User Differences	06
2	2	Generations of User Interfaces Batch Systems, Line-Oriented Interfaces, Full-Screen Interfaces, Graphical User Interfaces, Next-Generation Interfaces, Long-Term Trends in Usability	02
3	3	The Usability Engineering Lifecycle Know the User, Competitive Analysis, Goal Setting, Parallel Design, Participatory Design, Coordinating the Total Interface, Guidelines and Heuristic Evaluation, Prototyping, Interface Evaluation, Iterative Design, Follow-Up Studies of Installed Systems, Meta-Methods, Prioritizing, Usability Activities.	08
4	4	Usability Heuristics Simple and Natural Dialogue, Speak the Users' Language, Minimize User Memory Load, Consistency, Feedback, Clearly Marked Exits, Shortcuts, Good Error Messages, Prevent Errors, Help and Documentation, Heuristic Evaluation.	08
5	5	Usability Testing Test Goals and Test Plans, Getting Test Users, Choosing Experimenters, Ethical Aspects of Tests with Human, Subjects, Test Tasks, Stages of a Test, Performance Measurement, Thinking Aloud, Usability Laboratories,	08
6	6	Usability Assessment Methods beyond Testing Observation, Questionnaires and Interviews, Focus Groups, Logging, Actual Use, User Feedback, Choosing Usability Methods.	04
7	7	Interface Standards National, International and Vendor Standards, Producing Usable In-House Standards. International User Interfaces International Graphical Interfaces, International Usability Engineering, Guidelines for	08

		Internationalization, Resource Separation, Multilocale Interfaces.	
8	8	Future Developments Theoretical Solutions, Technological Solutions, CAUSE Tools: Computer-Aided Usability Engineering, Technology Transfer	04

Text Books:

➤ Usability Engineering by Jacob Nielson, Morgan Kaufmann, Academic Press.

* **eBook available**

References:

Developing User Interfaces - Ensuring Usability through Product & Process by Deborah Hix, Rex Hartson, Wiley

Suggested Practical List (If Any): Refer appendix A of the text book for Practical Exercise.

Theory Examination:

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus where in sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weight age of marks should be proportional to number of hours assigned to each module.

Course Code	Course Name	Teaching Scheme (Hrs./Week)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical/Oral	Tutorial	Total
BEITC7056	Ubiquitous Computing	04	02	---	04	01	---	05

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Avg. of 2 Tests					
BEITC7056	Ubiquitous Computing	20	20	20	80	25	---	25	150

Course Objectives:

- To introduce the ideas of ubiquitous computing techniques based on human experience.
- To generate an ability to design, analyze and perform experiments on real life problems using various smart devices, smart interaction and smart environment.
- To integrate computation into the environment, rather than having computers as distinct objects.
- To enable people to move around and interact with computers more naturally than they currently do.

Course Outcomes:

On successful completion of this course the student has: Knowledge and understanding regarding:

- The objectives and the historical development of the field of ubiquitous computing
- Fundamentals of sensor technology and sensor networks
- Apply middleware techniques to implement ubiquitous computing systems
- Design of new (often embedded) interactive artifacts
- Context aware and adaptive systems
- Compare the usability of alternative design of interactions for specific ubiquitous computing systems

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours
1	Introduction to Ubiquitous Computing	Definition, Advantage, Application and Scope. Properties of Ubiquitous Computing, Ubiquitous System Environment Interaction. Architectural Design for UbiCom Systems: Smart DEI Model.	4
2	Smart Devices and Services	Introduction to Smart Devices: Users, Mobiles, Cards and Device Networks. Service Architecture Models. Service Provision Life-Cycle. Virtual Machines and Operating Systems Mobile Computers and Communicator Devices.	8
3	Sensing and Controlling	Tagging the Physical World. Sensors and Sensor Networks. Micro Actuation and Sensing: Micro-Electro-Mechanical Systems (MEMS). Embedded Systems and Real-Time Systems. Control Systems for Physical World Tasks. Robots	8
4	Context-Aware Systems	Introduction to Context-Aware Computing, Context-Aware Systems, Context-Aware Applications, Designing and Implementing Context-Aware Applications, Issues for building Context-Aware Applications.	8
5	Human-Computer Interaction	User Interfaces and Interaction for Four Widely Used Devices. Hidden UI Via Basic Smart Devices. Hidden UI Via Wearable and Implanted Devices. Human-Centered Design (HCD). User Models: Acquisition and Representation. iHCI Desi	10
6	Ubiquitous Communication	Data Networks. Audio Networks. Wireless Data Networks. Universal and Transparent Audio, Video and Alphanumeric Data. Ubiquitous Networks. Network Design Issues. Human Intelligence Versus Machine Intelligence. Challenges in Ubiquitous System, Social Issues: Promise Versus Peril.	10

Text Books:

- [1] Stefan Poslad. Ubiquitous Computing: Smart Devices, Environments and Interactions, Wiley Publication.
- [2] John Krumm. Ubiquitous Computing Fundamentals. CRC Press.

References:

- [1] Yin-Leng Theng and Henry B. L. Duh. Ubiquitous Computing: Design, Implementation, and Usability. IGI Global.
- [2] Adam Greenfield. Everywhere the Drawing age of Ubiquitous Computing, Published in Association with AIGA.
- [3] Mobile and Ubiquitous Computing”, Georgia Tech, 2003.

Term work:

Term work will be based on Practical and Assignments covering the topics of the syllabus.

Suggested Practical List (If Any):

1. Applications for location-based messages
2. Global Positioning system
3. Context-Aware system
4. Human Computer Interaction
5. Ubiquitous Communication
6. Case study of Class Room 2020
7. Case study of Super Market
8. Case study of Hospital Management

Theory Examination:

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus where in sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weight age of marks should be proportional to number of hours assigned to each module.

Course Code	Course Name	Teaching Scheme (Hrs./Week)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical/Oral	Tutorial	Total
BEITP706	Project I	---	*	---	---	03	---	03

***Work load of the teacher in semester VII is equivalent to 6 hrs/week.**

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Avg. of 2 Tests					
BEITP706	Project I	---	---	---	---	25	---	25	50

Objective: To help the learner to develop some of the following:

1. Relate theory with real time applications.
2. Experiencing the issues involved with creation and design of simple products and processes.

Outcomes: The learner should be able to prepare a synopsis of the work selected.

Guidelines for Project

- Students should do literature survey/visit industry/analyze current trends and identify the problem for Project and finalize in consultation with Guide/Supervisor. Students should use multiple literatures and understand the problem. Students should attempt solution to the problem by experimental/simulation methods. The solution to be validated with proper justification and compile the report in standard format.

Guidelines for Assessment of Project I

- Project I should be assessed based on following points
 - Quality of problem selected
 - Clarity of Problem definition and Feasibility of problem solution
 - Relevance to the specialization
 - Clarity of objective and scope
- Project I should be assessed through a presentation by a panel of Internal and External examiners appointed by the University of Mumbai.