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 V)
Revised course for Information Technology
Academic Year 2014-15 (REV- 2012)

Sub Code	Subject Name	Teaching Scheme (hrs/week)			Credits Assigned			
		Theory	Practical	Tut.	Theory	TW/ Practical	Tut.	Total
TEITC501	Computer Graphics and Virtual Reality	4			4			4
TEITC502	Operating Systems	4			4			4
TEITC503	Microcontroller and Embedded Systems	4			4			4
TEITC504	Advanced Database Management Systems	4			4			4
TEITC505	Open Source Technologies	3			3			3
TEITC506	Business Communication and Ethics*		2**+2			2		2
TEITL501	Computer Graphics and Virtual Reality		2			1		1
TEITL502	Operating Systems		2			1		1
TEITL503	Microcontroller and Embedded Systems		2			1		1
TEITL504	Advanced Database Management Systems		2			1		1
TEITL505	Open Source Technologies		2			1		1
	Total	19	12		19	07		26

*Common for all programs.
**Theory class to be conducted for entire class.

Note: During third year of engineering learners can be exposed to industrial environment by arranging an industrial visit.

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.					
TEITC501	Computer Graphics and Virtual Reality	20	20	20	80	3	25	25	150
TEITC502	Operating Systems	20	20	20	80	3	25	25	150
TEITC503	Microcontroller and Embedded Systems	20	20	20	80	3	25	25	150
TEITC504	Advanced Database Management Systems	20	20	20	80	3	25	25	150
TEITC505	Open Source Technologies	20	20	20	80	3	25	25	150
TEITC506	Business Communication and Ethics*	---	---	---	---	---	25	25	050
	Total	100	100	100	400	15	150	150	800

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	TW/ Practical	Tutorial	Total
TEITC501	Computer Graphics And Virtual Reality	04 Hrs./Week	02 Hrs./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					
TEITC501	Computer Graphics And Virtual Reality	20	20	20	80	25	25	---	150

Course Objectives	
1	The objective of the course is to equip students with the fundamental knowledge and basic technical competence in the field of computer graphics.
2	Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes so as to fit them as per the picture definition.
3	Provide an understanding of mapping from a world coordinates to device coordinates, clipping, solid modeling, rendering, and projections.
4	To comprehend and analyze the fundamentals of animation, virtual reality, underlying technologies, principles, and applications.

Course Outcomes	
1	Students shall have understood basic concepts of computer graphics.
2	Students shall have understood algorithms to scan convert the basic geometrical primitives, transformations, Area filling, clipping.
3	Students shall have understood the fundamentals of animation, Virtual reality ,the related technologies, and shall be able to describe applications of Virtual Reality.

DETAILED SYLLABUS

Sr. No.	Module	Detailed Content	Hours
1.	**Introduction to Computer graphics and Output primitives**	Introduction, Display Devices, Bitmap and Vector based graphics, Overview of Coordinate system, Scan Conversion of:point, line using Digital differential analyzer& Bresenham's algorithm, circle using midpoint approach, Curve Generation : Bezier and B-Spline curves. Introduction to fractals: generation procedure, classification, dimension and Koch Curve.	**10**
2.	**Area Filling and Two Dimensional Transformations**	Area filling : Inside/Outside Test , Scan line Polygon Fill Algorithm , Boundary Fill and Flood Fill algorithm. Basic Geometrical 2D transformations : Translation, Rotation, Scaling, Reflection, Shear, their homogeneous Matrix representation and Composite transformation.	**8**
3.	**Two Dimensional Viewing**	Introduction ,Viewing Pipeline , View Coordinate reference frame ,Window to viewport transformation, Point clipping, Line clipping: Cohen Sutherland Algorithm, Liang Barsky algorithms, Polygon clipping: Sutherland Hodgeman polygon clipping and Weiler Atherton. Text Clipping.	**6**
4.	**Three Dimensional Transformation,Viewing and Projection.**	Three Dimensional transformations: Translation, Scaling, Rotations, Composite. Three Dimensional object representation: Polygon Surfaces, Tables, Meshes. Three Dimensional Viewing Pipeline , Viewing transformation , Projections : Parallel(Oblique and orthographic), Perspective (one Point)	**6**
5.	**Introduction to Animation**	Key Frame Animation, Animation Sequence, Motion Control Methods, Morphing, Warping(only Mesh Warping).	**2**
6.	**Introduction to Virtual Reality**	Virtual Reality : Basic Concepts , Classical Components of VR System , Types of VR Systems, Three Dimensional Position Trackers, Navigation and Manipulation Interfaces, Gesture	**8**

		Interfaces, Graphical Display, Sound displays, and Haptic Feedback . Input Devices ,Graphical Rendering Pipeline , Haptic Rendering Pipeline, Open GL rendering pipeline.Applications of Virtual Reality.	
7	**Modeling**	Geometric Modeling: Virtual Object Shape, Object Visual Appearance.Kinematics Modeling: Object Position, Transformation Invariants, Object Hierarchies, Physical Modeling: Collision Detection, Surface Deformation, Force Computation. Behavior Modeling.	**4**
8	**Introduction to VR programming**	Introduction , Programming through VRML : Defining and Using Nodes and Shapes , VRML Browsers , Java 3D :Visual Object Definition by Shape 3D instances , Defining personal visual object class, ColorCube Class, Geometric – Utility Classes, Geometry Classes , Attributes.	**4**

Text Books

1 Donald Hearn and M. Pauline Baker, "Computer Graphics", Pearson Education.

2 R. K Maurya, "Computer Graphics with Virtual Reality", Wiley India.

Reference Books

1 Grigore Burdea, Philippe Coiffet, "Virtual Reality Technology", Wiley.

2 Steven Harrington, "Computer Graphics", McGraw Hill.

3 Rogers, "Procedural Elements of Computer Graphics", Tata McGraw Hill.

4 Vince, "Virtual Reality Systems", Pearson Education.

5 F.S. Hill , Stephen M. Kelley , "Computer Graphics using Open GL" Prentice Hall

Term work: Term Work shall consist of programs based on the given list. Journal must include at least 2 assignments.

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

Suggested Practical List:

1. Implementation of Line Drawing algorithms : DDA , Bresenham and using them generating line with different styles like dotted , dashed , centered and thick line.
2. Implementation of Circle generation algorithm : Midpoint and using it generating concentric circles.
3. Implementation of Area Filling Algorithm : Boundary Fill , Flood Fill and Scan line Polygon Fill.
4. Curve Generation : Bezier for n control points , B Spline (Uniform)
5. Fractal Generation (Koch Curve)
6. Program for performing Two Dimensional Transformations : Translation , Scaling , Rotation , Reflection , Shear by using a homogeneous Matrix representation ,use of a function for matrix multiplication is desirable , so as to perform composite transformation.
7. Implementation of Line Clipping Algorithm : Cohen Sutherland , Liang Barsky.
8. Implementation of Polygon Clipping Algorithm : Sutherland Hodgman.
9. Program to represent a 3D object using polygon surfaces and then perform 3D transformation.
10. Program to perform projection of a 3D object on Projection Plane : Parallel and Perspective.
11. Program for Animation.

   It is desirable to implement some of the experiments by using Open GL.

   In addition at least 3 programs using VRML and JAVA 3D APIs.

   It is recommended to encourage the student to form a group for a mini project (a simple graphical utility) and for them submitting a theoretical Q. / A. type assignments can be kept optional.

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			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/ Practical	Tutorial	Total
TEITC502	Operating Systems	04 Hrs./Week	02 Hrs./Week	---	04	01	---	05

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test2	Avg. of 2 Tests					
TEITC502	Operating Systems	20	20	20	80	25	---	25	150

Pre-requisites: Data structures, Programming Language (C / JAVA), Computer Organization & Architecture.

Course Objectives:

- To understand the main components of an OS & their functions.

- To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS.

- To understand the concepts and implementation of virtual memory.

- To understand various issues in Inter Process Communication (IPC) and the role of OS in IPC.

- To study different file systems of OS like Linux, Windows and overview of OS for mobile & hand held devices.

Course Outcomes:

- Student will learn important computer system resources and their management policies, algorithms used by operating systems.
- Student will understand what makes a computer system function and the primary PC components.
- Student will   understand the working of an OS as a manager of various resources.
- Student will   implement some of the functions of OS such as scheduling policies, page replacement algorithms, IPC.

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours
1	**Overview of Operating System**	Operating system objectives and functions, Evolution of OS, Characteristics of modern OS, Basic concepts: Processes, Files, System calls, Shell, Kernel architectures: Monolithic, Micro-kernel, Layered, Kernel mode of operations.	**4**
2	**Process Management**	Process description: Process, Process States, Process Control Block (PCB), Threads, Thread management. Process Scheduling: Types, Comparison of different scheduling policies.	**10**
3	**Process Co-ordination**	Principles of Concurrency, Race condition and critical section, Mutual Exclusion- Hardware and Software approaches, Semaphores, Monitors, Message Passing, Producer Consumer Problem. Deadlock: Principles of Deadlock, Deadlock Detection, Deadlock Avoidance, Deadlock Prevention.	**10**
4	**Memory Management**	Memory Management Requirements, Memory Partitioning, Virtual memory: Paging; Segmentation; Page replacement policies, page faults.	**6**
5	**Input Output Management**	I/O Devices, Organization of the I/O Function, Operating System Design Issues, I/O Buffering, Disk Scheduling and disk scheduling algorithms, Disk cache.	**6**
6	**File Management**	Overview, File Organization, File Sharing; Record Blocking; Secondary Storage Management.	**6**
7	**Case Studies**	Producer Consumer Problem, Multithreading, RAID, File systems of Windows and Linux , Overview of Android OS.	**6**

Text Books:

1. Modern Operating Systems, Tanenbaum, IIIrd Edition, PHI
2. Operating System-Internal & Design Principles, VIth Edition, William Stallings, Pearson
3. Operating Systems Concepts, Silberschatz A., Galvin P., Gagne G, VIIIth Edition Wiley.
4. Principles of Operating Systems, Naresh Chauhan, First Edition , Oxford university press.

References:

1. Operating Systems in Depth, Thomas W. Doeppner, Wiley.
2. Operating System Programming and Operating Systems, D M Dhamdhere, IInd Revised Edition, Tata McGraw.
3. Operating Systems, *Achyut S. Godbole,* 2nd edition, Tata McGraw Hill.
4. Application development using Android, Hello, Android, mobile development platform, Ed Burnette, 3rd Edition.
5. Linux Command Line & Shell Scripting, Richard Blum and Christine Bresnahan, 2nd edition, Wiley.

Term work: Term Work shall consist of programs based on the given list. Journal must include at least 2 assignments.

Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)
Oral Examination will be based on the above syllabus.
Suggested Practical List:

1. Implementation of System Calls (at least five).
2. Implementation of CPU Scheduling Policies (both pre-emptive and non pre-emptive).
3. Implementation of Page Replacement Algorithms.
4. Implementation of IPC (Producer Consumer problem) .
5. Implementation of Multithreading.
6. Implementation of Deadlock Avoidance algorithm (Bankers algorithm).

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			Credits Assigned			
		Theory	Practical	Tut.	Theory	TW/ Practical	Tut.	Total
TEITC503	Microcontroller and Embedded Systems	04 Hrs./Week	02 Hrs./Week	---	04	01	---	05

Course Code	Course Name	Examination Scheme								
		Theory Marks				TW	Practical	Oral	Total
		Internal Assessment			End Semester Exam				
		Test1 (T1)	Test2 (T2)	Average of T1 & T2					
TEITC503	Microcontroller and Embedded Systems	20	20	20	80	25	-	25	150

Pre-requisites: Fundamentals of Computer, Digital Logic Circuits, Computer Organization and Architecture

Course Objectives:

CEO 1	To conceptualize the basics of embedded systems
CEO 2	To conceptualize the basics of organizational and architectural issues of a microcontroller.
CEO 3	To learn programming techniques used in microcontroller.
CEO 4	To understand basic concept of ARM processor
CEO 5	To understand fundamentals of real time operating system

Course Outcomes:

A	Ability to understand basic structure embedded systems
B	Ability to understand basic structure microcontroller.
C	Ability to understand basic concepts used in embedded system.
D	Ability to program microcontroller.
E	Ability to design conceptual embedded system.

Detailed Syllabus:

Module	Detailed Contents	Hours
1	**Introduction to Embedded Systems:** Overview of Embedded System Architecture, Application areas, Categories of embedded systems, specialties of embedded systems. Recent trends in embedded systems. Brief introduction to embedded microcontroller cores CISC, RISC, ARM, DSP and SoC.	06
2	**The Microcontroller Architecture:** Introduction to 8051 Microcontroller, Architecture, Pin configuration, Memory organization, Input /Output Ports, Counter and Timers, Serial communication, Interrupts.	08
3	**Assembly Language Programming of 8051:** Instruction set, Addressing modes, Development tools, Assembler Directives, Programming based on Arithmetic & Logical operations, I/O parallel and serial ports, Timers & Counters, and ISR.	10
4	**ARM 7 architecture:** Architectural inheritance, Detailed study of Programmer's model, ARM Development tools, Instruction set: Data processing, Data transfer, Control flow. Addressing modes. Writing simple assembly language programs. Pipelining, Brief introduction to exceptions and interrupts handling.	10
5	**Embedded / Real Time Operating System:** Architecture of kernel, Task and Task scheduler, Interrupt service routines, Semaphores, Mutex, Mailboxes, Message queues, Event registers, Pipes, Signals, Timers, Memory management, Priority inversion problem. Off-the-Shelf Operating Systems, Embedded Operating Systems, Real Time Operating System (RTOS) and Handheld Operating Systems.	8
6	**Embedded System - Design case studies:** Digital clock, Battery operated smart card reader, Automated meter reading system, Digital camera.	06

Text Books:
1. The 8051 microcontroller & Embedded systems, M. A. Mazidi, J. G. Mazidi, R. D. McKinlay, Pearson
2. The 8051 microcontroller & Embedded systems, Kenneth J. Ayala, Dhananjay V. Gadre, Cengage Learning
3. Embedded / real – time systems: concepts, design & programming, Black Book, Dr. K. V. K. K. Prasad, Dreamtech press, Reprint edition 2013
4. Introduction to embedded systems, Shibu K. V., McGraw Hill
5. ARM System on chip Architecture, Steve Furber, Pearson, edition second

Reference Books:

1. Embedded systems an integrated approach, Laya B. Das, Pearson, Third impression, 2013
2. ARM system developer's guide, Andrew N. Sloss, Dominic Symes, Chris Wright, Morgan Kaufmann Publishers
3. Embedded system design A Unified hardware/software Introduction, Frank Vahid, Tony Givargis, Wiely
4. ARM Technical Reference manual

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

The faculty should conduct eight programming practicals/experiments based on the above syllabus and two case studies based on recent trends in embedded systems.

Oral examination will be based on the above syllabus.

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			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical/Oral	Tutorial	Total
TEITC504	Advanced Database Management 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	Test2	Avg. of 2 Tests					
TEITC504	Advanced Database Management Systems	20	20	20	80	25	---	25	150

Course Objectives:

1. To reinforce and strengthen the database concepts learned in the basic course in database technologies

2. To impart skills that can help design and implement advanced queries using Structured Query Language.

3. To equip students with knowledge to implement and integrate databases in actual applications.

4. To make students aware of how databases are actually stored and accessed.

5. To introduce advanced concepts of transaction management and recovery techniques.

6. To initiate awareness about the potential security threats that exist in database systems and how to tackle them

7. To introduce other database models like distributed and object based

8. To create awareness of how enterprise can organize and analyze large amounts of data by creating a Data Warehouse.

Course Outcomes: At the end of the course the student will be able to:

1. Construct complex queries using SQL to retrieve and manipulate information in a database.

2. Design and implement full-fledged real life applications integrated with database systems.

3. Clearly understand how databases are actually stored and accessed; How transaction ACID properties are maintained and how a database recovers from failures.

4. Apply security controls to avoid any type of security incidents on vital database systems.

5. Design advanced data systems using Object based systems or Distributing databases for better resource management.

6. Understand the importance of enterprise data and be able to organize data to perform analysis on the data and take strategic decisions.

DETAILED SYLLABUS

Sr. No.	Module	Detailed Content	Hours	Weightage
1	**Introduction**	Reviewing basic concepts of a relational database, Basic SQL	**01**	**0%**
2	**Advanced SQL**	Complex Retrieval Queries using Group By, Recursive Queries, nested Queries ; Specifying Constraints as Assertions; Event Condition Action (ECA) model (Triggers) in SQL; Creating and working with Views in SQL; Database Programming: Embedded SQL, Dynamic SQL and SQLJ, Database Programming with Function Calls: JDBC; Stored Procedures in SQL, Embedded SQL, Dynamic SQL.	**06**	**10%**

3	**Advanced Transaction Processing & Recovery**	Review of ACID properties and Serializability; Multiversion Concurrency Control Techniques; Granularity of Data Items and Multiple Granularity Locking ; Advanced Database Recovery techniques like Write Ahead Logging (WAL), ARIES, Checkpoints.	**06**	**10%**
4	**Data Security**	Introduction to Database Security Issues; Discretionary Access Control Based on Granting and Revoking Privileges; Mandatory Access Control and Role-Based Access Control for Multilevel Security; SQL Injection; Introduction to Statistical Database Security Introduction to Flow Control	**04**	**10%**
5	**Storage and Indexing**	Operation on Files; hashing Techniques; Types of Single-Level Ordered Indexes; Multilevel Indexes; Dynamic Multilevel Indexes Using B-Trees and B+-Trees; Indexes on Multiple Keys.	**04**	**10%**
6	**Distributed Databases**	Types of Distributed Database Systems; Distributed Database Architectures; Data Fragmentation, Replication and Allocation Techniques for Distributed Database Design; Query Processing and Optimization in Distributed Databases; Overview of Transaction Management in Distributed Databases; Overview of Concurrency Control and Recovery in Distributed Databases.	**06**	**10%**
7	**Object Based Databases**	Overview of Object Database Concepts; Object-Relational Features; Object Database Extensions to SQL; The Object Definition Language ODL; Object Database Conceptual Design; The Object Query Language OQL.	**05**	**10%**
8	**Introduction to Data**	The Need for Data Warehousing; Increasing Demand for Strategic Information; Inability of Past Decision Support System; Operational Vs Decisional Support System; 1.3 Data	**02**	**5%**

	Warehousing	Warehouse Defined; Benefits of Data Warehousing ; Features of a Data Warehouse; The Information Flow Mechanism; Role of Metadata; Classification of Metadata; Data Warehouse Architecture; Different Types of Architecture; Data Warehouse and Data Marts; Data Warehousing Design Strategies.		
9	**Dimensional Modeling**	Data Warehouse Modeling Vs Operational Database Modeling; Dimensional Model Vs ER Model; Features of a Good Dimensional Model; The Star Schema; How Does a Query Execute? The Snowflake Schema; Fact Tables and Dimension Tables:; he Factless Fact Table; Updates To Dimension Tables: Slowly Changing Dimensions, Type 1 Changes, Type 2 Changes, Type 3 Changes, Large Dimension Tables, Rapidly Changing or Large Slowly Changing Dimensions, Junk Dimensions, Keys in the Data Warehouse Schema, Primary Keys, Surrogate Keys & Foreign Keys; Aggregate Tables; Fact Constellation Schema or Families of Star.	**06**	**15%**
10	**ETL Process**	Challenges in ETL Functions; Data Extraction; Identification of Data Sources; Extracting Data: Immediate Data Extraction, Deferred Data Extraction; Data Transformation: Tasks Involved in Data Transformation, Data Loading: Techniques of Data Loading, Loading the Fact Tables and Dimension Tables Data Quality; Issues in Data Cleansing.	**04**	**10%**
11	**Online Analytical Processing (OLAP)**	Need for Online Analytical Processing; OLTP vs OLAP; OLAP and Multidimensional Analysis; Hypercubes; OLAP Operations in Multidimensional Data Model; OLAP Models: MOLAP, ROLAP, HOLAP, DOLAP;	**04**	**10%**

Text Books:

1. Elmasri and Navathe, "Fundamentals of Database Systems", 6th Edition, PEARSON Education.

2. Korth, Slberchatz,Sudarshan, :"Database System Concepts", 6th Edition, McGraw – Hill

3. Theraja Reema, "Data Warehousing", Oxford University Press, 2009

References:

1. Paulraj Ponniah, "Data Warehousing: Fundamentals for IT Professionals", Wiley India.

2. C. J. Date, A. Kannan, S. Swamynathan "An Introduction To Database Systems", 8th Edition Pearson Education.

3. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems" 3rd Edition - McGraw Hill

4. Ralph Kimball, Margy Ross, "The Data Warehouse Toolkit: The Definitive Guide To Dimensional Modeling", 3rd Edition. Wiley India.

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:

Suggested Practical List

1. Problem Definition and draw ER /EER diagram

2. Creation of the database: using constrains and triggers

3. Advanced SQL – must cover Views, nested and recursive queries.

4. Implementing an application and integrating with the database using JDBC, Dynamic and embedded SQL

5. Any one Database Hashing technique

6. Implementing and index using B or B+ trees.

7. Creating and querying an Object database. – Use ODL and OQL (Paper Exercise-Assignment)

8. Implementing a Distributed Database.

9. Demonstration of database security techniques – SQL injection, inference attacks etc.

10. Problem Definition for a Data Warehouse, Construction of Star Schema Model.

11. Creation of a DW and running OLAP operations on them (Roll up, Drill down, Slice, Dice, pivot)

Tools used:
1. Any Database software like Oracle, DB2, SQL Server, MY SQL or any other open source tools.

2. Programming to be done in JAVA.

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
TEITC505	Open Source Technologies	03 Hr/Week	02 Hr/Week	---	03	01	---	04

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					
TEITC505	Open Source Technologies	20	20	20	80	25	25	---	150

Course Objectives:

1. To introduce the concept of open Source Software.

2. To enable students to learn Linux Environment.

3. To make students well versed with Android and Shell Programming

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

1. To develop android applications.

2. To install and work on Linux.

3. To perform Shell Programming.

DETAILED SYLLABUS

Sr. No.	Module	Detailed Content	Hours
1.	Over View of Open Source Software	Need of Open Sources –Advantages of Open sources – Applications- FOSS – FOSS usage –Free Software Movement – Comercial Aspect of Open Source Movement – Licensing – Certification – Open Source Software Development Model – comparision with close source / Proprietary software – Free Software – Open source vs source –available –Widely used open source software license :Apache License, BSD license, GNU General Public License, GNU Lesser General Public License, MIT License, Eclipse Public License and Mozilla Public License.	04
2.	Open Source Operating System	Installation of Linux (Redhat-CentOS): Theory about Multiboot Enviroment, Hardisk Partitioning, Swap space, LVM, and Bootloader Command Line: Basic File System Manamgnet Task, Working with files, Piping and Redirection, Working with VI editor, use of sed and understanding FHS of Linux	04
3.	Open Source Operating System: system Administrator task	Job management, Process Mangment, Mounting Devices and filesystem working with Linux, Backup, working with user, group and permission, Managing Software. Understanding Boot process and related files, Common kernel Manamgnet Task	04
4.	Open source Operating System: Network and Security Administration	Basic networking commands, Configuration of Apache Web servers, DNS servers, DHCP servers, mail Servers, NFS, FTP servers. Securing servers with IPtables. Setting up cryptographic services, SSL, Managing Certificate with OpenSSL, working with the GNU Privacy guard.	06

5.	Open Source Operating System: Shell Programming	Bash Shell Scripting, Executing Script, Working with Variables and Input, Using Control Strutures, Script control, handling with signals, Creating functions, working sed and gawk -Working with web using shell script: Downloading web page as formatted text file and parsing for data, working cURL etc.	08
6.	Open source Tools Only in LAB	Version Control using RCS and CVS (hands on RCS in single Machine) Content management : Understanding working of Drupal (Basic Drupal components) Security assessment : OpenVAS IDE :Working of Eclipse	---
7.	Open Source Mobile Programming	Android programming: Setting up Android Enviroment (using Eclipse for android development), Activites and Intents, User Interface, Designing UI using views, Data Persistence, Conent Providers, messaging and networking, Location-based Services, Publishing Android Applications	10

Text Books:

1. Redhat Linux 6.0 Administration Wiley
2. Linux Shell scripting Cookbook: Sarath Lakshman PACKT
3. Linux Lab - Open source Technology : Ambavade -Dreamtech
4. Beginning Adnorid Development Wrox Press

References:

1. Drupal guide to Planning and Building Web Site: Wrox Press

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

Suggested Practical List :

1. Linux command line : File System, Process Managment User Administration

2. Setting Up Web server, DNS server, FTP Servers

3. Working with IPTABLES, OpenVAS

4. Version Control

5. Working with Drupal

6. Shell Script

7. Andorid Setup

8. Programning in Andorid

9. Programming in Android

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/Subject Name	Credits
TEITC506	**Business Communication &Ethics**	**2**

Pre-requisite
- FEC206 Communication Skills

Objective

1. To inculcate in students professional and ethical attitude, effective communication skills, teamwork, skills, multidisciplinary approach and an ability to understand engineer's social responsibilities.
2. To provide students with an academic environment where they will be aware of the excellence, leadership and lifelong learning needed for a successful professional career.
3. To inculcate professional ethics and codes of professional practice
4. To prepare students for successful careers that meets the global Industrial and Corporate requirement' provide an environment for students to work on Multidisciplinary projects as part of different teams to enhance their team building capabilities like leadership, motivation, teamwork etc.

Outcomes: A learner will be able to …..

1. communicate effectively in both verbal and written form and demonstrate knowledge of professional and ethical responsibilities
2. Participate and succeed in Campus placements and competitive examinations like GATE, CET.
3. Possess entrepreneurial approach and ability for life-long learning.
4. Have education necessary for understanding the impact of engineering solutions on Society and demonstrate awareness of contemporary issues.

DETAILED SYLLABUS:

Module	Unit No.	Topics	Hrs
1.0	**1.0**	**Report Writing**	**08**
	1.1	Objectives of report writing	
	1.2	Language and Style in a report	
	1.3	Types of reports	
	1.4	Formats of reports: Memo, letter, project and survey based	
2.0	**2.0**	**Technical Proposals**	**02**
	2.1	Objective of technical proposals	
	2.2	Parts of proposal	
3.0	**3.0**	**Introduction to Interpersonal Skills**	**08**
	3.1	Emotional Intelligence	
	3.2	Leadership	

	3.3	Team Buliding	
	3.4	Assertiveness	
	3.5	Conflict Resolution	
	3.6	Negotiation Skills	
	3.7	Motivation	
	3.8	Time Management	

4.0	**4.0**	**Meetings and Documentation**	**02**
	4.1	Strategies for conducting effective meetings	
	4.2	Notice	
	4.3	Agenda	
	4.4	Minutes of the meeting	
5.0	**5.0**	**Introduction to Corporate Ethics and etiquettes**	**02**
	5.1	Business Meeting etiquettes,Interview etiquettes,Professional and work etiquettes,Social skills	
	5.2	Greetings and Art of Conversation	
	5.3	Dressing and Grooming	
	5.4	Dinning etiquette	
	5.5	Ethical codes of conduct in business and corporate activities (Personal ethics,conflicting values,choosing a moral response,the process of making ethical decisions)	
6.0	**6.0**	**Employment Skills**	**06**
	6.1	Cover letter	
	6.2	Resume	
	6.3	Group Discussion	
	6.4	Presentation Skills	
	6.5	Interview Skills	
		Total	**28**

List of Assignments

1. Report Writing (Synopsis or the first draft of the Report)
2. Technical Proposal (Group activity,document of the proposal)
3. Interpersonal Skills (Group activity and Role play)
4. Interpersonal Skills (Documentation in the form of soft copy or hard copy)
5. Meetings and Documentation (Notice,Agenda,Minutes of Mock Meetings)
6. Corporate ethics and etiquettes (Case study,Role play)
7. Cover Letter and Resume
8. Printout of the PowerPoint presentation

Term Work
Term work shall consist of all assignments from the list.

The distribution of marks for term work shall be as follows:

- Assignments **:**   **20 marks**
- Project Report Presentation**:**   **15 marks**
- Group Discussion**:**   **10 marks**
- Attendance **:**   **05 marks**

The final certification and acceptance of term work ensures the satisfactory performance of work assigned and minimum passing in the term work.

Reference Books:
1. Fred Luthans, *"Organisational Behavior"* , Mc Graw Hill, edition
2. Lesiker and Petit, *"Report Writing for Business"* , Mc Graw Hill,   edition
3. Huckin and Olsen, *"Technical Writing and Professional Communication"*, Mc Graw Hill
4. Wallace and Masters, *"Personal Development for Life and Work"* , Thomson   Learning, 12th edition
5. Heta Murphy, *"Effective Business Communication"* , Mc Graw Hill,   edition
6. R.C Sharma and Krishna Mohan, *"Business Correspondence and Report Writing",*
7. B N Ghosh, *"Managing Soft Skills for Personality Development"*, Tata McGraw Hill.Lehman, Dufrene, Sinha, *"BCOM"*, Cengage Learning, 2nd edition
8. Bell .Smith,"Management Communication" Wiley India Edition,3rd edition.Dr.K.Alex ,"Soft Skills",S Chand and Company
9. Dr.KAlex,"SoftSkills",S Chand and Company

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

Sr. No.	Module	Detailed Content	Hours
1	Introduction to Software Engineering	Professional Software Development, Layered Technology, Process framework, CMM, Process Patterns and Assessment	**03**
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	**06**
03	Agile Software Development	Agile Process and Process Models, Adaptive and Dynamic system Development, Scrum, Feature Driven Development and Agile Modeling	**03**
04	Engineering and Modeling Practices	Core Principles, Communication, Planning, Modeling, Construction and deployment. System Modeling and UML	**04**
05	Requirements Engineering and Analysis Model	Requirements Engineering Tasks, Elicitation, building analysis model, Data Modeling concepts, Object Oriented Analysis	**06**
06	Design Engineering	Design Concepts, Design Model – Data, Architecture, Interface, Component Level and Deployment Level design elements	**05**
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	**06**
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	**06**

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

Text Books:

1. "Software Engineering : APractitioner'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:

Sr. No.	Module	Detailed Content	Hours 48
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	**4**
		Introduction to .NET, .NET architecture, . NET Remoting	**3**
		Comparison of RMI, CORBA, EJB, .NET	**1**
7.	Service Oriented Architecture	Defining SOA, Business value of SOA, SOA characteristics, Concept of a service, SOA Architecture, Deploying SOA applications.	**3**

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				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
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	**Introduction to Computer Security**	Vulnerabilities, Threats and Attacks, Public Key Cryptography and Cryptanalysis, Knapsack cryptosystem	04
2	**Authentication**	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	**Access Control**	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	**Software security**	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	**Operating System Security**	Linux Security Model, File System Security, Linux Vulnerabilities, Windows Security Architecture, Windows Vulnerabilities	04
6	**Network Security**	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	**Web Security**	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, **3rd 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

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:

Sr. No.	Module	Detailed Content	Hours
1	**Introduction to Data Mining**	What is Data Mining; Kind of patterns to be mined; Technologies used; Major issues in Data Mining	**02**
2	**Data Exploration**	Types of Attributes; Statistical Description of Data; Data Visualization; Measuring similarity and dissimilarity.	**04**
3	**Data Preprocessing**	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.	**04**
4	**Classification**	Basic Concepts; **Classification methods**: 1. Decision Tree Induction: Attribute Selection Measures, Tree pruning. 2. Bayesian Classification: Naïve Bayes' Classifier. **Prediction**: Structure of regression models; Simple linear regression, Multiple linear regression. **Model Evaluation & Selection:** Accuracy and Error measures, Holdout, Random Sampling, Cross Validation, Bootstrap; Comparing Classifier performance using ROC Curves. **Combining Classifiers**: Bagging, Boosting, Random	**08**

		Forests.	
5	**Clustering**	Cluster Analysis: Basic Concepts; **Partitioning Methods**: K-Means, K-Mediods; **Hierarchical Methods**: Agglomerative, Divisive, BIRCH; **Density-Based Methods:** DBSCAN, OPTICS	**08**
6	**Outlier Analysis**	What are outliers? Types, Challenges; **Outlier Detection Methods:** Supervised, Semi-Supervised, Unsupervised, Proximity based, Clustering Based.	**02**
7	**Frequent Pattern Mining**	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.	**08**
8	**Business Intelligence**	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	**03**
9	**Decision Support System**	Representation of the decision-making process; Evolution of information systems; Definition of decision support system; Development of a decision support system.	**03**
10	**BI Applications**	Data mining for business Applications like Fraud Detection, Clickstream Mining, Market Segmentation, retail industry, telecommunications industry, banking & finance CRM etc	**06**

Text Books:

1. Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann 3nd 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", 1st Edition, Wiley India.
3. Business Intelligence: Data Mining and Optimization for Decision Making by Carlo Vercellis ,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:

Sr. No.	Module	Detailed Content	Hours
1.	Search Engine Optimization	Search Engine Basics 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 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 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. 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.	**20**
2.	Responsive web design with HTML5 and CSS3	Getting Started with HTML 5, CSS3 and Responsive Web Design.	**16**

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

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.