

# **UNIVERSITY OF MUMBAI**



## **Bachelor of Engineering**

**Information Technology (Third Year – Sem. V & VI)**

**Revised course**

**(REV- 2012) from Academic Year 2014 -15**

**Under**

**FACULTY OF TECHNOLOGY**

**(As per Semester Based Credit and Grading System)**

## **Preamble**

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 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**  
**University of Mumbai, Mumbai**

**Third Year Engineering (Semester VI)**  
**Revised course for Information Technology**  
**Academic Year 2014 -15 (REV- 2012)**

Subject Code	Subject Name	Teaching Scheme (hrs/week)			Credits Assigned			
		Theory	Practical	Tut.	Theory	TW/Pract.	Tut.	Total
TEITC601	Software Engineering	4			4			4
TEITC602	Distributed Systems	4			4			4
TEITC603	System and Web Security	4			4			4
TEITC604	Data Mining and Business Intelligence	4			4			4
TEITC605	Advance Internet Technology	4			4			4
TEITL601	Software Engineering		2			1		1
TEITL602	Distributed Systems		2			1		1
TEITL603	System and Web Security		2			1		1
TEITL604	Data Mining and Business Intelligence		2			1		1
TEITL605	Advance Internet Technology		2			1		1
	Total	20	10		20	05		25

## Examination Scheme

Course Code	Course Name	Theory					Term work	Practical /Oral	Total
		Internal Assessment			End Sem exam	Exam duration (in Hrs)			
		TEST 1	TEST 2	AVG.					
TEITC601	Software Engineering	20	20	20	80	3	25	25	150
TEITC602	Distributed Systems	20	20	20	80	3	25	25	150
TEITC603	System & Web Security	20	20	20	80	3	25	25	150
TEITC604	Data Mining & Business Intelligence	20	20	20	80	3	25	25	150
TEITC605	Advance Internet Technology	20	20	20	80	3	25	25	150
	Total	100	100	100	400	15	125	125	750

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical/ Oral	Tutorial	Total
TEITC601	Software Engineering	04 Hr/Week	02 Hr/Week	---	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						
TEITC601	Software Engineering	20	20	20	80	25	---	25	150	

### Course Objectives:

This course will study a collection of methods which embody an "engineering" approach to the development of software. It will discuss the nature of software and software projects, software development models, software process maturity, project planning, management, and estimations. Students are required to study and practice methods for analysis, design, testing, and implementation of large, complex software systems. We will inquire into the various perspectives on software quality -- what it means, how to measure it, how to improve it. The major work of the course should be a group project.

### Course Outcomes:

1. Meet the Information Technology Program Objectives of identifying and solving engineering problems
2. To understand principles, concepts, methods, and techniques of the software engineering approach to producing quality software for large, complex systems.
3. To function effectively as a member of a team engaged in technical work.
4. To think critically about ethical and social issues in software engineering for different applications

## DETAILED SYLLABUS

<b>Sr. No.</b>	<b>Module</b>	<b>Detailed Content</b>	<b>Hours</b>
1	Introduction to Software Engineering	Professional Software Development, Layered Technology, Process framework, CMM, Process Patterns and Assessment	<b>03</b>
2	Process Models	Prescriptive Models : Waterfall Model, Incremental, RAD Models Evolutionary Process Models: Prototyping, Spiral and Concurrent Development Model Specialized Models: Component based, Aspect Oriented development	<b>06</b>
03	Agile Software Development	Agile Process and Process Models, Adaptive and Dynamic system Development, Scrum, Feature Driven Development and Agile Modeling	<b>03</b>
04	Engineering and Modeling Practices	Core Principles, Communication, Planning, Modeling, Construction and deployment. System Modeling and UML	<b>04</b>
05	Requirements Engineering and Analysis Model	Requirements Engineering Tasks, Elicitation, building analysis model, Data Modeling concepts, Object Oriented Analysis	<b>06</b>
06	Design Engineering	Design Concepts, Design Model – Data, Architecture, Interface, Component Level and Deployment Level design elements	<b>05</b>
07	Testing strategies and tactics	Testing strategies for conventional and Object Oriented architectures, Validation and system testing  Software testing fundamentals, Black box and white box testing, Object Oriented testing methods	<b>06</b>
08	Metrics for Process and Projects	Process Metrics and Project Metrics, Software Measurement, Object Oriented Metrics, Software Project Estimation, Decomposition Techniques, LOC based, FP based and Use case based estimations, Empirical estimation Models	<b>06</b>

09	Risk Management	Risk strategies, Software risks, Risk Identification, Projection, RMMM	<b>03</b>
10	Quality Management	Quality Concepts, SQA activities, Software reviews, FTR, Software reliability and measures, SQA plan	<b>03</b>
11	Change Management	Software Configuration Management, elements of SCM, SCM Process, Change Control	<b>03</b>

**Text Books:**

1. “Software Engineering : A Practitioner’s Approach” by Roger Pressman Sixth Edition
2. “Software Engineering” by Ian Sommerville, Pearson
3. “Software Engineering : A Precise Approach” Pankaj Jalote , Wiley India

**References: (for Practical)**

1. “System Analysis and Design” Alan Dennis, Wixom, R M Roth – Wiley India
2. “Software Engineering : Principles and Practice” by Waman S Jawadekar

**Term work:** Should be based on the Project work done as a team.

**Suggested Practical List:**

The focus of the lab component of this course is to apply software engineering methods for carrying out a software development mini project. Students will be assigned to teams of 3-4 students. Each team will be assigned to produce a software development model, complete with specifications, prototyping, and design.

The deliverables required may be:

1. Application of agility principles/process model selection/system modeling tools for the given scenario
2. Requirements gathering, elicitation, elaboration, negotiation, specification, validation using appropriate tools
3. Use case development
4. Activity diagram, class diagrams, swimlane, data flow diagrams, State diagrams and sequence diagrams
5. Data design model, Architecture, UI, Collaboration diagrams
6. Component Level Design
7. Design unique test cases on different strategies
8. Prepare project Plan, predict resources and timeline(scheduling)
9. Prepare a risk identification and management plan



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

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical/Oral	Tutorial	Total
TEITC602	Distributed Systems	04 Hr/Week	02 Hr/Week	---	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						
TEITC602	Distributed Systems	20	20	20	80	25	25	---	150	

### Course Objectives:

Distributed Systems form a significant field in Information Technology. The course aims to provide solid foundation in the concepts of distributed systems along with its design and implementation. Synchronization, Message Passing, Remote Communication, Consistency Management and Application development using different Distributed Technologies form part of core concepts to be studied under this course.

### Course Outcomes:

- The student gains clear understanding of fundamental principles of Distributed Systems along with design and implementation of key mechanisms, Clock Synchronization, Election Algorithms, Mutual Exclusion, Message Communication, Process and Resource Scheduling etc.
- The student understands the message communication, remote procedure call and Remote method invocation (RPC and RMI) along with group communication.
- Emphasis is on developing applications using current distributed computing technologies like EJB, CORBA and .NET.
- Student should be able to develop/design distributed system/applications for an enterprise using SOA

**DETAILED SYLLABUS:**

<b>Sr. No.</b>	<b>Module</b>	<b>Detailed Content</b>	<b>Hours</b>
1	Fundamentals	Introduction, Distributed Computing Models, Software Concepts, Issues in designing Distributed System, Client – Server Model	4
2	Communication	Message Passing , Introduction to Message Passing, Advantages and features of Message Passing, Message Format, Message Buffering, Multi Data gram Messaging , Group Communication  Remote Procedure Call (RPC): Basic RPC Operations, Parameter Passing, Extended RPC Models  Remote Object Invocation: Distributed Objects, Binding a Client to an Object, Static Vs Dynamic RMI, Parameter Passing, Java RMI  Message Oriented Communication: Persistence and synchronicity in communication, Message Oriented Transient and Persistent Communications	8
3	Processes	Threads, Code Migration: Approaches to Code Migration, Migration and Local Resources, Migration in Heterogeneous Systems	4
4	Synchronization	Clock Synchronization, Physical and Logical Clocks, Global State, Election Algorithms, Mutual Exclusion, Distributed Transactions, Deadlocks	8
5	Consistency and Replication	Introduction, Data-Centric Consistency Models, Client Centric Consistency Models, Distributed Protocols	8
6	Distributed Technologies and Frameworks	Overview of EJB S/W Architecture, view of EJB Conversation, Building and Deploying EJB, Roles in EJB, Types of Enterprise Beans, Lifecycle of Beans , Developing Applications using EJB Framework.	5

		Introduction to CORBA, CORBA Components and architecture, Method Invocation, Static and Dynamic Invocation in CORBA, CORBA IDL, Developing Application using CORBA	<b>4</b>
		Introduction to .NET, .NET architecture, . NET Remoting	<b>3</b>
		Comparison of RMI, CORBA, EJB, .NET	<b>1</b>
7.	Service Oriented Architecture	Defining SOA, Business value of SOA, SOA characteristics, Concept of a service, SOA Architecture, Deploying SOA applications.	<b>3</b>

**Text Books:**

- Sunita Mahajan, Seema Shah, “ Distributed Computing”, Oxford, second edition.
- Andrew S. Tanenbaum & Maarten van Steen “ Distributed Systems : Principles and paradigms” Prentice Hall of India Private Limited
- G. Sudha Sadasivam, Radha Shankarmani, "Middleware and Enterprise Integration Technologies " , Wiley Precise Textbook

**References:**

1. Pradeep K. Sinha “Distributed Operating Systems”, Prentice Hall of India Private Limited
2. Thomas Erl "Service Oriented Architecture : Concepts, Technology and Design" Prentice Hall
3. G. Coulouris, J. Dollimore and T. Kindberg “Distributed Systems :

**Term work: 25 marks**

Term work should consist of at least 10 practical experiments with 1 mini project and assignments covering the topics of the syllabus

Distribution of marks for term work shall be as follows:

Laboratory work (10 Experiments)	10 Marks
Mini Project	05 Marks
Assignments	05 Marks
Attendance	05 Marks

**Suggested Practical List :**

1. Client Server based program using RPC
2. Client Server based program using RMI
3. Implementation of Clock Synchronization (logical/physical)
4. Implementation of Election algorithm.
5. Implementation of Mutual Exclusion algorithms
6. Program multithreaded client/server processes.
7. Program to demonstrate process/code migration.
8. Write a distributed application using EJB
9. Write a program using CORBA to demonstrate object brokering.
10. Use .Net framework to deploy a distributed application.
11. Mini Project : For Eg. using SOA

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

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical/Oral	Tutorial	Total
TEITC603	System And Web Security	04 Hr/Week	02 Hr/Week	---	04	01	---	05

Course Code	Course Name	Examination Scheme								
		Theory Marks				End Sem. Exam	Term Work	Practical	Oral	Total
		Internal assessment			Avg. of 2 Tests					
		Test1	Test 2							
TEITC603	System And Web Security	20	20	20	80	25	---	25	150	

### Course Objectives

1. Understand the fundamental principles of access control models and techniques, authentication and secure system design
2. Apply methods for authentication, access control, intrusion detection and prevention
3. Identify and mitigate software security vulnerabilities in existing systems.
4. Understand the role of firewalls, IPSec, Virtual Private Networks and identity management, etc.
5. Understand Web Server vulnerabilities and their counter measures

### Course Outcomes:

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

- Differentiate between authentication and authorization;
- Explain the basic idea behind access control and compare the various access control policies and models.

- Explain the need for security protocols in the context of use with Internet-based applications;
- Explain the basic idea behind firewalls and intrusion detection systems and how they work;
- Explain malicious software and typical software solutions used in dealing with viruses and worms;
- Understand and explain various issues related to program security and web security.

**DETAILED SYLLABUS:**

Sr. No.	Module	Detailed Content	Hours
1	<b>Introduction to Computer Security</b>	Vulnerabilities, Threats and Attacks, Public Key Cryptography and Cryptanalysis, Knapsack cryptosystem	04
2	<b>Authentication</b>	Authentication Methods and Protocols, Password based authentication, Token Based Authentication, Biometric Authentication, Digital Certificates, X.509 Directory Services, PKI, Needham Schroeder Authentication Protocol, Single sign on, Kerberos Authentication Protocol, Federated Identity Management.	08
3	<b>Access Control</b>	Access control Policies: DAC, MAC, RBAC, Access control Matrix, ACLs and Capability Lists, Multiple level security model: Biba and Bell La Padula Models, Multilateral security, Covert channel, CAPTCHA.	06
4	<b>Software security</b>	Software Flaws, Buffer Overflow, Incomplete Mediation, Race conditions, Malware: Viruses, Worms, Trojans, Logic Bomb, Bots, Rootkits, Miscellaneous Software Attacks: Salami attack, Linearization Attacks, Trusted Computing: Software reverse engineering, Digital Rights management	08

5	<b>Operating System Security</b>	Linux Security Model, File System Security, Linux Vulnerabilities, Windows Security Architecture, Windows Vulnerabilities	04
6	<b>Network Security</b>	Network security basics, TCP/IP vulnerabilities Layer wise: Packet Sniffing, ARP spoofing, port scanning, IP spoofing, TCP syn flood, DNS Spoofing, Internet Security Protocols: SSL, TLS, IPSEC, Secure Email and S/MIME, Denial of Service: Classic DOS attacks, Source Address spoofing, ICMP flood, SYN flood, UDP flood, Distributed Denial of Service, Defenses against Denial of Service Attacks.  Firewalls, Intrusion Detection Systems: Host Based and Network Based IDS, Honey pots.	12
7	<b>Web Security</b>	User Authentication and session management, Cookies, Secure HTTP, SQL Injection Techniques, Cross Site Scripting, Cross-Site Request Forgery, Session Hijacking and Management, Phishing and Pharming Techniques, Web Services Security.	06

### **Text Books**

- 1) Computer Security Principles and Practice, by William Stallings, Pearson Education.
- 2) Security in Computing by Charles P. Pfleeger , Pearson Education
- 3) Computer Security by Dieter Gollman, **3<sup>rd</sup> Edition**, Wiley India.
- 4) Cryptography and Network Security by Behrouz A. Forouzan, TATA McGraw hill.

### **Reference Books**

- 1) Information security Principles and Practice by Mark Stamp, Wiley publication
- 2) OWASP TOP 10: [https://www.owasp.org/index.php/Top\\_10\\_2013](https://www.owasp.org/index.php/Top_10_2013)
- 3) Network security bible 2nd edition, Eric Cole, Wiley India.



**Term Work:** 25 Marks (Total marks) = 15 Marks (Experiment and Case Studies) + 5 Marks (Assignments) + 5 Marks (Attendance)

**Suggested Practical List:**

1. Design and implement the RSA cryptosystem.
2. Implement Digital signature scheme using RSA.
3. Simulate the Buffer overflow attack.
4. Simulate the Salami attack.
5. Design and implement a program for adding passwords to a file. The program should be able to filter out weak passwords (based on dictionary words or variants) and store the strong passwords by creating a hash of user ID and password.
6. Study of a packet sniffer like wireshark, or tcpdump. Use this tool to capture and analyze data in packets.
7. Download and install nmap. Use it with different options to scan open ports, perform OS fingerprinting, do a ping scan, tcp port scan, udp port scan, etc
8. Detect ARP spoofing using open source tool ARPWATCH
9. Install an IDS (e.g. SNORT) and study the logs.
10. Use of iptables in linux to create firewalls.
11. Implement a simple SQL injection attack.

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

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical/Oral	Tutorial	Total
TEITC604	Data Mining and Business Intelligence	04 Hr/Week	02 Hr/Week	---	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					
TEITC604	Data Mining and Business Intelligence	20	20	20	80	25	---	25	150

### Course Objectives:

1. To introduce the concept of data Mining as an important tool for enterprise data management and as a cutting edge technology for building competitive advantage.
2. To enable students to effectively identify sources of data and process it for data mining.
3. To make students well versed in all data mining algorithms, methods, and tools.
4. Learning how to gather and analyse large sets of data to gain useful business understanding.
5. To impart skills that can enable students to approach business problems analytically by identifying opportunities to derive business value from data.

**Course Outcomes: On successful completion of this course students should be able:**

1. Demonstrate an understanding of the importance of data mining and the principles of business intelligence
2. Able to prepare the data needed for data mining algorithms in terms of attributes and class inputs, training, validating, and testing files.
3. Implement the appropriate data mining methods like classification, clustering or association mining on large data sets.
4. Define and apply metrics to measure the performance of various data mining algorithms.
5. Apply BI to solve practical problems : Analyze the problem domain, use the data collected in enterprise apply the appropriate data mining technique, interpret and visualize the results and provide decision support.

**DETAILED SYLLABUS:**

<b>Sr. No.</b>	<b>Module</b>	<b>Detailed Content</b>	<b>Hours</b>
1	<b>Introduction to Data Mining</b>	What is Data Mining; Kind of patterns to be mined; Technologies used; Major issues in Data Mining	<b>02</b>
2	<b>Data Exploration</b>	Types of Attributes; Statistical Description of Data; Data Visualization; Measuring similarity and dissimilarity.	<b>04</b>
3	<b>Data Preprocessing</b>	Why Preprocessing? Data Cleaning; Data Integration; Data Reduction: Attribute subset selection, Histograms, Clustering and Sampling; Data Transformation & Data Discretization: Normalization, Binning, Histogram Analysis and Concept hierarchy generation.	<b>04</b>
4	<b>Classification</b>	Basic Concepts; <b>Classification methods:</b> 1. Decision Tree Induction: Attribute Selection Measures, Tree pruning. 2. Bayesian Classification: Naïve Bayes' Classifier. <b>Prediction:</b> Structure of regression models; Simple linear regression, Multiple linear regression. <b>Model Evaluation &amp; Selection:</b> Accuracy and Error measures, Holdout, Random Sampling, Cross Validation, Bootstrap; Comparing Classifier performance using ROC Curves. <b>Combining Classifiers:</b> Bagging, Boosting, Random	<b>08</b>

		Forests.	
5	<b>Clustering</b>	Cluster Analysis: Basic Concepts; <b>Partitioning Methods:</b> K-Means, K-Medoids; <b>Hierarchical Methods:</b> Agglomerative, Divisive, BIRCH; <b>Density-Based Methods:</b> DBSCAN, OPTICS	<b>08</b>
6	<b>Outlier Analysis</b>	What are outliers? Types, Challenges; <b>Outlier Detection Methods:</b> Supervised, Semi-Supervised, Unsupervised, Proximity based, Clustering Based.	<b>02</b>
7	<b>Frequent Pattern Mining</b>	Market Basket Analysis, Frequent Itemsets, Closed Itemsets, and Association Rules; Frequent Pattern Mining, Efficient and Scalable Frequent Itemset Mining Methods, The Apriori Algorithm for finding Frequent Itemsets Using Candidate Generation, Generating Association Rules from Frequent Itemsets, Improving the Efficiency of Apriori, A pattern growth approach for mining Frequent Itemsets; Mining Frequent itemsets using vertical data formats; Mining closed and maximal patterns; Introduction to Mining Multilevel Association Rules and Multidimensional Association Rules; From Association Mining to Correlation Analysis, Pattern Evaluation Measures; Introduction to Constraint-Based Association Mining.	<b>08</b>
8	<b>Business Intelligence</b>	What is BI? Effective and timely decisions; Data, information and knowledge; The role of mathematical models; Business intelligence architectures; Enabling factors in business intelligence project; Development of a business intelligence system; Ethics and business intelligence	<b>03</b>
9	<b>Decision Support System</b>	Representation of the decision-making process; Evolution of information systems; Definition of decision support system; Development of a decision support system.	<b>03</b>
10	<b>BI Applications</b>	Data mining for business Applications like Fraud Detection, Clickstream Mining, Market Segmentation, retail industry, telecommunications industry, banking & finance CRM etc	<b>06</b>

**Text Books:**

1. Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann 3<sup>rd</sup> Edition
2. G. Shmueli, N.R. Patel, P.C. Bruce, "Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner", 1<sup>st</sup> Edition, Wiley India.
3. Business Intelligence: Data Mining and Optimization for Decision Making by Carlo Verzellis, Wiley India Publications

**Reference Books:**

1. P. N. Tan, M. Steinbach, Vipin Kumar, "Introduction to Data Mining", Pearson Education
2. Michael Berry and Gordon Linoff "Data Mining Techniques", 2nd Edition Wiley Publications.
3. Michael Berry and Gordon Linoff "Mastering Data Mining- Art & science of CRM", Wiley Student Edition
4. Vikram Pudi & Radha Krishna, "Data Mining", Oxford Higher Education.

**Oral Exam:**

An oral exam will be held based on the above syllabus.

**Term work:**

Assign a case study for group of 2/3 students and each group to perform the following experiments on their case-study; Each group should perform the exercises on a large dataset created by them.

**Suggested Practical List:**

- 1) 2 tutorials
  - a) Solving exercises in Data Exploration
  - b) Solving exercises in Data preprocessing
- 2) Use WEKA to implement the following Classifiers - Decision tree, Naïve Bayes, Random Forest;
- 3) Implementation of any one classifier using languages like JAVA;
- 4) Use WEKA to implement the following Clustering Algorithms – K-means, Agglomerative, Divisive;
- 5) Implementation of any one clustering algorithm using languages like JAVA;

- 6) Use Weka to implement Association Mining using – Apriori, FPM;
- 7) Detailed study of any one BI tool like Oracle BI, SPSS, Clementine, and XLMiner etc. (paper Assignment)
- 8) Business Intelligence Mini Project: Each group assigned one new case study for this; A BI report must be prepared outlining the following steps:
  - a) Problem definition, Identifying which data mining task is needed
  - b) Identify and use a standard data mining dataset available for the problem. Some links for data mining datasets are: WEKA site, UCI Machine Learning Repository, KDD site, KDD Cup etc.
  - c) Implement the data mining algorithm of choice
  - d) Interpret and visualize the results
  - e) Provide clearly the BI decision that is to be taken as a result of mining.

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

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical/Oral	Tutorial	Total
TEITT605	Advanced Internet Technology	04 Hr/Week	02 Hr/Week	---	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						
TEITT605	Advanced Internet Technology	20	20	20	80	25	25	---	150	

**Course Objectives:**

1. To introduce the concept of Search Engine basics.
2. To enable students to determine SEO Objective and develop SEO plan prior to Site Development.
3. To make students well versed with HTML 5, CSS3 and Responsive Web Design.
4. Learning the characteristic of RIA – Web Mashup Eco System.

**Course Outcomes: On successful completion of this course students should be able:**

1. Develop Keyword Generation, Using Google Analytics etc.
2. To demonstrate Responsive Web Design.
3. To demonstrate Amazon/Google or yahoo mashup.

**DETAILED SYLLABUS:**

<b>Sr. No.</b>	<b>Module</b>	<b>Detailed Content</b>	<b>Hours</b>
1.	Search Engine Optimization	<p>Search Engine Basics</p> <p>Algorithm based Ranking Systems – Determining Searcher Intent and Delivering Relevant, Fresh Content, Analyzing Ranking Factors, Using Advanced Search Techniques, Vertical Search Techniques, Country-Specific Search Engines</p> <p>Determining SEO Objective and Finding Your Site’s Audience – Setting SEO Goals and Objective, Developing SEO plans Perior to Site Deveopment - SEO for Rawtraffic;E-commerce Sales;Mindsahre/Branding; Direct Marketing; Reputation Management; Ideological Influence</p> <p>Getting started SEO: Defining Your Site’s Information Architecture, Auditing an Existing Site to identify SEO Problems, Identifying Current Server Statistic Software and Gaining Access – Dtermining Top competitors, Benchmarking Current Indexing Status, Current Rankings, Benchmarking Current Traffic Source and Volumes, Conduct SEO/Website SWOT analysis.</p> <p>Keyword Genration – Creating Pages – Website Structure- Creating Content-Creating Communities-building Links-Using Google Analytics-Social Media Optimization-Creating Pay-per-click Campaigns-Optimizing PPC Campaigns through Quality Score optimization - Tracking Results and Measuring Success.</p>	<b>20</b>
2.	Responsive web design with HTML5 and CSS3	Getting Started with HTML 5, CSS3 and Responsive Web Design.	<b>16</b>



		<p>Media Queries: Supporting Differing Viewports</p> <p>Embracing Fluid Layout</p> <p>HTML 5 for Responsive Design</p> <p>CSS3: Selectors, Typography and color Modes</p> <p>Stunning Aesthetics with CSS3</p> <p>CSS3 Transitions, Transformations and Animations</p> <p>Conquer Forms HTML5 and CSS3</p>	
3.	RIA and Mashup	<p>Characteristic of RIA – Web Mashup Eco Systems – Mashup Techniques :1) Mashing on the Web Server, Rich User Interface using Ajax, Mashing with JSON</p> <p>RIA: Ajax vs Traditional Approach</p> <p>Technical Background:</p> <p>1) Javascript and AJAX</p> <p>2) JSON Alternative to XML</p> <p>3) Syndication</p> <p>4) REST and WS * Web Services</p>	<b>12</b>

**Text Books:**

1. Professional Web 2.0 Programming WROX press
2. Responsive Web Design with HTML5 and CSS3 PACKT
3. The Art of SEO O'Reilly Publication

**References:**

1. Rich Internet Application AJAX and Beyond WROX press
2. Web Technology, Srinivasan, Pearson

**Term Work:** 25 Marks (Total marks) = 15 Marks (Experiment and Case Studies) + 5 Marks (Assignments) + 5 Marks (Attendance)

**Suggested Practical List:**

- 1) Practical on SEO (Keyword Generation, Using Google Analytics etc.)
- 2) Practical to demonstrate Responsive Web Design
- 3) Practical to demonstrate Amazon/Google or yahoo mashup

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