SHIVAJI UNIVERSITY, KOLHAPUR

REVISED SYLLABUS AND STRUCTURE

THIRD YEAR (C.B.C.S.) BACHELOR OF TECHNOLOGY

IN

Computer Science and Engineering

To be introduced from the academic year 2020-21

(w. e. f. June 2020) onwards

	THIRD YEAR COMPUTER SCIENCE AND ENGINEERING - CBCS PATTERN															
	SEMESTER - V															
		TEACHING SCHEME							EXAMINATION SCHEME							
Sr. No.	Course Subject / Title	THEORY			TUTORIAL		PRACTICAL		THEORY				ORAL / PRACTICAL		TERMWORK	
		Credits	N0. Of Lectures	Hours	Credits	No. of Hours	Credits	No. of Hours	mode	marks	Total Marks	MIN.	MAX	MIN.	MAX	MIN.
1	**PCC-CS501** Information Security	3	3	3			1	2	CIE ESE	30 70	100	40			50	20
2	**PCC- CS502** System Programming	3	3	3			1	2	CIE ESE	30 70	100	40	25	10	50	20
3	**PCC- CS503** Object-Oriented Modeling & Design	3	3	3					CIE ESE	30 70	100	40				
4	**PCC- CS504** Computer Algorithms	4	4	4	1	1			CIE ESE	30 70	100	40			25	10
5	**OEC- CS505** Computer Graphics & Multimedia **OEC-CS506** Internet of Things	3	3	3					CIE ESE	30 70	100	40				
6	**PCC- CS507** Java Programming	3	3	3			2	4					50	20	50	20
7	**HM- CS508** Business English				1	2							25	10	25	10
	Total (SEM –V)	***19***	***19***	***19***	***2***	***3***	***4***	***8***			***500***		***100***		***200***	

THIRD YEAR COMPUTER SCIENCE AND ENGINEERING - CBCS PATTERN

SEMESTER - VI

		TEACHING SCHEME							EXAMINATION SCHEME							
		THEORY			TUTORIAL		PRACTICAL		THEORY				ORAL / PRACTICAL		TERMWORK	
Sr. No.	Course Subject / Title	Credits	N0. Of Lectures	No. of Hours	Credits	No. of Hours	Credits	No. of Hours	mode	marks	Total Marks	MIN.	MAX	MIN.	MAX	MIN.
1	**PCC-CS601** Compiler Construction	3	3	3			1	2	CIE ESE	30 70	100	40			25	10
2	**PCC- CS602** Operating System-II	4	4	4			1	2	CIE ESE	30 70	100	40			25	10
3	**PCC- CS603** Database Engineering	4	4	4			1	2	CIE ESE	30 70	100	40	50	20	25	10
4	**PCC- CS604** Machine Learning	3	3	3	1	1			CIE ESE	30 70	100	40			25	10
5	**OEC- CS605** E-Commerce & Digital Marketing **OEC - CS606** ii) Cyber Security	3	3	3					CIE ESE	30 70	100	40				
6	**PCC- CS607** C# Programming	2	2	2			1	2					50	20	25	10
7	**PW- CS608** Domain Specific Mini Project						1	2					50	20	25	10
	Total (SEM –VI)	***19***	***19***	***19***	***1***	***1***	***5***	***10***			***500***		***150***		***150***	
	Total (SEM - V+ SEM - VI)	**38**	**38**	**38**	**3**	**4**	**9**	**18**			**1000**		**250**		**350**	

CIE- Continuous Internal Evaluation

ESE – End Semester Examination

• Candidate contact hours per week : 30 Hours (Minimum)	• Total Marks for T.Y. Sem V & VI : 8**00 + 800 =1600**
• Theory and Practical Lectures : 60 Minutes Each	• Total Credits for T.Y. Sem V & VI : **50 (SEM-V: 25 + SEM -VI: 25)**
• In theory examination there will be a passing based on separate head of passing for examination of CIE and ESE.	
• There shall be separate passing for theory and practical (term work) courses.	

Note:

1. **PCC-CS:** Professional Core Course – Computer Science and Engineering are compulsory.
2. **HM-CS:** Humanities and Management- Computer Science and Engineering are compulsory.
3. **PW-CS:** Domain Specific Mini Project -– Computer Science and Engineering are compulsory.
4. **#OEC-CS: Open Elective Course** – To be offered to Inter departmental students.

# - 60% of the students from other branches to be chosen on merit.
- 40% of the students may be from same branch based on merit.
- Number of students to be allowed should be 72(Max.) for the branch with intake of 60 students.
- The above ratio should be followed in proportionate to the sanctioned intake.

OPEN ELECTIVE COURSE-I

Sr. No.	**Name of the Subject**	**Name of the concern Branch**
1	i) Computer Graphics & Multimedia ii) Internet of Things	Computer Science and Engineering

OPEN ELECTIVE COURSE-II

Sr. No.	Name of the Subject	**Name of the concern Branch**
1	i) E-Commerce & Digital Marketing ii) Cyber Security	Computer Science and Engineering

T. Y. B. Tech (Computer Science and Engineering) Sem – V

1. Information Security (PCC - CS501)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week	**Theory : ** ESE 70 Marks CIE 30 Marks
Tutorial : -------	**Term work :** 50 Marks
Practical: 2 Hrs./Week	**Practical : ------**

Pre-requisites: Computer Network, Modular Arithmetic &Number Theory, C / C++.

Course Objectives

1. To introduce the principles of Crypto-Systems.
2. To expose students to various security services and mechanisms used.
3. To make the students aware of the security features of PGP, S/MIME, Digital Signatures, IPSec& SSL.
4. To make the students understand the system level security issues concerning threats, intruders and use of firewalls and trusted systems.
5. To make students to explore non-cryptographic and software vulnerabilities.

Course Outcomes

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

1. Understand principles of Crypto-systems.
2. Compare and analyze various security services and mechanisms.
3. Apply and use the features of PGP, S/MIME, DSA, IPSec, SSL in their profession.
4. Take precautions of their personal computing system from possible threats and attacks.
5. Explore newer vulnerabilities and provide the solutions to them.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Classical Encryption Techniques and DES:** The OSI Security Architecture, Symmetric Cipher Models: Substitution Techniques, Transposition Techniques, Block Cipher Principles, The Data Encryption Standard.	**6**
2.	**Public-Key Cryptosystems, Key Management and Authentication :** Principles of Public-Key Cryptosystems, The RSA Algorithm, Key Management, Diffie-Hellman Key Exchange, Authentication requirements, Authentication functions, MAC and Hash functions and their requirements.	**7**
3.	**Digital Signatures and Authentication Applications**: Digital Signature, Digital Signature Standard, Authentication applications - Kerberos, X.509 Authentication service.	**5**
4.	**Electronic mail and IP security**: Email Security - PGP, S/MIME, IP Security-IP Security Architecture, Authentication Header and Encapsulating Security Payload.	**5**
5.	**Web and System Security**: Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction, Intruders, Intruder Detection, Password Management, Firewall Design Principles, Trusted Systems.	**6**
6.	**Non-Cryptographic Protocol Vulnerabilities**: DoS and DDoS, Session Hijacking and Spoofing, Pharming attacks. Software Vulnerabilities - Phishing, Buffer Overflow, Format String attacks, SQL Injection.	**7**

Term Work

- Minimum of 10 Experiments to be performed from the list given below.
- Practical should include the implementation and use of the following mechanisms/Algorithms/Tools /Techniques
- Implementation can be in C/C++ Programming Language

Experiment List

1. GCD Using Euclidean algorithm/Computing Multiplicative inverses/ Prime number and modular arithmetic operations.
2. Substitution/Transposition/ Product Cipher and their Analysis
3. Single round of DES algorithm/Double DES/ Triple DES and its analysis
4. RSA Algorithm to provide Confidentiality and Authentication services or any other Public-Key Algorithm.
5. Diffie–Hellman or any other key exchange Algorithm.

6. Implementation and use of any authentication functions / algorithm.
7. Generation and use of Digital Signature for real world situation.
8. Usage of PGP security package and S/MIME features.
9. Experimenting with SSL/TLS/E-Commerce Applications and identifying their Vulnerabilities.
10. Demo and usage of network traffic analysis tools.
11. Experimentation on identifying non-cryptographic Protocol Vulnerabilities and remedies thereon.
12. Experimenting on identifying software Vulnerabilities using various tools/techniques and their analysis.
13. Any other4 Implementation/Demo/Experimentation based on the topics of syllabus.

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Cryptography and Network Security	William Stallings	Pearson Edition	(Unit I to V)
2	Network Security and Cryptography	Bernard Menezes	Cengage Learning	Unit -VI

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Cryptography and network security	Atul Kahate	TMGH
2	Cryptography and Network Security	B. A. Forouzan	TMGH
3	Network Security Know it All	Joshi et. al	Morgan Kaufmann Publisher

T. Y. B. Tech (Computer Science and Engineering) Sem –V

2. System Programming (PCC - CS502)

TEACHING SCHEME	EXAMINATION SCHEME
**Theory : ** 3 Hrs./Week	**Theory : ** ESE 70 Marks CIE 30 Marks
Tutorial : -----	**Term work:** 50 Marks
Practical: 2 Hrs./Week	**Oral : ** 25 Marks

Pre-requisites: Basics of OS and Basics Microprocessor.

Course Objectives

1. To expose the students to the fundamentals of languages and processing
2. To make students to learn design of grammars, assemblers and compilers
3. To provide hands on experience to the students on simulation of linkers, loaders and software tools for UIs

Course Outcomes

1. Student will be able to identify the role of system programs and application programs.
2. Student will be able to understand the basics of system programs like editors, compiler, assembler, linker, loader, interpreter and debugger.
3. Students able to describe the various concepts of assemblers and macro - processors.
4. Students able to understand the various phases of compiler and compare its working with assembler.
5. Students understand how linker and loader create an executable program from an object module created by assembler and compiler.
6. Students will be able to create graphical user interfaces for basic programs and learn about terminal input/output through the termios libraries.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Language Processors**: Introduction, Language processing activities, Fundamentals of language processing, Fundamentals of language, Specification, Language Processing Development Tools: LEX and YAC	**7**
2.	**Assemblers:** Elements of assembly language programming, A simple assembly scheme, pass structure of assemblers, Design of a two pass assemble	**5**
3.	**Macros and Macro Processors:** Macro definition and call, Macro expansion, Nested macro calls, Advanced macro facilities, Design of macro pre-processor: Design Overview, Data structure of Macro pre-processor with and Example	**7**

4	**Compilers and Interpreters:** Aspects of compilation, Memory allocation: Static and Dynamic memory allocation, Memory Allocation in block Structure language. Compilation of expressions, Code optimization: Local and Global optimization and Optimization technique, Interpreters	7
5.	**Linkers:** Introduction, Relocation and linking concepts, Self- relocating programs, linking for overlays, Loaders	5
6.	**Software tools:** Introduction, Software tools for program development, Editors, Debug Monitors, Programming Environments, and User Interface	5

Term Work

Minimum of 5 experiments on LEX and 5 case-studies each on Assembler, Complier, Macro Preprocessor, Linker and Loaders

Oral Exam

Orals can be conducted over the syllabus contents and Term Work assignments.

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1.	System Programming and operating systems	D. M. Dhamdhere	2ndEdition (TMGH)	All Units
2.	Lex &Yacc Publisher:	Doug Brown, John Levine, Tony Mason	2nd Edition O'Reilly Media	For Practical

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T. Y. B. Tech (Computer Science and Engineering) Sem – V

3. Object Oriented Modeling and Design (PCC - CS503)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial : -----	**Term work : -----**
Practical : -----	**Oral : -----**

Pre-requisites: Software Engineering & Object Oriented Concepts.

Course Objectives

1. To Understand the Object Based View of the System
2. To design Problems using Object Oriented Analysis and Design Techniques
3. To Understand UML notations and compare with OMT
4. To inculcate necessary skills to handle complexities in Software Design

Course Outcomes

1. Ability to analyze and model software systems
2. Ability to construct OO view of the system
3. Ability to design a Software System using OMT design techniques.
4. Ability to design a Software System using UML design techniques.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Introduction: Ability to analyze and model software systems** Object oriented themes, modeling as a design technique. **Object Modeling:** Object, classes, Link & association, advanced link & Association concepts, generalization & Inheritance, grouping constructs, aggregation, abstract classes, generalization as extension & restriction, multiple inheritance, metadata, candidate key & constraints.	**8**

2.	**Dynamic & Functional Modeling:** **Dynamic modeling**: Events & states, operations, nested state diagrams, concurrency, advanced dynamic modeling concepts &simple dynamic model, relation of object dynamic models. **Functional Modeling**: functional model, data flow diagrams, specifying operations, constriction, a simple functional model, relation of functional to object & dynamic model.	**7**
3.	**Design Methodology:** OMT methodology, Impact of an object-oriented approach, analysis, system design with examples, combining models, design algorithms, design optimization, implementation of controls, design association & physical packaging.	**3**
4.	**Introducing the UML:** An overview of the UML, Conceptual Model of UML, Architecture of UML Structure modeling Using UML**:** Classes, Relationship, Diagrams, Class Diagrams**.**	**7**
5.	**Behavioral Modeling:** Interactions, Use Cases, Use Case Diagram, Interaction diagrams, Activity diagrams, Events & Signals, State Machines, Process & Threads, Time & Space, State chart diagrams.	**5**
6.	**Architectural Modeling:** Components, Deployment, Collaboration, Patterns & frameworks, component diagrams, Deployment diagrams.	**6**

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Object-orientated Modeling & Design: (Unit 1 to 3)	James Rambaugh, Michael Blaha, William Premerlani, Frederick Eddy, William Lorensen	PHI	Unit 1 to 3
2	The Unified Modeling Language User Guide	Grady Booch, James Rambaugh, Lvar Jacobson	Addison Wesley	Unit 4 to 6

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Object oriented analysis & design using UML	H. Srimathi, H. Sriram, A. Krishnamoorthy	SCITECH PUBLICATION 2nd Edition
2	Object Oriented analysis& Design	Andrew High	TMG
3	Practical Object Oriented Design with UML	Mark Priestley	McGraw-Hill Education
4	Threat first Object oriented analysis & design	Breet Mclaughline, Garry Police & Devide West	OREILLY

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T. Y. B. Tech (Computer Science and Engineering) Sem – V

4. Computer Algorithms (PCC - CS504)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 4 Hrs/Week	**Theory : ** ESE 70 Marks CIE 30 Marks
Tutorial : 1Hr/Week	**Term work :** 25 Marks
Practical : -----	**Oral : -----**

Pre-requisites: Data Structures, Discrete Mathematics, Engineering Mathematics, Programming Concepts.

Course Objectives

1. To introduce algorithm design methods / techniques with analysis
2. To devise algorithm for given problem statement
3. To introduce complex computational problems
4. Introducing parallel algorithms

Course Outcomes

Upon Completion of this course, students will be able to:

1. Understand and demonstrate algorithm design methods with analysis
2. Devise algorithm for given problem statement and analyze its space and time complexity by using recurrence relation
3. Categorize the problem to determine polynomial and non-polynomial based on its nature
4. Understand and demonstrate basic concepts of parallel algorithms

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Unit 1 : Divide and Conquer:** What is algorithm, Algorithm Specification, Recurrence relations, Performance Analysis, Randomized Algorithms. Divide and Conquer**:** The general method, Binary search, Finding the maximum and minimum, Merge sort, Quick sort, DC Selection Algorithm, analysis of Divide and Conquer algorithms.	10
2.	**The Greedy Method:** The general method, Knapsack problem, Job sequencing with deadlines, minimum-cost spanning trees – Prim's and Kruskal's Algorithms, Optimal storage on tapes, Optimal merge Patterns, Single source shortest paths.	7
3.	**Dynamic Programming:** The general method, Multistage graphs, All pair shortest paths, 0/1 knapsack, Reliability design, Traveling Sales person problem.	7
	Basic Traversal and Search Techniques and Backtracking: Techniques for Binary Trees, Game Tree; Techniques for Graphs – Breadth First Search & Traversal, Depth First Search	13

4.	& Traversal, AND/OR graphs; Connected components and Spanning Trees; Bi-connected components and depth first search. Backtracking - The general method, 8-queen problem, sum of subsets, Knapsack Problem, Hamiltonian Cycle, and Graph Coloring.	
5.	**NP Hard and NP Complete Problems:** Basic Concepts, Introduction to NP Hard Graph Problems.	4
6.	**Introduction to Parallel Algorithm:** Computational Model and Fundamental Techniques and Algorithms – PRAM, MESH and HYPERCUBE.	7

Term Work

It should consist of minimum 10-12 assignments based on following guidelines

- A batch of students will be assigned different algorithms and expected to analyze the algorithms in terms of time and space complexity
- Solve different exercise problems in text book mentioned in syllabus
- Student need to perform at least 6 programs from the syllabus. Perform Priori Analysis and Posteriori Measurement on the same.

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Fundamentals of Computer Algorithms	Ellis Horowitz, Satraj Sahani, Saguthevar Rajasejaran	Universities Press, Second Edition	**All Units**

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Fundamentals of Algorithmics	Gilles Brassard, Paul Bratley	Pearson Education
2	Mastering Algorithms with C	Kyle Loudon	SPD O'Reilly
3	Computer Algorithms-Introduction to Design and Analysis	Sara Baase, Allen Van Gelder	Pearson Education

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T. Y. B. Tech (Computer Science and Engineering) Sem – V

5. Open Elective Course - I (OEC - CS505)

Computer Graphics and Multimedia (OEC - CS505)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week	**Theory : ESE 70 Marks** CIE 30 Marks
Tutorial : -----	**Term work : -----**
Practical : -----	**Practical : -----**

Course Objectives

1. To provide knowledge to the students about basics of computer graphics and different display devices.
2. To expose students to the various 2D & 3D transformation & projection techniques.
3. To provide knowledge to the students about basics of Illumination models, surface rendering methods.
4. To make the students aware of multimedia system &Multimedia Authoring, Compression techniques.

Course Outcomes

Upon successful completion of this course, the student will be able to -

1. Express basic ideas of computer graphics and different display devices.
2. Understand & apply various transformation, projection and rendering techniques on graphical objects.
3. Identify & apply the intensity of light on graphical objects using different illumination models.
4. Understand multimedia system & use of Multimedia Authoring & Compression techniques on graphical objects.

Unit No.	Unit Name and Contents	No. of Lectures
1	**Basic of Computer Graphics** Basic of Computer Graphics, Applications of computer graphics, Display devices: Random and Raster scan systems, Input devices, Scan Conversion techniques: RLE, Frame Buffer, Graphics software and standards.	**5**
2	**Transformations –** Basic 2D & 3D transformations - Translation, Scaling, Rotation, Reflection, Shearing, Multiple Transformations, Rotation about an axis parallel to a coordinate axis, Rotation about an arbitrary axis in space, Affine and Perspective Geometry, Orthographic projections and Axonometric projections.	**8**
3	**Illumination models and surface rendering methods** Light sources, Basic illumination models, Displaying light intensities, Polygon Rendering methods, Ray tracing methods, Radiosity lighting.	**5**

4	**Introduction to Multimedia** Multimedia: Historical perspective, multimedia data and multimedia systems, a multimedia system today, Analog and Digital Signals, Analog-to-Digital Conversion, Media Representation and Media Formats - Digital Images, Digital Video, Digital Audio.	**6**
5	**Multimedia Authoring & Compression** Examples of Multimedia, Requirements for Multimedia Authoring Tools, Intramedia Processing, Intermedia Processing, Media Compression - The Need for Graphics Compression, Graphics compression in relation to other media compression, Mesh compression using connectivity encoding.	**7**
6	**Computer Animation** Introduction: Types, Key frame animation, Procedural animation, Construction of an animation sequence, Motion control methods, VFX, SFX, Introduction to Morphing, Wrapping techniques, Defining virtual & Augmented reality.	**5**

Text Books:

1. Procedural elements for Computer Graphics - David F. Rogers (MGH International) (For Units 1)
2. Mathematical elements for Computer Graphics - David F. Rogers, J. Alan Adams (MGH Int.) (Unit 2)
3. Computer Graphics C Version second edition –Donald D. Hearn, M. Pauline Baker (Pearson) (Unit 3)
4. Multimedia systems: Algorithms, Standards & Industry Practice-Parag Havaldar & Gerard Medioni, Cengage Learning (Unit 4, 5)
5. Computer Graphics- Rajesh Maurya (WILEY India) (Unit 6)
6. Virtual & Augmented reality - Paul Mealy (Kindle Edition) (Unit 6)

Some assignments on following topics can be given and its evaluation should be considered for CIE

1. Introduction to computer graphics, OPEN GL, GLUT, GLU
2. Design 2D & 3D objects by using graphics primitives
3. Apply the different transformation techniques on 2D & 3D graphical objects
4. Create graphics design using any software(Picasa, Autodesk Maya, Sketch Up, Solid works)
5. Perform rendering using Blender or Lux Core Render Software
6. Create 2D & 3D animated object using Synfig or Blender Software.

T. Y. B. Tech (Computer Science and Engineering) Sem – V

5. Open Elective Course - I (OEC - CS506)

Internet of Things (OEC - CS506)

TEACHING SCHEME	EXAMINATION SCHEME
**Theory : **3 Hrs./Week	**Theory : **ESE 70 Marks CIE 30 Marks
Tutorial : -----	**Term work : -----**
Practical : -----	**Practical : -----**

Pre-requisites: Fundamentals of Computer Network and Internet, basics of C / C++ programming language.

Course Objectives

1. To learn Internet of Things Technology
2. To know the basics of RFID, Sensor technologies.
3. To know the basics of IoT systems like Raspberry Pi, Arduino, and Banana Pi.
4. To aware students about wireless communication technologies and IoT applications.
5.

Course Outcome

1. Students will understand basic concepts of IoT
2. students will be able to learn and implement RFID technology in various applications.
3. Students will be able to write programs for basic applications
4. Student will understand and implement different communication technologies in IoT systems.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Introduction:** IoT, Objects / Things, IoT definitions, IoT frame work, Identification technologies, Internet in IoTs.	4
2.	**Fundamental of IoT mechanisms:** Identification of IoT objects and services, Traffic characteristics, scalability and inter-operability, security and privacy, Communication capabilities, Mobility support and device power, Sensor technology, RFID technology and satellite technology.	6
3.	**Radio Frequency Identification Technology**: RFID, IoT objects and services, principles of RFID, Components of an RFID system, RFID reader, Tags, middleware, Sensor nodes, connecting nodes, networking nodes.	6
4.	**IoT systems:** Hardware and Software: Introduction to Raspberry Pi, Familiar with Raspberry Pi hardware, study of I/O ports, Programming with Raspberry Pi: Study of operating system, simple programs in C / C++, Introduction with Python programming.	8

5.	**Communication Technologies:** WPAN Technologies: Introduction to IEEE 802.15.4 standard, Bluetooth, Zigbee, IEEE 802.15.6; WBANS, NFC, IEEE 802.11 WLAN, Cellular and mobile technologies.	6
6.	**IoT Application Examples:** Smart Metering, advanced metering infrastructure, e-health / Body Area Network, City Automation (Smart City), Automotive Application, Environmental Applications, Home Automation, Control Applications.	6

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	The Internet of Things - Connecting objects to the web	Hakima Chaouchi	Wiley Publications
2	Building the Internet of Things	Daniel Minoli	Wiley Publications
3	Raspberi Pi Beginner's Guide	Gareth Halfacree	Raspberi Press
4	Introduction to Wireless Telecommunications systems and Networks	Gary J. Mulett.	Cengage Learning (India Edition).

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Raspberry Pi for Dummies	Sean McManus, Mike Cook	A Wiley Brand
2	Architecting the Internet of Things	Bernd Scholz, Reiter	Springer

T. Y. B. Tech (Computer Science and Engineering) Sem – V

6. Java Programming (PCC - CS507)

TEACHING SCHEME	EXAMINATION SCHEME
**Theory : ** 3 Hrs./Week	**Theory : ------**
Tutorial : -----	**Term work :** 50 Marks
Practical : 4 Hrs./Week	**Oral :** 50 Marks

Pre-requisites: C++ and html.

Course Objectives

1. To introduce the concept of object-oriented programming using java.
2. To learn how to implement reliable and secure application using exception handling and package concept.
3. Have the ability to write program to perform file operations.
4. To understand how to design components with java Swing API and present mechanism of multithreading.
5. To familiarize database connectivity through JDBC and learn the collection framework.
6. To explore the concept of networking and web programming using java servlet and jsp.

Course Outcomes

1. Students will be able to articulate the principle of object-oriented problem solving & programming**.**
2. Students will be able to illustrate code reusability, security and abstraction using inheritance, package and interface.
3. Students will be able to develop reliable and user-friendly applications using exception handling and file handling.
4. Students will be able to create desktop apps using SWING and event handling and also illustrate multithreading concepts.
5. Students will be able to use JDBC & collection framework.
6. Students will be able to apply network programming concept & develop web applications using servlet and jsp.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Fundamental Programming in Java:** The Java Buzzwords, The Java Programming Environment- JVM, JIT Compiler, Byte Code Concept, Hotspot, A Simple Java Program, Source File Declaration Rules, Comments, Data Types, Variables, Operators, Strings, Input and Output, Control Flow, Big Numbers, Arrays-Jagged Array. **Objects and Classes:** Object-Oriented Programming Concepts, Declaring Classes, Declaring Member Variables, Defining Methods, Constructor, Passing Information to a Method or a Constructor, Creating and using objects, Controlling Access to Class Members, Static Fields and Methods, this keyword, Object Cloning, Class Design Hints,	5
2.	**Inheritance, Interface and Packaging**: Inheritance: Definition, Super classes, and Subclasses, Overriding and Hiding Methods, Polymorphism, Inheritance Hierarchies, Super keyword, Final Classes and Methods, Abstract Classes and Methods, casting, Design Hints for Inheritance, Nested classes & Inner Classes, finalization and garbage collection. Interfaces**:** Defining an Interface, Implementing an Interface, Using an Interface as a Type, Evolving Interfaces, and Default Methods. Packages**:** Class importing, Creating a Package, Naming a Package, Using Package Members, Managing Source and Class Files. Developing and deploying (executable) Jar File.	7
3.	**Exception and I/O Streams:** **Exception:** Definition, Dealing with Errors, The Classification of Exceptions, Declaring Checked Exceptions, Throw an Exception, Creating Exception Classes, Catching Exceptions, Catching Multiple Exceptions, Re-throwing and Chaining Exceptions, finally clause, Advantages of Exceptions, Tips for Using Exceptions. **I/O Streams:** Byte Stream – Input Stream, Output Stream, Data Input Stream, Data Output Stream, File Input Stream, File Output Stream, Character Streams, Buffered Stream, Scanner, ,Random File Access File.	4
4.	**Graphical User Interfaces using Swing and Multithreading** Introduction to the Swing, Swing features, Swing Top Level Containers-Creating a Frame, Positioning a Frame, Displaying Information in a Panel, The Model-View-Controller Design Pattern, The JComponent Class. **Layout Management:** Introduction to Layout Management, APIs for Border Layout, Flow Layout, Grid Layout	6

	Event Handling: Basics of Event Handling, The AWT Event Hierarchy, Semantic and Low- Level Events in the AWT, Low-Level Event Types **User Interface Components:** Text Input, Choice Components, Menus, Dialog Boxes Setting the Look and Feel of UI, Introduction to JApplet **Multithreading:** Processes and Threads, Runnable Interface and Thread Class , Thread Objects, Defining and Starting a Thread, Pausing Execution with Sleep, Interrupts, Thread States, Thread Properties, Joins, Synchronization	
5.	**Collection and Database Programming** Collections: Collection Interfaces, Concrete Collections- List, Queue, Set, Map, the Collections Framework **Database Programming**: The Design of JDBC, The Structured Query Language, JDBC Installation, Basic JDBC Programming Concepts, Query Execution, Scrollable and Updatable Result Sets, Metadata, Row Sets, Transactions	**7**
6.	**Networking and Web:** **Networking**: Overview of Networking, Networking Basics, Working with URLs, Creating a URL, Parsing a URL, Reading Directly from a URL, Connecting to a URL, Reading from and Writing to a URL Connection, Sockets, Reading from and Writing to a Socket, Writing the Server Side of a Socket, Datagram, Writing a Datagram Client and Server. **Servlet and JSP:** Introduction to Servlet, The servlet Lifecycle, Retrieving Information and Sending Information, Database Connectivity using servlet, Introduction to JSP, Writing Scriplets, The jsp Lifecycle, Retrieving Information and Sending Information, Database Connectivity using jsp	**7**

Term Work

1. 25 marks for performance in practical and experiments as part of continuous evaluation
2. 25 marks for Two Practical Tests and oral (Each of 25 Marks) to be conducted during the semester.

Practical List

- Minimum 15 experiments should be conducted based on above topics and covering following list. At least two experiments should be conducted on each unit in the syllabus.

1. Create a class called Employee that includes three pieces of information as instance variables- first name, a last name and a monthly salary. Your class should have a constructor that initializes the three instance variables. Provide a set and a get method for each instance variable. If the monthly salary is not positive, set it to 0.0. Write a test application named EmployeeTest that demonstrates class

Employee's capabilities. Create two Employee objects and display each object's yearly salary. Then give each Employee a 10% raise and display each Employee's yearly salary again.

2. Create class SavingsAccount. Use a static variable annualInterestRate to store the annual interest rate for all account holders. Each object of the class contains a private instance variable savingsBalance indicating the amount the saver currently has on deposit. Provide method calculateMonthlyInterest to calculate the monthly interest by multiplying the savingsBalance by annualInterestRate divided by 12this interest should be added to savingsBalance. Provide a static method modifyInterestRate that sets the annualInterestRate to a new value

   Write a program to test class SavingsAccount. Instantiate two savingsAccount objects, saver1 and saver2, with balances of Rs 2000.00 and Rs 3000.00, respectively. Set annualInterestRate to 4%, then calculate the monthly interest and print the new balances for both savers. Then set the annualInterestRate to 5%, calculate the next month's interest and print the new balances for both savers.

3. Create Vehicle Interface with name, maxPassanger, and maxSpeed variables. Create LandVehicle and SeaVehicleInteface from Vehicle interface. LandVehicle has numWheels variable and drive method. SeaVehicle has displacement variable and launch method. Create Car class from LandVehicle, HoverCraft from LandVehicle and SeaVehicle interface. Also create Ship from SeaVehicle. Provide additional methods in HoverCraft as enterLand and enterSea. Similarly provide other methods for class Car and Ship. Demonstrate all classes in a application.

4. Create abstract class Shape which has instance variables side, area and perimeter

   And methods calculateArea(), calculatePerimeter() as abstract methods and display() as concrete method. Write subclasses which extend Shape class like Triangle, Rectangle, Circle, Cube and Squere and override abstract methods and display methods in subclass take instance variable if needed as per the formula. And use parameterized constructor to initialize instance variables using “this” reference variable

   Write Test class and Create a reference variable of Shape which will hold the objects of all the sub classes and calculate respective area, perimeter and display the results.

5. Create the interface stack which has variable size, abstract methods push (), pop (), display (), overflow () and underflow (). We need to implement 3 subclasses IntegerStack, StringStack and DoubleStack respectively by implementing interface. All the methods in interface are declared for string. And in subclass for integerStack convert string to integer. Same thing to all other. Create one test class and check for the working of all the classes.

6. Develop a mathematical package for Statistical operations like Mean, Median, Average, Standard deviation. Create a sub package in the math package -convert. In “convert” package provide classes

to convert decimal to octal, binary, hex and vice-versa. Develop application program to use this package, and build executable jar file of it.

7. Develop application which can handle any 5 combination of predefined compile time and runtime exceptions using multiple catch blocks. Use throws and finally keywords as well.
8. Develop a BankAccount class which should contain all methods of Bank i.e. balanceEnquery(), withdraw(), transfer() and deposit(). You should create at least two objects of BankAccount using array and do all operations mentioned above. Also generate user defined exception LowBalanceException, NegetiveNumberException and PasswordMismatchException whenever required. To transfer amount from one account to another use two BankAccount objects.
9. Take file name as input to your program through command line, if file exists the open and display contents of the file. After displaying contents of file ask user – 1.do you want to add the data at the end of file or 2.replace specified text in file by other text. Based on user's response, then accept data from user and append it to file. If file in not existing then create a fresh new-file and store user data into it. Also. User should type exit on new line to stop the program. Do this program using Character stream classes.
10. Take Student information such as name, age, weight, height, city, phone from user and store it in the file using DataOutputStream and FileOutputStream and Retrive data using DataInputStream and FileInputStream and display the result. Use Serialization concept and Bytestream classes.
11. Develop a Swing GUI based standard calculator program. Use event handling, Layout of swing package.
12. Create Stop Watch with Swing GUI and Multithreading. Provide Facility for Lap Counting.
13. Write a program to read a text file one line at a time. Read each line as a String and place that String object into a LinkedList. Print all of the lines in the LinkedList in reverse order.
14. Fill a HashMap with key-value pairs. Print the results to show ordering by hash code. Extract the pairs, sort by key, and place the result into a LinkedHashMap. Show that the insertion order is maintained.
15. Write a GUI based program to create a student registration and Login. Store Registration data in Database and take Login information from Database.
16. Create GUI Based chat application using TCP or UDP.
17. Design a student registration form which contains all the registration details and after registration display success page which should display all the entered details. And also design login form , home page and logout form using servlet.
18. Write a program to store the above form information in database. And while login check with database. Display all student names in home page. Give one search field and button to search for

particular student record and display all his information as search result using servlet and jsp using MVC.

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Core Java- Volume I Fundamentals	Cay Horstmann and Gary Cornell	Pearson, Eight edition	Unit 1 to Unit 4
2	Core Java- Volume II Advanced Features	Cay Horstmann and Gary Cornell	Pearson, Eight edition	Unit 5 and Unit 6
3	Java Servlet Programming	Jason Hunter	O'Reilly Publication, 2nd Edition	Unit 6
4	Core-Servlet and Java Server Pages Volume – 1	Marty Hall, Larry Brown	Pearson Education	Unit 6

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	JAVA-The Complete Reference	Herbert Schildt	McGraw Hill, Oracle Press	Ninth edition
2	Head First Java	Eric Freeman Elisabeth Robson Bert Bates Kathy Sierra	O'Reilly Publication	3rd edition
3	Head First Servlets and JSP	Bryan Basham, Kathy Sierra, Bert Bates	O'Reilly Publication	2nd Edition

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T. Y. B. Tech. (Computer Science and Engineering) Sem – V

7. Business English (HM - CS508)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : -----	**Theory : -----**
Tutorial : 2 Hrs./Week	**Term work :** 25 Marks
Practical: -----	**Oral :** 25 Marks

Pre-requisites:

1) Knowledge of functional grammar and vocabulary in English
2) Knowledge of the importance of business English in their career path
3) Knowledge of linguistic competence and understand intricacies involved in technical communication

Course Objectives

1. Develop basic skills to deal with people in business situations
2. Increase their knowledge of key business concepts worldwide
3. Write and read basic business reports, letters, e-mails etc
4. Expand vocabulary related to general business situations
5. Develop confidence to deal with people and basic issues in the business world

Course Outcomes

1. Learn to communicate with others in practical, business oriented situations
2. Learn to express themselves in English with greater fluency, accuracy and confidence
3. Learn to handle themselves in English in a variety of business contexts, from negotiating, to using the telephone, to making presentations, to socialising
4. Enhance the skills of listening, speaking, pronunciation skills, as well as business vocabulary
5. Acquire the communicative competencies crucial for appropriate workplace behavior

UNIT NO.	UNIT NAME & DETAILS
1.	**Getting acquainted with professional culture:** • First day at work • Induction program • Company hierarchy • Behavior pruning
2.	**Vocabulary building and Reading comprehension:** • Reading techniques and comprehension skills • Synonyms and antonyms • One-word substitution • Prefixes and Suffixes • Idioms and phrases • Homonyms and homographs • Irregular verbs like (write, wrote, written) • Situational vocabulary
3.	**Effective vocal Communication:** • Effective Meetings • Video Conferencing • Effective Telephonic Communication • Breaking Bad news
4.	**Effective written Communication:** • Business letters • Resume Writing • E-mail writing • Report writing • Minutes of meeting • Memo writing
5.	**Public speaking and Presentation Skills:** • Preparing and conducting presentation • Body language • Overcoming stage fear • Best practices • Interviewing and being interviewed
6.	**Miscellaneous:** • Group Discussion • Handling Complains • Negotiation Skills • Business Etiquettes

Term Work

- Individual Performance or Presentation to be Evaluated Continuously
- Group Activity Performance to be Evaluated in the Batch
- Assignments or Write up (Minimum 10)

Assignment List

1. Case study of organizational hierarchy
2. Match the following on antonyms & synonyms
3. Irregular verb list (like choose, chose, chosen)
4. Word building by using prefixes suffixes (eg. ir-regular, im-possible)
5. Minutes of Meeting – writing
6. Report writing (any report)
7. Comprehension/paragraph writing
8. Business letter / resume writing / email writing
9. PPT presentation on any non-technical topic. PPT handout should be attached
10. Do's & Dont's of group discussion & Business etiquettes

Textbooks / Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1.	**Technical Communication**	**Ashraf Rizvi**	**Tata McGraw Hill, 2005**	**1, 2, 3, 4, 6**
2	**Effective Business Communication**	**M. V Rodriques**	**Concept Publishing Company Pvt. Ltd. 2013**	**1, 2, 3, 4, 6**
3	**English for Technical Communication**	**K. R. Laxminarayan**	**SCITECH 2nd Edition 2014**	**2, 4, 3**
4.	**Technical English**	**Dr. M. Hemamalini**	**Wiley, 2014**	**2, 3, 4, 5**
5	**Business English**	**T. Thomson**	**Heinle & Heinle 2004**	**1, 3, 5, 6**
5	**Business Communication; The Real World and Your Career**	**Senguin J**	**South-Western 1999**	**1, 3, 4, 6**

T. Y. B. Tech (Computer Science and Engineering) Sem – VI

1. Compiler Construction (PCC - CS601)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week	**Theory** : ESE 70 Marks CIE 30 Marks
Tutorial : -----	**Term work :** 25 Marks
Practical : 2 Hrs./Week	**Oral : -----**

Pre-requisites: C, System Programming, Data structures

Course Objectives

1. To introduce the fundamentals of compilers and their phases.
2. To design and implement phases of a compiler.
3. To expose the students to various tools like LEX and YACC.

Course Outcomes

1. Recall the compiler phases and compiler construction tools like LEX and YACC.
2. To design and implement Lexical Analyser for a simple language.
3. To design and implement Syntax analyser for a simple expression.
4. To apply Syntax directed translations and Syntax Directed definitions to generate intermediate code.
5. To identify appropriate code optimizing transformation for the given code.
6. To **e**xplain concept of code generation.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Introduction:** Compilers, Phases of a compiler, Compiler construction tools, cousins of the compiler.	**5**
2.	**Lexical Analysis:** Role of a Lexical analyzer, input buffering, specification and recognition of tokens, finite automata implications, designing a lexical analyzer generator.	**6**
3.	**Syntax Analysis**: Role of Parser, Writing grammars for context free environments, Top-down parsing, Recursive descent and predictive parsers (LL), Bottom-Up parsing, Operator precedence parsing, LR, SLR and LALR parsers	**7**
4.	**Syntax Directed Translation and Intermediate Code Generation**: Syntax directed definitions, construction of syntax tree, S-attributed definitions, L-attributed definitions, Intermediate languages, assignment statements, back patching.	**7**

5.	**Code Optimization**: Principle sources of optimization, optimization of Basic Blocks, loops in flow graphs, Peephole optimization	**5**
6.	**UNIT 6- Code Generation**: Issues in design of a code generator and target machine, Run time storage management, Basic blocks and flow graphs, Next use information and simple code generator, Issues of register allocation, code generation from Dags.	**6**

Term Work

Minimum of 10 to 12 experiments should be carried out based on the following experiments based on following list.

Practical List

Minimum of 10 to 12 experiments should be carried out based on the following experiments.

1. Design of preprocessor for C program.
2. Design a complete lexical analyzer for C language.
3. Program to create a symbol table generator.
4. Design a syntax analyzer for simple expression in c language using top down parsing.
5. Program to create a syntax tree for simple expression in c language using recursive descent parsing.
6. To implement intermediate code generator for Boolean expression in three address code format.
7. Implement intermediate code generator for the conditional statements in three address code format.
8. Implement any one bottom up parsing [LR, SLR, LALR, Operator precedence] technique.
9. To implement a program for code generator from labeled tree.

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1.	Compilers - Principles, Techniques and Tools	A. V. Aho, R .Shethi and J. D. Ullman	Pearson Education	ALL Units

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1.	Compiler construction	D.M. Dhamdare	Mc-Millan	-
2.	LEX & YACC	Dong Brown, John Levine, Tony Mason	O'Reilly 2nd Edition	Refer for Practical's

T. Y. B. Tech (Computer Science and Engineering) Sem –VI

2. Operating System -II (PCC - CS602)

TEACHING SCHEME	EXAMINATION SCHEME
**Theory : ** 4 Hrs./Week	**Theory : ** ESE 70 Marks CIE 30 Marks
Tutorial : -----	**Term work:** 25 marks
Practical: 2 Hrs./Week	**Practical : -----**

Pre-requisites: Data Structures, Concepts of Process, deadlock and System calls.

Course Objectives

1. Fundamental architecture of UNIX operating system kernel.
2. Detail algorithms of buffer cache management.
3. Internal File system organizations and related algorithms in UNIX.
4. System calls for UNIX file system.
5. Process structure, creation and management in UNIX.
6. Architecture and algorithms of process scheduling and memory management.
7. I/O subsystem architecture and algorithms.

Course Outcomes

Upon Completion of this course, students will be able to:

1. To understand UNIX kernel, its architectural components like file subsystem, process control subsystem, memory management.
2. To understand a concrete way (UNIX i-nodes) of organizing a file system on a physical storage medium.
3. To maintain UNIX directories, files, manage processes, manipulate data with proper use of pipes and file redirection, UNIX filters.
4. To implement and handle various UNIX system calls.
5. To explain the principles of paging, virtual memory (VM) and describe the data structures and components (both hardware and software) that are necessary to implement it.
6. To perform shell programming involving decision control, looping and control flow statements on UNIX based machines.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Introduction and buffer cache:** **General Overview of the System** - History, System Structure, User Perspective, Operating System Services, Assumptions About Hardware, Architecture of the UNIX OS, Introduction to System Concepts, Kernel Data Structure, System Administration. **Buffer Cache: -** Buffer Headers, Structure of the Buffer Pool, Scenarios for Retrieval of a Buffer, Reading and Writing Disk Blocks, Advantages and Disadvantages of Buffer Cache.	10
2.	**Internal Representation of Files:** I-nodes, Structure of the Regular File, Directories, Conversion of a Pathname to I-node, Super Block, I-node Assignment to a New File, Allocation of Disk Blocks, Other File Types.	8
3.	**System Calls for File System:** Open, Read, Write, File and Record Locking, Adjusting the Position of FILE I/O-LSEEK, Close, File Creation, Creation of Special Files, Change Directory and Change Root, Change Owner and Change Mode, Stat and FStat, Pipes, Dup, Mounting and Un-mounting File Systems, Link, Unlink, File System Abstractions, File System Maintenance.	6
4.	**The Structure of Processes:** Process States and Transitions, Layout of System Memory, The Context of a Process, Saving Context of a Process, Manipulation of the Process Address Space.	8
5.	**Process Control and Scheduling:** Process Control: - Process Creation, Signals, Process Termination, Awaiting Process Termination, Invoking Other Programs, The User ID of a Process, The Shell, System Boot and the Init Process. Process Scheduling: - Process Scheduling, System Calls for Time, Clock.	8
6.	**Memory management and I/O Subsystem:** Swapping, Demand Paging, A Hybrid System with Demand Paging and Swapping. Driver Interfaces, Disk Drivers, Terminal Drivers, Streams.	8

Term Work

- It should consist of minimum 10-12 experiments based on the above topics and covering the following list of assignments. (Reference book – Linux System Programming by Robert Love may be referred for the assignments listed below.)

1. Demonstration of how the Linux Kernel implements and Manages files.
2. Implement User Buffer I/O using ‘C’ program.
3. Study & Implement file management using low level file access system calls.

4. Implementation of various operations on Files (Create, Open, Read, Write, Append, Fstat, Dup etc.,)
5. Implementation of various system call (OPEN, READ, WRITE) by reader & writer process.
6. Study & Implementation of pipe () system call.
7. Demonstration of UNIX Process Management – from process creation to process termination.
8. Study & Implementation of signal () system call.
9. Study and demonstration of different Memory Management Techniques.
10. Study and Implement Time, Sleep and Clock Management.
11. Client - Server communication using IPC mechanism: Unnamed pipe, Named pipe.
12. Implementation of Shell Scripts.
13. Implementation of system call for UNIX/Linux.
14. Study of boot loader like "Grub"
15. Study of compilation of Linux kernel.

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	The design of Unix Operating System	Maurice J. Bach	PHI	**All Units**

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Linux System Programming	Robert Love	SPD, O' REILLY
2	Unix concepts & administration	Sumitabha Das	Tata McGrow Hill, 3rd Edition

T. Y. B. Tech (Computer Science and Engineering) Sem – VI

3. Database Engineering (PCC - CS603)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 4 Hrs./Week	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial : -----	**Term work :** 25 marks
Practical: 2 Hrs./Week	**Practical :** 50 Marks

Pre-requisites: Set Theory, Operating System, Data Structures**.**

Course Objectives

1. To understand fundamental concepts and algorithms of Database Systems.
2. To gain familiarity with SQL and DBMS.
3. To learn database design techniques.

Course Outcomes

1. Understand fundamentals of database management systems.
2. Represent logical design of database using E-R Diagram.
3. Analyze & construct good database design.
4. Apply SQL queries to design & manage the database.
5. Understand transactions, concurrency control and apply to database system.
6. Understand failures in database and appropriate recovery techniques.

UNIT NO.	UNIT Name and Contents	NO. OF LECTURES
1.	**INTRODUCTION TO DATABASES [Text Book 1]** Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Database Users & Administrators, Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations.	**8**
2.	**E-R MODEL AND DATABASE DESIGN** **[E-R Model: Text Book 1] [Normalization: Text Book 2]** E-R Model: The Entity-Relationship Model, Mapping Constraints, Keys, Entity-Relationship Diagrams, Reduction to Relational Schemas, Extended ER features-Specialization, Generalization, Aggregation. Normalization: Data Redundancies & Update Anomalies, Functional Dependencies. Canonical Cover, The Process of Normalization, First Normal Form, Second Normal Form, Third	**10**

	Normal Form, Boyce-Codd Normal Form, Fourth Normal Form, Fifth Normal Form.	
3.	**STRUCTURED QUERY LANGUAGE (SQL) [Text Book 1]** Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Aggregate Functions, Nested sub Queries, Modification of Databases, Join expression, Views.	**8**
4.	**DATA STORAGE & INDEXING [Text Book 1]** Physical storage media, File Organization, Organization of records in File, Data Dictionary Storage, Database Buffer, Basic Concepts indexing & hashing, Ordered Indices, B+ Tree Index files, Multiple-Key Access, Static Hashing, Dynamic Hashing.	**8**
5.	**TRANSACTION MANAGEMENT [Text Book 1]** Transaction Concept, A Simple Transaction Model, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols.	**9**
6.	**RECOVERY SYSTEM [Text Book 1]** Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Failure with Loss of Nonvolatile Storage, Remote Backup Systems.	**5**

Term Work

Minimum 12 -14 Experiments based on the following topics.

1. Draw an E-R Diagram of any organization.
2. Reduce above mentioned E-R Diagram into tables.
3. Normalize any database from first normal form to Boyce-Codd Normal Form (BCNF).
4. Write a program of Database connectivity with any object oriented language.
5. Use DDL Queries to create, alter (add, modify, rename, drop) & drop Tables.
6. Use DML Queries to insert, delete, update & display records of the tables.
7. Create table with integrity constraints like primary key, check, not null and unique.
8. Create table with referential integrity constraints with foreign key, on delete cascade and on delete set null.
9. Display the results of set operations like union, intersections & set difference.
10. Display the results of Join Operations like cross join, self join, inner join, natural join, left outer join, right outer join and full outer join.
11. Display the records using Aggregate functions like min, max, avg, sum & count. Also use group by, having clauses.
12. Display the results using String operations.

13. Create & Update views for any created table.
14. Write java program to implement dense and sparse indexing
15. Write java program to implement B+ tree indexing.
16. Write java program to implement static hashing.
17. Study of NoSql.

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Database System Concepts	A. Silberschatz, H.F. Korth, S. Sudarshan	6th Edition, McGraw Hill Education.	**1,3,4,5,6**
2	Database Systems - A practical approach to Design, Implementation and Management	Thomos Connolly, Carolyn Begg	3rd Edition, Pearson Education	**2**

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Database Systems – Design, Implementation and Management	Rob & Coronel	5th Edition Thomson Course Technology	**3**
2	Fundamentals of Database Systems	Ramez Elmasri, Shamkant B. Navathe	4th Edition, Pearson Education	**2**

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4. Machine Learning (PCC - CS604)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial :1 Hrs./Week	**Term work :** 25 marks
Practical : -----	**Practical : -----**

Pre-requisites: Linear Algebra, Statistics, Probability Theory.

Course Objectives

1. To understand Machine Learning Aspects.
2. To understand primitives in learning process by Computer.
3. To understand nature of problems solved with Machine Learning.

Course Outcomes

On completion of the course, student will be able to

1. Explain Machine Learning concepts.
2. Analyze the Machine Learning model.
3. Design solution using Machine Learning techniques.
4. To tackle real world problems in domain of data mining, information retrieval, computer vision, linguistics and bioinformatics, etc.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Introduction to Machine Learning:** Introduction to Probability and Statistics, **Machine Learning:** Definition, Terminology, Types of learning, Machine Learning Problem categories, Machine learning architecture, process, Lifecycle, Performance measures, tools and framework, data visualization.	**06**
2.	**Regression:** **Simple regression** – hypothesis, cost function, parameter learning with gradient descent, learning rate, Gradient Descent for linear regression, examples, simple regression in matrix form. **Multivariate Linear Regression** – Multiple features, hypothesis functions, Gradient Descent for multiple variables, Feature scaling, polynomial regression	**06**
3.	**Classification- logistic regression & Naïve Bayes :** **Logistic Regression** – Definition, Hypothesis representation, decision boundary, cost function, Gradient Descent for Logistic Regression. Multiclass Classification, **Regularization** - Over fitting &Under fitting, cost function, Regularized Linear Regression, Regularized Logistic Regression, Conditional probability and Naïve Bayes Classifier. Instance-based classifier – K- Nearest Neighbor Classifier, Bayesian Network, Hidden Markov Model.	**07**
4.	**Classification- Decision trees and Support Vector Machine:** **Decision trees:** definition, terminology, the need, advantages, and limitations. Constructing and understanding Decision trees, common problems with Decision trees, Decision tree algorithms, random forest, examples. **Support Vector Machine:** What is SVM, Kernel Trick, Cost Function, Decision Trees vs. Support Vector Machine.	**06**
5.	**Unsupervised learning :** Clustering, K Means clustering, Hierarchical clustering, Association Rule mining.	**04**
6.	**Neural Network & Recommendation System:** **Neural Networks-** Neuron representation and model, Hypothesis for neuron, cost function, solution of a problem using single neuron. Gradient descent for a neuron. Neural network, Multiclass classification with neural network. Learning in neural network-back propagation algorithm **Recommendation System:** Popularity based recommender engines, Content based recommendation engines, Classification based recommendation engine, Collaborative filtering.	**07**

Term Work

- It should consist of minimum 10-12 assignments based on the above topics.

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Machine Learning with Python- an approach to applied ML	Abhishek Vijayvargia	BPB Publications	**All Units**
2	Practical Machine Learning	Sunila Gollapudi	Packt Publishing Ltd	**1,2**
3	Machine Learning	Tom M. Mitchell	McGraw Hill Education; First Edition	**1,2,3,4,5**

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Machine Learning for dummies	John Paul Muller	Willey Publication	
2	Introduction to Machine Learning	EthemAlpaydin	PHI 2nd Edition-2013	**1,2**
3	http://neuralnetworksanddeeplearning.com/			**6**

T. Y. B. Tech (Computer Science and Engineering) Sem –VI

5. Open Elective Course - II (OEC- CS605)

E- Commerce & Digital Marketing (OEC - CS605)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial : -----	**Term work : -----**
Practical : -----	**Practical : -----**

Course Objectives:

1. To get the knowledge about business advantages of the e-commerce and digital marketing and its importance

2. To develop a digital marketing plan and to make SWOT analysis

3. To get introduced with various digital channels, business tools in social networking

4. To understand the optimization of a Web site and SEO optimization

Course Outcomes:

1. Students will be able to identify the importance of the e-commerce and digital marketing for business success
2. Students will be able to create a digital marketing plan, starting from the SWOT analysis and defining a target group
3. Students will be able to identifying digital channels, business tools used in social networking
4. Students will be able to demonstrate the optimization of web site using business tools.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Introduction to E-commerce, frameworks & architectures** **Introduction:** The term “E-Commerce”, Business models related to E-Commerce, Technical and economic challenges **Frameworks and architectures:** Actors and stakeholders, Fundamental sales process, Technological elements	**(4)**
2.	**B2C business, B2B business** **B2C Business:** The process model and its variants, The pricing challenge, The fulfillment challenge, The payment challenge, B2C-business and CRM, B2C software systems **B2B business:** The process model and its variants, B2B software systems	**(5)**

3.	**Introduction to Digital Marketing** How digital technologies transformed marketing?, Definitions-digital marketing and multichannel marketing- Paid, owned and earned media, the growing range of digital marketing platform, digital marketing strategy-key features of digital marketing strategy, applications of digital marketing, benefits of digital marketing, alternative digital business models, difference between e-commerce and e-business, challenges in developing and managing digital marketing strategy	**(6)**
4.	**Online marketplace analysis & macro environment** **Introduction:** situation analysis for digital marketing, the digital marketing environment, understanding customer journeys, online consumer behavior and implications for marketing, business models for e-commerce **Online macro environment**: Technological forces, economic forces, political forces, Legal forces, social forces and cultural forces	**(8)**
5.	**Digital Marketing Strategy and relationship marketing** **Digital Marketing strategy development**: how to structure digital marketing strategy, strategy implementation **Relationship marketing using digital platforms**: Introduction, the challenge of customer engagement, customer lifecycle management	**(6)**
6.	**Marketing Communications** Marketing Communications using digital media channels: Introduction, search engine marketing, online public relations, e-mail marketing and mobile text messaging, social media and viral marketing, offline promotion techniques. **Case study:** How the ministry of food processing took to social media or world food India 2017.	**(7)**

Text Books:

1. Introduction to E-commerce: Combining Business & Information Technology 1st Edition, (2016) Martin Kutz. & bookboon.com
2. Digital Marketing: Strategy, Implementation and Practice, 6th Edition by Dave Chaffey, Fiona Ellis-Chadwik, Pearson Education.

Reference Books:

1. The Beginner's Guide to Digital Marketing (2015). Digital Marketer.
   Pulizzi, J.(2014) Epic Content Marketing, McGraw Hill Education.
2. “Electronic Commerce”, Jeffrey F Rayport and Bharat Bhasker, Tata McGraw Hill.

It should consist of assignments on following topics within group of 4-5 students & its evaluation will be considered for CIE

1. Define a target group (working in groups)
2. Creating web sites, MS Expression (working in groups)
3. Writing the SEO content (working in groups)
4. Google AdWords (working in groups)
5. CRM strategy (working in groups)

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5. Open Elective Course - II (OEC - CS606)

Cyber Security (OEC - CS606)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week	**Theory : ESE 70 Marks** CIE 30 Marks
Tutorial : -----	**Term work : -----**
Practical : -----	**Practical : -----**

Prerequisite: Fundamental knowledge of Data Communication, Networking and Information Security.

Course Objectives:

1. To gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks

2. To examine secure software development practice

3. To understand key terms and concepts in I.T. ACT

4. To incorporate approaches for incident analysis and response

Course Outcomes:

On completion of the course, student will be able to

1. Explain the cyber security concepts.

2. Describe the cyber security vulnerabilities and prevention techniques.

3. Explain the different rules and regulations under I.T. ACT.

4. Explain the concepts of digital forensics & incident management

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Computer and Network Security** Introduction to Computer Security - Introduction, How Seriously Should You Take Threats to Network Security?, Identifying Types of Threats, Basic Security Terminology, Concepts and Approaches, Online Security Resources Networks and the Internet : Introduction, Network Basics, How the Internet Works, Basic Network Utilities , Advanced Network Communications Topics	06
2.	**Cyber Frauds, DoS, Viruses:** Cyber Stalking, Fraud, and Abuse: Introduction, How Internet Fraud Works, Identity Theft, Cyber Stalking, Protecting Yourself	06

	Against Cyber Crime. Denial of Service Attacks: Introduction, DoS, Illustrating an Attack, Malware: Introduction, Viruses, Trojan Horses, The Buffer-Overflow Attack. The Sassier Virus/Buffer Overflow, Spyware, Other Forms of Malware, Detecting and Eliminating Viruses and Spyware	
3.	**Techniques Used by Hackers :** Introduction, Basic Terminology, The Reconnaissance Phase, Actual Attacks, Malware Creation, Penetration Testing	**06**
4.	**Computer Security Technology:** Introduction, Virus Scanners, Firewalls, Antispyware, IDS, Digital Certificates, SSL/TLS, Virtual Private Networks, Wi-Fi Security	**06**
5.	**I.T. ACT:** Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, I.T. Act	**06**
6.	**Introduction to Forensics:** Introduction, General Guidelines, Finding Evidence on the PC, Finding Evidence in System Logs , Getting Back Deleted Files, Operating System Utilities, Operating System Utilities, Mobile Forensics: Cell Phone Concepts	**06**

Text Books:

1. Computer Security Fundamentals - Chuck Easttom, Pearson, third edition.

Reference Books:

1. Jason Luttgens, Matthew Pepe, Kevin Mandia, Incident Response & Computer Forensics, McGraw-Hill Osborne Media, 3 rd edition , 2014.
2. Keith J. Jones, Richard Bejtlich, Curtis W. Rose, Real Digital Forensics: Computer Security and Incident Response, Paperback – Import, 2005.
3. John Sammons, the Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics Paperback, February 24, 2012.
4. Hacking Exposed: Network Security Secrets & Solutions, Stuart McClure, Joel Scambray and George.Kurtz, McGraw-Hill, 2005.
5. Ethical Hacking, Thomas Mathew, OSB Publisher, 2003.
7. Dave Shackleford, Virtualization Security: Protecting Virtualized Environments, John Wiley & Sons, 2012.
8. BRAGG, Network Security: The Complete Reference, McGraw Hill Professional, 2012

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6. C# Programming (PCC - CS607)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 2 Hrs./Week	**Theory : -----**
Tutorial : -----	**Term work :** 25 marks
Practical : 2 Hrs./Week	**Practical : 50** marks

Pre-requisites: C++, Java, HTML

Course Objectives

1. Understand code solutions and compile C# projects within the .NET framework
2. Demonstrate knowledge of object-oriented concepts using C#.NET application
3. Create and manipulate GUI components in C# and interact with database using ADO.NET in window based application
4. Create network based and multithreaded applications using C#
5. Creating ASP.Net applications using standard .net controls
6. Maintain session and controls related information for users in multi-user web applications

Course Outcomes

1. Students will be able to develop correct, well-documented programs using the C# programming language.
2. Students will be able to learn to develop object-oriented programs using C# classes and objects
3. Students will be able to learn to use Windows Forms and WPF to create GUI-based programs
4. Students will be able to build networking and multithreading based programs using C#
5. Students will be able to design web applications using ASP.NET using ASP.NET controls in web applications.
6. Students will be able to debug and deploy ASP.NET web applications and create database driven ASP.NET web applications.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**.Net architecture and C# Basics:** **.Net Architecture:** The Relationship of C# to .NET, The Common Language Runtime, A Closer Look at Intermediate Language, Assemblies, .NET Framework Classes, Namespaces, **C# basics**: Predefined data types, The Main () Method, More on Compiling C# Files, Console I/O, Using Comments# Programming Guidelines, Dynamic variables, DLL creation & calling.	3

2.	**Object oriented programming in C# :** Classes and Structs, Class Members, Anonymous Types, Structs, Partial Classes, Static Classes, The Object Class, Extension Methods, **Inheritance**: Types of Inheritance, Implementation Inheritance, Modifiers, Interfaces	**4**
3.	**Arrays, Operators and casts and strings:** **Arrays**: Simple Arrays, Multidimensional Arrays, Jagged Arrays, Array Class, Array and Collection Interfaces, Enumerations **Operators and casts:** Operators, Type Safety, Comparing Objects for Equality, Operator Overloading, User-Defined Casts, **String:** System. String, Building Strings, String Builder Members, Format Strings, Regular Expressions.	**4**
4.	**Windows Form & Database with ADO.NET:** Introduction to GUI application & components –add data control programmatically, Link data to control, process all control, track the visible forms, Find all MDI child forms, Save configuration setting for form, Force list box to scroll items, Restrict text box, Use of auto complete combo-box ,Sort a list view, Database with ADO.NET-Overview of Ado.NET, Data components in Visual Studio .NET.	**5**
5.	**Threading and Networking:** **Threading:** Overview, Asynchronous Delegates, the Thread Class and Thread Pools, Threading Issues, Synchronization, and Timers. **Networking:** Networking-Obtain information about Local network, Detect changes in network, Download data over HTTP or FTP, Download a File & Process using Stream, Respond to HTTP request from your application.	**4**
6.	**Introduction to ASP.NET 4.5** ONE ASP.NET: Introducing One ASP.NET, Simplifying a Complex Ecosystem, How Do You Benefit? **ASP.NET web form structure:** Application Location Options, The ASP.NET Page Structure Options, ASP.NET 4.5 Page Directives, ASP.NET Page Events, Dealing with Post backs, Cross-Page Posting ,ASP.NET Application Folders, Compilation, Build Providers, Global.aspx	**4**

Term Work

1. It should consist of 10 to 12 experiments based on the above syllabus covering following list of assignments
2. 50% of the experiment should be console based & 40 % experiment should be windows form application. and 10% should be web-based application

Practical List:

1. Language Introduction (Includes console-based application, creation of DLL, running a program without IDE) calling a method from another program.
2. OOPS concepts in C#-Class, Implementation Inheritance, Extension methods (Use any application).
3. Develop DLL file and use it in application program. (Use Any application)
4. Implementation of Interface Inheritance (Use Any Application).
5. Implementation of Multidimensional & Jagged array (Use Any application).
6. Use of properties in any application.
7. Implementation of Operator overloading (Any application).
8. String manipulation using String & String builder(Any application)
9. Develop program to use Regex. Matches method and Regular Expression pattern matching.
10. Design a Windows Form based application for different controls.(Any application)
11. Design a Windows Form based MDI application with different controls.(Any application)
12. Design a Windows Form based application for field validation.(Any application)
13. Design a any Windows Form based application with Database connectivity with all field validation.(Any application)
14. Develop a Win1dows Form application that performs SELECT, INSERT, UPDAE & DELETE queries and also displays the List of Books available in a Library System by fetching the details from a database. The C# application must also contain the filter capability.
15. Implement console-based networking application to obtain information of network & detect changes in network.
16. Design a Windows form application to download file & process it using stream.
17. Simple ASP.NET web application deployment in IIS server
18. Design simple login and registration page using client-side validation controls in ASP.NET
19. Do the server-side validation by using database connectivity for above problem and display all the records of database when successfully logged in using ASP.NET.

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Professional C# 2012 & .Net 4.5	Christian Nagel, Bill, Evjen, Jay Glynn, Morgan Skinner, Karli Watson	Wrox Publication	1 to 2 and unit 3 (threading)
2	A Programmer's Guide to ADO.Net in C#	Mahaesh Chand	Apress Publication	Unit 3 Windows app and ADO.NET
3	Visual C# 2010 Recipes- A Problem-Solution Approach	Allen Jones, Adam Freeman, Matthew MacDonald, Rakesh Rajan	Apress Publication	Unit 3 Windows app and ADO.Net and Unit 4 networking
4	Professional ASP.NET 4.5 in C# and VB	John Wiley & Sons Inc.	WROX publication	Unit 4 ASP part and Unit 5 and 6

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	ASP.NET 4.5-Black book	Kogent	Dreamtech Publication

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7. Domain Specific Mini-project (PW - CS608)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : -----	**Theory : -----**
Tutorial : -----	**Term work :** 25 marks
Practical : 2 Hrs./Week	**Practical :** 50 marks

Pre-requisites:

1. Software Engineering Concepts
2. Object Oriented Concepts

Course Objectives

1. To expose the students to use engineering approach to solve domain specific real time problem.
2. To use the appropriate and newer technologies while developing the project.
3. To learn the skills of team building and team work.

Course Outcomes

Upon successful completion of this course, the student will be able to –

1. Identify specific problem statement from a selected domain.
2. Analyze the problem and prepare SRS and design document.
3. Write code and carry out testing.
4. Write a report covering details of the project and give presentation on a project.

Contents

The students should form group of 4 to 5 students and every group is supposed to choose a specific domain (preferably from Smart India Hackathon problem statement) to do the mini project. Further the group should identify the relevant problem in the selected domain and propose the solution, which can be implemented as a mini-project using suitable technology. The mini-project work should be evaluated by a team of teachers appointed by the department. The evaluation and marking should include Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) during which the group should give presentation and demonstration of their work done. Care should be taken to avoid out-sourcing of the work.